

**ESTIMATES COMMITTEE
1959-60**

EIGHTY-THIRD REPORT

(SECOND LOK SABHA)

**MINISTRY OF SCIENTIFIC RESEARCH
AND CULTURAL AFFAIRS**

PART IV

National Laboratories & Miscellaneous



**LOK SABHA SECRETARIAT
NEW DELHI**

March, 1960

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CORRIGENDA

Eighty-third Report of the Estimates Committee on the Ministry of Scientific Research and Cultural Affairs Part IV—National Laboratories and Miscellaneous

- Page 2, Para 5, Line 3 for 'within' read 'with in'.
- Page 4, Para 9, Line 1, after 'was' read 'made'.
- Page 6, Para 12, Line 10, for 'soiling' read 'soling'.
- Page 22, Line 2 from bottom, for 'CDRL' read 'CDRI'.
- Page 29, Para 72, Line 9, for 'authrities' read 'authorities'.
- Page 40, Para 99, Line 5, for 'Rajsthan' read 'Rajasthan'.
- Page 41, Para 101, Table, Item 3(b), Under Col. Percentage to total number, insert '8'.
- Page 41, Para 101, Table, against Total, for '1' read '100'.
- Page 41, Para 102, Line 7, for 'inordniate' read 'inordinate'.
- Page 47, Footnote, add "*" over 'Note'.
- Page 47, Footnote, last line, for 'level' read 'levels'.
- Page 50, Under C G C R I, Table for 1957-58, Against Total, for '27.380' read '19.380'.
- Page 51, Under C F T R I, Table for 1957-58, Against Recurring, Col. 4, for '13.127' read '13.727'.
- Page 71, Line 27, for 'State Government' read 'State Governments'.
- Page 71, Line 38, for 'centre' read 'Centre'.
- Page 72, Line 21, for 'scientists' read 'scientist'.
- Page 73, Line 8 from bottom, Delete 'been'.
- Page 77, Against 1956-57, S. No. 1, Line 1, for 'on' read 'of' and Line 2, for 'Conference' read 'held'.
- Page 83, S. No. 32, Col. 3, Line 3, for 'Government' read 'Governments'.
- Page 85, S. No. 44, Col. 3, Line 4, for 'the' read 'a'.
- Page 86, S. No. 51, Col. 3, Line 1, for 'foreig' read 'foreign'.
- Page 88, S. No. 58, Col. 3, Line 2, for 'series' read 'a series'.

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1959-60

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INTRODUCTION

I, the Chairman, Estimates Committee having been authorised by the Committee to submit the Report on their behalf, present this Eighty-third Report on the Ministry of Scientific Research and Cultural Affairs Part IV—National Laboratories and Miscellaneous.

2. A statement showing an analysis of the recommendations contained in this Report is also appended to the Report (Appendix VIII).

3. The Committee wish to express their thanks to the Secretary of the Ministry of Scientific Research and Cultural Affairs and Director General, Scientific and Industrial Research and other Officers of the Ministry and the Council of Scientific and Industrial Research for placing before them the material and information that they wanted in connection with the examination of the estimates.

NEW DELHI;
The 29th March, 1960.

H. C. DASAPPA,
Chairman,
Estimates Committee.

The 9th Caitra, 1882 (S).

I. INTRODUCTORY

The Study Groups of the Committee paid visits to the following twelve National Laboratories/Institutes during the year 1959-60 as a part of their general examination of the estimates of the Ministry of Scientific Research and Cultural Affairs:—

- (i) Central Road Research Institute, New Delhi.
- (ii) National Metallurgical Laboratory, Jamshedpur.
- (iii) Central Glass & Ceramic Research Institute, Calcutta.
- (iv) Central Fuel Research Institute, Jealgora.
- (v) Central Food Technological Research Institute, Mysore.
- (vi) Central Salt Research Institute, Bhavnagar.
- (vii) National Botanic Gardens, Lucknow.
- (viii) Central Drug Research Institute, Lucknow.
- (ix) Central Building Research Institute, Roorkee.
- (x) National Chemical Laboratory, Poona.
- (xi) Central Leather Research Institute, Madras.
- (xii) Central Electro-Chemical Research Institute, Karaikudi.

2. The general matters common to all the National Laboratories/Institutes have already been dealt with by the Committee in their Seventy-sixth Report on the Ministry of Scientific Research and Cultural Affairs Part I—CSIR. In the present Report, the Committee have dealt briefly with the activities of each of the above institutions, with special reference to the industrial application of the researches conducted there and also with some specific problems pertaining to those institutions.

3. The sanctioned estimates, finally modified grants and the actual expenditure of the above mentioned National Laboratories/Institutes during the last three years as also the sanctioned estimates for 1959-60 are given in Appendix I. It will be seen that there have been wide variations between the sanctioned estimates and the actual expenditure particularly under the heads 'capital' and 'pilot plant'. The main reasons for the variations were stated to be as follows:—

- (1) Foreign exchange restrictions due to which a large part of the equipment could not be procured;
- (2) Failure of suppliers to deliver the equipment during the financial years concerned;
- (3) Difficulty in procuring controlled raw materials;
- (4) Delay in construction of buildings.

The Committee cannot help feeling that the budget estimates were framed in an unrealistic manner. The need for taking suitable steps to avoid such wide variations is indicated.

4. The Committee would like to note that they were generally well impressed with the research programmes and their implementation as also with the potentialities of the institutions as a powerful aid for progress in their respective fields. *They are, however, of the view that there is considerable scope for accelerating the pace of industrial application of the results of the researches. As a matter of fact the most reliable criterion to judge whether various researches in National Laboratories/Institutes have been completed successfully would be to see whether the processes evolved have been commercially exploited or not. This can be achieved not so much by these Institutions as by NRDC with the co-operation of CSIR, other Central Ministries and the various undertakings both in the public and private sectors. Without such application of the researches at the field level there would be little justification for all the efforts made and expenses incurred on the institutions.*

5. The last Chapter "Miscellaneous" deals with a few residual items pertaining to the activities of the Ministry of S.R. & C.A. and the CSIR, which have not been dealt within any of the previous three Reports.

II. CENTRAL ROAD RESEARCH INSTITUTE, NEW DELHI

A. Scope and Functions

6. Some preliminary research work covering different aspects of road building etc. was started in October 1950, but the Institute started functioning properly from July 1952 when the building which houses the Institute became ready for occupation. The main functions of the Institute are:—

- (i) fundamental research on materials for road construction;
- (ii) correlation of laboratory tests with those under actual conditions;
- (iii) tests on soils and studies of soil mechanics with a view to evolving low cost roads;
- (iv) standardisation of specifications for roads, including road building, plant and machinery;
- (v) technical advice and assistance on road construction, maintenance and failures;
- (vi) application and development of instruments for tests on road for the measurement of irregularities of road surfaces, impact factors, traffic counters, etc.;
- (vii) studies on the characteristics of different types of roads under different traffic conditions (incidence of accidents, road safety and road statistics);
- (viii) co-operative research schemes and co-ordination with other institutes, universities and industrial institutions;
- (ix) dissemination of results of research for the benefit of engineers; and
- (x) training of technical personnel.

B. Construction of cheap all weather stabilised roads

7. The Central Road Research Institute has developed a technique of stabilisation of soil with soft aggregates for construction of cheap all weather stabilised soil roads. It is claimed that this technique has cut by almost half the expenditure for laying out asphalted roads, which on an average, cost about Rs. 35,000 per mile of 10 feet wide road. Over two hundred miles of the stabilised soil roads using locally available soils and brick aggregates had been constructed in the Punjab, and these roads were functioning efficiently and had stood the test of time. This technique of stabilised soil road construction is being investigated in detail by the CRRI and being tried in various States having different climatic and soil conditions, where blending of soil is possible.

The response from the States to the scheme of stabilised roads does not seem to be encouraging. The representative of the Ministry stated that money had been made available by the CSIR to almost all the States for constructing about a mile length of road in their respective States utilising the method of soil stabilisation developed by the CRRI but the machinery in the States had not been moving. The Study Group of the Committee were given to understand that there was noticeable reluctance on the part of the Public Works Departments to try out new techniques of road construction developed by the Institute. This, they learnt, arose from the risk of failures that were likely to arise and the prospect of the engineers themselves being made responsible for any losses arising from such trials. As failures in a small percentage of cases could not be ruled out, when new techniques were applied in the field for development purposes, such reluctance came seriously in the way of application of research results.

The Committee consider it rather unfortunate that the method of soil stabilisation successfully evolved by the CRRI should have remained practically unutilised for years together, in spite of the fact that various Government agencies are engaged in the construction of roads all over the country. The Committee suggest that this method may be utilised by the C.P.W.D. in the Union Territories in all suitable cases and the States should also be approached for its adoption wherever possible. They recommend that conditions should be created so that development work of new techniques can be carried out freely on a reasonably large scale.

8. In para 161 of their Fifty-ninth Report (First Lok Sabha), the Committee had suggested that the Transport Ministry should take positive steps to encourage construction of stabilised soil roads specially in the rural areas in view of the low construction and maintenance cost involved. *The Committee regret to observe that no appreciable progress has been made so far in this direction.*

C. Creation of a Fund for Experimental Constructions

9. A recommendation was by the Panel of Scientists of the Planning Commission in 1956 regarding the creation of a fund for large scale experimental construction and development work and the setting up of an Assessment Committee to evaluate research results and to administer the fund. This fund was to be non-lapsable and to be fed by the transfer of 1½% of the cost of every construction and developmental scheme, specifically to be earmarked for this purpose. This recommendation was endorsed by the Estimates Committee (1956-57) in para 181 of their Fifty-ninth Report. In their reply indicating the action taken on the recommendation of the Estimates Committee, the Ministry of Transport have stated that only two States have agreed with the suggestion in principle. Most of the States have either not accepted the proposal or accepted it with certain conditions, while the replies are still awaited from the remaining States. The views of the

State Governments are being examined in consultation with the Planning Commission to decide what further action should be taken by the Government of India.

The Committee cannot over-emphasise the importance of the matter and they suggest that the decision of the Government of India on the suggestion made by the Panel of Scientists already long delayed may be expeditied.

D. Foundation Engineering Study of Delhi Sub-soil

10. The water table in Delhi has been rising continually over a period of years and is stated to be almost at a depth of 4 to 5 ft. from the ground surface in some regions. To avert the deleterious consequences of the rising water table, there is a proposal to lower the water table by resorting to artificial methods of drainage, such as pumping from tubewells, etc. The process of lowering the water table itself may, under some conditions, give rise to differential settlements. An investigation was therefore undertaken by the CRRI to determine the possibility of detrimental differential settlements occurring in the existing structures in New Delhi. The preliminary investigations consisted in determining the consolidation characteristics of the sub-soil, in general, by tests on undisturbed samples recovered up to a depth of 50 ft. in different locations. The second phase of the work comprised settlement analyses for some typical, important, existing buildings in New Delhi.

As a result of these investigations, the CRRI framed the following conclusions which were sent to the Central Public Works Department on Delhi Sub-soil Water Scheme in 1957-58:—

- (1) The possibility of appreciable surface subsidence occurring in the unbuilt areas, as a result of dewatering is ruled out.
 - (2) In the case of existing buildings, by and large, the resulting differential settlement due to lowering of water table to 10 ft. below ground level will be insignificant.
- (Repeated fluctuations of the water table may, however, cause a settlement of the order of 1/2 inch in the case of a few foundations which rest upon sand. Although this magnitude of settlement is within allowable limits, it is advisable that pumping should be so arranged that frequent fluctuations within a depth of 10 ft. below ground level are avoided as far as possible).

In reply to a written question, the CSIR informed the Committee that further action taken by Government on the basis of these conclusions was not known to it.

11. In view of the alarming rise in the level of water table in Delhi over a period of years, this question assumes considerable importance. The Committee suggest that the Ministry of Works, Housing and Supply should indicate what action they have taken in regard to the proposal to lower water table, in the light of conclusions furnished by the Central Road Research Institute.

E. Techniques evolved by the CRRI which can be applied on a large scale

12. The Study Group of the Committee that visited the Institute were informed that the following techniques were evolved by the CRRI which could be applied on a large scale:—

- (i) Construction of stabilised-soil road according to Mehra's method in dry areas for an average traffic intensity of about 500 tons a day (Already dealt with earlier).
- (ii) Stabilisation of black cotton soil with lime for use in road construction with a view to economise cost.
- (iii) Stabilisation of soil for use in the sub-base and bases of the roads to replace soiling in water-logged areas.
- (iv) Use of soft aggregates in road bases.
- (v) Use of small concentration of lime in stabilisation of loamy soils.
- (vi) The techniques of spreading two different sized aggregates in single coat surface dressing with a view to achieve better riding surfaces.
- (vii) Bituminous stabilisation of sandy soils and the locally available Kankar for road construction in desert area.
- (viii) Membranes Curing of Concrete in arid regions.

The Committee are sorry to observe that no serious effort appears to have been made so far to apply these techniques on a large scale in spite of the fact that these techniques are capable of being utilised by the Government agencies in the Centre and the States. The Director of the Institute accepted the urgent need for a reasonably rapid application of the results of research of the Institute to actual road construction in the country. The Committee suggest that the question of large scale utilisation of these techniques at least during the Third Plan period should be examined by the Central Government in conjunction with the State Governments.

F. Implementation of the recommendations made by the Central Road Research Institute

13. The Committee were glad to learn from the Institute that at least in the following three cases the recommendations made by this

Institute after detailed investigations have been or are being implemented by the authorities concerned:—

(a) *Designs of Factory and Township Roads for Heavy Electricals Ltd., Bhopal*

Due to the presence of black soil and the very heavy loadings comprising 180 tons transporters expected on some of the factory roads, the problem of design of Heavy Duty Factory and Township roads was referred to the Central Road Research Institute by the Heavy Electricals (P) Ltd., Bhopal.

After detailed investigations and analysis, the Institute has prepared and furnished the formulae both for the rigid and flexible pavements in the factory and township area.

The work is in progress as per the recommendations of the Institute.

(b) *The Plan and layout of roads of the Heavy Electricals (P) Ltd., Township and Factory area, Bhopal.*

As many of the acute traffic problems of a city or township can be avoided at the planning stage rather than corrected at a later stage, the above problem of studying the plans and layout of the new township from the traffic view point was referred to the Central Road Research Institute.

A critical study of the plan has been made from the view point of traffic flow and parking requirements and suitable recommendations have been made for implementation by the industrial concern.

(c) *Design of the Eastern Express Highway, Bombay*

A long section of the proposed route of the Eastern Express Highway, Bombay lies over the low-lying tidal flats randomly dissected by a number of creeks subject to tidal action. A section of the Express Highway already constructed showed distinct signs of subsidence and gave poor riding qualities due to the soft sub-soil which could not stand the heavy traffic density. The problem was referred by the P.W.D. (B & R), Government of Bombay to the Institute, which investigated into the problem. It recommended the use of light weight cinder locally available, and installation of vertical sand drains, etc. Construction of the Express Highway is now progressing in accordance with the recommendations of the Institute. This is claimed to be the first road project in India with a proper scientific background.

III. NATIONAL METALLURGICAL LABORATORY, JAMSHEDPUR

A. Scope and Functions

14. The National Metallurgical Laboratory was officially opened by the Prime Minister on 26th November 1950. The laboratory deals with different aspects of metallurgical research and constitutes an up-to-date research centre where knowledge of metallurgy, physics, chemistry, engineering etc. is utilised. The main functions of the laboratory apart from conducting research are application of research results to commercial operating conditions; close collaboration with other research institutes and organisations, particularly on long-term research of a fundamental nature; testing and standardization of manufactured products, and tendering advice on the preparation of specifications appropriate to Indian conditions; collection of data and technical information to function as a clearing house for information; and providing facilities for solution of problems of industries.

B. Some of the important items of work done by the Laboratory

15. The research programme of the National Metallurgical Laboratory is directed towards the discovery of effective uses of indigenous raw materials and development of substitute alloys to replace those imported at considerable expenditure of foreign exchange. The Committee are glad to learn that thirty-six new techniques and processes based on the utilisation of indigenous materials have been developed by the Laboratory which are mostly covered by patent rights. Some of the important processes developed are—

- (1) production of electrolytic manganese;
- (2) production of high purity electrolytic manganese dioxide;
- (3) production of foresterite refractories, sillimanite refractories, carbon refractories;
- (4) production of nickel-free austenitic stainless steels;
- (5) aluminising of steel.

The Committee were informed that the Laboratory had also done valuable work on the beneficiation of low grade manganese and chromite ores and was engaged at present on many important items of work, including the development of—

- (1) high manganese nickel-free coinage alloy;
- (2) low alloy high tensile structural steel;
- (3) technique for production of bimetals.

(a) *Low shaft furnace*

16. The 15 ton per day pilot low shaft furnace erected as an adjunct to the laboratory is said to be one of the largest pilot plants established anywhere in the world. The capital cost of the project so far amounted to about Rs. 27 lakhs. The Study Group of the Committee were given to understand that this process would enable the establishment of small units for iron and steel production in different parts of the country. *The Committee suggest that the economics of the setting up of such small units in different parts of the country (taking into consideration the cost of transporting raw material) should be worked out jointly by the CSIR and the Ministry of Commerce and Industry and if the result is favourable, steps should be taken to set up a few such units, to start with, during the Third Plan period.*

(b) *Production of Nickel-free Austenitic stainless steels*

17. The Committee note with satisfaction that the process of production of nickel-free austenitic stainless steels developed in the National Metallurgical Laboratory is proposed to be incorporated in the projected Alloy, Tool and Special Steels Plant to be set up in the public sector. *The Committee suggest that the proposal may be expedited as already much time has been lost in planning an Tool and Alloy Steel Project.*

(c) *Electrolytic Manganese*

18. Production of electrolytic manganese metal of 99.95 per cent. purity from low grade manganese ores is said to be another significant contribution made by the laboratory. It was stated that if the process was industrially developed, the country could not only save foreign exchange but ultimately earn even dollars by export. *The Committee feel that with the development of nickel-free austenitic stainless steel and nickel-free coinage alloys in which nickel is replaced by electrolytic manganese, the potential demand for this metal is assured and suggest that early steps should be taken to develop the process industrially.*

(d) *Manufacture of High Tensile Steel*

19. The Committee understand that the use of high tensile steel in pre-stressed concrete results in savings in cement and steel to the extent of 50 and 75 per cent. respectively. The Committee further understand that it was stressed in a symposium held at Roorkee in August 1958 on "Pre-stressed Concrete as applied to Buildings", that steps should be taken to manufacture high tensile steel in India and that this recommendation was forwarded to the Government of India. *The Committee suggest that the question of manufacture of high tensile steel may be pursued vigorously by Government.*

(e) Refractories

20. A note furnished by the CSIR giving the latest position regarding refractories, with special reference to the success achieved and the way in which they are being utilised for commercial exploitation is enclosed as Appendix II.

Refractories are the backbone of iron and steel and other metallurgical industries and it is estimated that 1,50,000 tons of refractories are required in the installation of a new steel plant of one million tons of ingot steel. The current demand for refractories has been estimated at 80,000 tons per million tons of ingot steel per year. The annual cost of imported refractories comes to Rs. 3 crores approximately. *The Committee strongly urge that a higher priority should be accorded to the indigenous production of refractories to meet all the requirements within the country.*

(f) Electrolytic Manganese Dioxide

21. The Study Group of the Committee were given to understand that high purity electrolytic manganese dioxide suitable for use in dry cells had been successfully prepared in the Laboratory and that the country imported at present about 6,000 tons per year of manganese dioxide costing about Rs. 1 crore per annum in foreign exchange. *The Committee suggest that vigorous steps should be taken for the commercial exploitation of the process developed.*

C. Pilot Plant Projects

22. The Committee understand that in respect of the following, efforts have been made to translate the results into pilot plant stage before releasing them to commercial exploitation:—

- (1) The production of iron in pilot plant low shaft furnace.
- (2) Pilot Plant production of steel by oxygen injection (L. D Process).
- (3) Semi-pilot plant studies on the beneficiation of low grade ferruginous manganese ores.
- (4) Semi-pilot plant production for electrolytic manganese.
- (5) Semi-pilot plant production of high purity manganese dioxide.
- (6) Hot-dip aluminizing of steel wire and sheet.
- (7) Pilot plant on the production of special type of refractories from indigenous materials.
- (8) Beneficiation plants for the upgrading of low grade manganese, chrome and other ores and minerals on tonnage basis.
- (9) Plant for studying the thermal beneficiation of low grade manganese and chromite.
- (10) Plant for the production of ferrovanadium from Vanadiferous ores of Mayurbhanj and Singhbhum.

IV. CENTRAL GLASS AND CERAMIC RESEARCH INSTITUTE, JADAVPUR, CALCUTTA

A. Scope and Functions

23. The Central Glass and Ceramic Research Institute was established in August 1950. Its functions are as follows:—

- (i) Fundamental research having a bearing on different branches of glass and ceramics;
- (ii) Standardisation and testing;
- (iii) General technical assistance to industry;
- (iv) Dissemination of technical information; and
- (v) Training for special work.

The main subjects of research at the Institute are glass, pottery, refractories and enamel.

B. Programme of industrial research and technical assistance

24. The Committee understand that the programme of the Institute in regard to industrial research and technical assistance to the industry is divided into the following four categories:—

- I. (a) Examination of raw material.
(b) Methods for improving the quality of glass and ceramic products produced in the country.
(c) Standardisation.
(d) Methods for testing which can be adopted in works practice.
- II. (a) Substitutes for raw materials that are scarce in the country or whose supply may be cut off during emergency.
(b) utilisation of waste materials.
- III. (a) Investigation into the possibility of producing imported articles.
(b) Developing new products of special use.
- IV. (a) General technical assistance to the Industry.
(b) Training of personnel for special work.

C. Some of the important items of work done by the Institute

25. The Committee find that the Central Glass and Ceramic Research Institute has developed a number of processes, some of

which have already been licensed out to entrepreneurs. Some of the important processes released are:—

- (a) Heat-insulating mica bricks,
- (b) Enamel-coated resistors,
- (c) Chemical porcelain,
- (d) Foam glass
- (e) Boron-free enamels
- (f) Wet-ground mica; and
- (g) Selenium-free red glass.

The Study Group of the Committee were given to understand that of these the first three had gone into production and that an entirely new industry for producing heat-insulating mica bricks urgently required by the new and existing plants, especially the steel works had been established by utilising mica. Preparations for putting up factories by the assignees for the other three items were stated to be in progress. The last process namely selenium-free red glass has been given by the CSIR free of charge for the entire bangle industry—a cottage industry with annual production worth about four crores of rupees.

26. Some of the researches for improving the quality of indigenous products have been concerned with glass containers especially for chemical, pharmaceutical, ink and fruit preservation industries, saggars and plaster of Paris for the ceramic industry, refractories for the iron and steel and other industrial furnaces.

(a) *Saggars*

27. The Study Group of the Committee were given to understand that there was a general reluctance on the part of the industry to adopt the new saggars, the production techniques of which had been developed at the Institute. It was stated that service trials in factories showed that the improved saggars could withstand 18 to 30 firings whereas the life of saggars which were at present used in factories was about 6 to 8 firings. *The Committee suggest that the reasons for the reluctance on the part of the industry to adopt the new saggars may be investigated and early steps taken to induce the industry to use the new saggars. It may be due to the fact that publicity is lacking in this regard.*

(b) *Programme of Mineral Development*

28. The Committee learnt with regret that the progress on the programme of mineral development had been rather slow and that the information service in the Institute had not yet been created. *The Committee suggest that the progress on both the items may be speeded up.*

(c) *Production of Optical Glass*

29. The Committee note that the Institute has successfully developed a process for the production of optical glass, a strategic material, which has been called the "eye" of the Defence Forces. The samples of glass produced by the Institute have been classified as 'A' grade by the Ordnance Establishment of the Ministry of Defence at Dehra Dun. A special feature of this production is that the whole work has been done without the association of foreign firms. The designing of furnace and fabrication of the entire specialised equipment have been carried out at the Institute, since the manufacturing firms do not sell or supply such designs. A unit plant having an annual capacity of 5 tons with provision for expansion upto an annual capacity of 10 tons is being installed at the Institute. India's present annual requirements are stated to be about 5 tons. The Committee were informed that the CGCRI had produced two of the main types of optical glass and that it would be able to produce the other main types by 1962. They were also informed that as a result of the development of the process for the production of optical glass by the CGCRI, the Russian firm which had submitted a project report for setting up a plant in India for the production of ophthalmic and optical glass in accordance with the provisions of a contract entered into by the Government of India with the firm in December, 1957 had now been told to drop the production of optical glass from the proposed project.

The Committee appreciate the success achieved by the CGCRI in the production of optical glass. They also welcome the action taken by the Government to drop the production of optical glass from the project report submitted by the Russian firm in view of the fact that the CGCRI is in a position to meet the entire demand for optical glass through the unit plant already set up.

(d) *Foreign Exchange Savings*

30. The Committee were glad to be informed that the results of researches which had so far been completed at the institute when fully utilised would, besides providing additional employment, help the country in saving valuable foreign exchange to the extent of Rs. 1 crore every year. The Committee trust that no efforts would be spared to secure utilisation of the researches to the fullest extent within the shortest possible time.

V. CENTRAL FUEL RESEARCH INSTITUTE, JEALGORA

A. Scope and Functions

31. The Central Fuel Research Institute was officially opened by the President of the Indian Republic on the 22nd April, 1950. The object of the Institute is to undertake research, both fundamental and applied, on solid, liquid and gaseous fuels. Another major undertaking of this Institute is the physical and chemical survey on the coals of India, with a view to providing a reliable assessment of the quality and quantity of the coal resources of the country, in order to ensure that the different types of coal are utilised to the best advantage.

The work of the Institute covers broadly (1) assessment of the fuel resources in quantity and quality; (2) encouragement of the use of the different types of fuel for the purposes for which they are best suited; (3) improvements in fuel economy and especially in combustion technique; (4) improvements in solid fuel preparation and purification (including coal washing, screening, grinding, pulverising, etc.); (5) carbonisation of coal at high and low temperatures; (6) gasification of solid fuels; (7) hydrocarbon synthesis; (8) hydrogenation of coal and tars; (9) special problems in fuel utilisation or treatment, *e.g.*, benzol, coal tars, lignites, desulphurisation, etc., (10) fundamental studies in the composition, constitution, and properties of fuels and of their associated impurities; (11) spontaneous combustion and its prevention; (12) sampling, sizing, and similar investigations; and (13) analytical and other tests.

In addition to dealing with the various problems of fundamental and applied research, the Institute also gives technical aid and advice to the industry and to the Government on various problems covering a wide field of uses of coal and other fuels.

B. Some of the important items of work done by the Institute

32. One of the major functions of the Institute is directed to the detailed physical and chemical survey of coals of the different coal-fields of India. This work is being conducted through a chain of six regional coal survey stations at Jharia, Raniganj, Ranchi, Bilaspur, Jorhat (Assam) and Hyderabad. It is claimed by the Institute that the investigations conducted so far have led to correct assessment of the quality of coal resources in the country and also helped in formulating the pattern of utilisation, most suited for the raw materials.

33. The washability investigations of Indian coals constitute one of the major research schemes for which detailed studies, both on the laboratory as well as on pilot plant scale are undertaken to (a) assess the washability characteristics of the different coals, and (b) to evolve the most suitable commercial washing plants matching the characteristics and to develop washing technique best suited for Indian coals.

The Committee were informed that the washability studies at the Institute had led to the establishment of central washeries both in the public and private enterprises. A few pilot washing plants have been installed and others are envisaged to be set up in the near future.

34. The studies of the carbonization potentialities of coals both at high and low temperatures are the other major research schemes undertaken by the Institute. The Committee were informed that the work done in this field had led to the selection of the suitable coking blends for the coke ovens of the steel plants at Rourkela, Bhilai and Durgapur. Owing to extremely limited resources of coking coal in the country and in view of the increased needs of iron and steel, it will be necessary for the Institute to continue its efforts towards evolving new ways and means of manufacturing metallurgical coal by utilising as much as possible of the indifferent types of coal both coking, semi-coking and non-coking in blends.

35. The gasification investigations on the semi-pilot plant and pilot plant scale have been undertaken with the object of utilising slack high ash coals, the reserves of the latter not being too meagre.

C. Commercial exploitation of the results of research

36. Some of the important directions in which the results of research at the Institute can be usefully exploited, are indicated below:—

(a) *Briquetting*

A large part of coal produced in India is slack coal *i.e.* less than one inch thickness. The slack produced from coking coal can often be sold for coke making, but there is no such market for the slack produced from non-coking coals. Briquetting of the slack coal for domestic use however offers an out-let.

(b) *Soft coke for domestic use*

The institute has been carrying out investigations on the low temperature carbonisation of Indian coals. Valuable tar and soft coke are obtained from this process. The coke can be efficiently utilised as smokeless domestic fuel. The development of a proper low temperature carbonisation industry will remove much of the smoke nuisance and domestic pollution in big cities and in coal fields and lead to cleaner and better conditions.

(c) Lignite investigations

The work done at the Institute has shown that the lignites of South Arcot are similar to the Australian and German brown coals. By successfully exploiting this source of supply, it may be possible to set up a large thermal generating plant fired by raw or partly dried lignite. In addition, some of the lignite may be briquetted and some may be carbonised.

(d) Benzol Recovery

Benzol forms an important by-product from the coke oven and is necessary for defence purposes. If it is fully recovered from each of the coke oven plants, considerable foreign exchange can be saved in the form of lowered import of petroleum. Special efforts are therefore necessary to ensure full recovery of benzol from all the coke oven plants.

37. The following important products have been prepared from coal at the Institute:—

- (i) active carbon from bituminous coal and lignites;
- (ii) zeo-karbs for water softening and the manufacture of glucose from starch;
- (iii) ashless carbon for the manufacture of electrode carbon and other moulded products;
- (iv) indene and coumarone type of resins from Indian coal tars for paint, varnish, rubber and paper industry, floor coverings, printing inks and adhesives;
- (v) montan wax from South Arcot lignite;
- (vi) recovery of sulphur during carbonization; and
- (vii) pyrites from the washery rejects from coal.

Large quantities of some of these materials are at present improved. *The Committee are therefore of the view that special efforts should be made for the manufacture of these products on a commercial scale.*

VI. CENTRAL FOOD TECHNOLOGICAL RESEARCH INSTITUTE, MYSORE

A. Scope and Functions

38. The Central Food Technological Research Institute was inaugurated on 21st February 1950. The Institute deals with all aspects of food technology aimed at a better conservation and more efficient utilization of food material available in the country. Its functions include:—

- (1) storage and preservation of different classes of food materials; prevention of spoilage; reclamation and utilization of partially affected material;
- (2) processing of foodstuffs to improve their keeping quality and facilitate ready usage; refrigeration, freezing, gas storage, dehydration, canning, etc;
- (3) treatment of different coarse food materials to improve their palatability, digestibility and general food value; elimination of harmful and unpalatable ingredients;
- (4) study of new and hitherto unfamiliar sources of food materials; their processing and fortification to render them more wholesome and acceptable; emergency food;
- (5) preparation of concentrated foods, vitamins and other food accessories, composite and multipurpose foods, ready-to-serve foods, supplementary foods, food substitutes, etc;
- (6) preservation of fruits, vegetables and other perishable articles; training of personnel into methods of preparation of squashes, jams, preserves, pickles, chutneys, etc., and general investigations into fruit technological problems including possible use of exhaled gases, artificial colourization and antioxidants for preservation of shape and food quality;
- (7) dietetics, design and demonstration of improved types of food preparations to suit economic conditions and tastes of people in different regions; improved cooking methods;
- (8) study of problems of food industries; provision of technological information; survey of existing industries, their technical problems and collection of factual data for development of new industries; pilot plant trials with different types of industrial equipment;

- (9) food sanitation; survey and advice on hygienic conditions in food industries; treatment and utilization of waste products from food industries;
- (10) development of improved and rapid methods of determining quality of food products; detection of new and unfamiliar adulterants; and
- (11) food information; dissemination of general information bearing on food and dietary problems; popular presentation of important developments in food technology, issue of bulletins and charts for the preparation of home preserves, different small-scale industries, demonstration of new methods.

B. Some of the important items of work done by the Institute

(a) Tapioca Macaroni

39. The Institute has developed a technique for the production of cheap and enriched foods with tapioca as the base which can be cooked and consumed in the same way as foodgrains. The product called 'Tapioca Macaroni' which is being produced on a pilot plant in the Institute at the rate of one ton per day is a blend of tapioca flour (60 per cent.), specially prepared ground flour (11 per cent.), and wheat semolina (25 per cent.) and contains 10-11 per cent. protein. Tapioca Macaroni has about twice the nutritive value of rice. It has been extensively used in Kerala where there is abundant supply of the major raw material. The Committee understand that a proposal to set up a Tapioca Macaroni plant in Kerala is under consideration of the Department of Food, Ministry of Food and Agriculture. *The Committee suggest that the scheme may be expedited.*

(b) Incorporation of Tapioca Flour with wheat atta or maida Enriched flour.

40. It is stated that researches carried out at the Institute have shown that tapioca flour makes a good addition to cereal diets and leads to improved growth. The incorporation of tapioca flour to the extent of 25 per cent. is comparatively easy and the Committee understand that this will reduce the import of wheat to the corresponding extent. The quality of the mixture of tapioca flour with wheat flour or *atta* is further enhanced by incorporation of a protein rich material like edible groundnut flour. Even 5 per cent. incorporation of such a product is stated to increase the protein content by about 2.5 per cent. and at the same time improves the taste of the cooked dishes.

(c) Mysore Flour

41. This product is a blend of 75 per cent. tapioca flour and 25 per cent. groundnut flour of edible quality and can be used in exactly the same way as used for making the dough. 'Mysore flour' has been

extensively used in famine stricken areas and has found favour in several parts of the country like Rajasthan, Himachal Pradesh, Assam and West Bengal.

(d) *Concentrated and protective foods*

42. Work done mainly at the Institute has shown that oilseeds can be processed so as to yield clean and attractive products which are very rich in proteins and also some of the vitamins and minerals. These products are too concentrated for being used as such but they can easily go into other forms of food which they can help to enrich. They can also be fortified with vitamins and minerals and converted into cheap protective foods which can be added to our diet preparations so as to make them more balanced. The preparation of edible quality meal from groundnut has been standardised and the product is now being used regularly for preparation of (1) enriched flour compositions (2) composite grains and (3) protective and enriched foods such as multipurpose food, enriched biscuits, children's food of different kinds etc. The Committee understand that the chief merit of this line of work lies in the fact that it will make use of abundantly available materials which have not so far been used as human food.

(e) *Indian Multipurpose Food*

43. The Indian Multipurpose Food has been developed at the Institute from indigenous and cheaply available raw materials and it has already become popular. It contains 75 per cent. groundnut flour, besides roasted bengal gram, vitamins, minerals and spices, and has proved a good supplement to the dietary. It was stated that even the use of $\frac{1}{2}$ oz. of the food per day by children had beneficial effect on them. It lends itself to many uses in the dietary of the people without necessitating any major change in their food habits. It is claimed that a person can overcome the deficiency in his daily diet by using 1-2 ozs. of Multipurpose Food at a cost of about 5 nP. The product contains about 44 per cent. protein and at that level it is one of the cheapest foods.

The Committee were informed that the Institute was producing Multipurpose Food on a pilot plant at the rate of one ton per day and distributing the product all over the country and abroad. They were also informed that a proposal to set up a plant in Madras for its manufacture was under consideration of the Department of Food, Ministry of Food and Agriculture. *The Committee suggest that the matter may be expedited.* They had also referred earlier to this matter in paras 101 and 102 of their Forty-fourth Report (1958-59) on the Ministry of Health.

(f) *Vegetable Milk and Curd*

44. Conditions have been standardised for the production of milk and curd from groundnuts which is very close to cow's milk in its

composition and nutritive value. During the past eight years, milk is being regularly produced, converted into curd and supplied not only to private users but also to hotels and restaurants. The curd is now being distributed at about half the cost of the cow or buffalo milk.

(g) *Composite Protein Food*

45. The Institute has standardised processing condition for the production of a Sanatogen-like product from indigenous materials. This process has been taken over by the industry for large scale manufacture.

(h) *Infant Food*

46. The Institute has worked out a process for the manufacture of infant food from buffalo milk. After intensive trials the product has been found to be as easily digestible as the product made from cow's milk. Large scale manufacturing trials have already been completed by the Kaira District Co-operative Milk Producer's Union, Anand, Gujerat and that Union is expected to take up large scale manufacture of Infant Food from buffalo milk at an early date.

(i) *Malted Milk Powder*

47. A process has been developed for the manufacture of malted milk powder which is similar to categories of products like horlicks and is based on indigenous millets. The consumers acceptability and the value of the product have been established by extensive trials. The commercial application of the process has already been taken up by a firm.

(j) *Fruit Juice Powders*

48. In order to prevent loss of fruit juices in seasons when fruits are available in surplus, a process has been developed to manufacture fruit juice powders which can be used for preparing fruit juice beverages during the off season. Fruit juice powders are easy to handle for packaging, transportation and marketing. The process has been released to industry.

(k) *Parboiling of Paddy*

49. As a result of the investigations a new parboiling technique has been developed when the processing time has been reduced to a few hours instead of a few days. The resulting product is stated to be far superior and has none of the objectionable off-flavours. Further the yield of head rice is more and there is very little wastage. The improved hot soaking method has been adopted by several rice mills in and around Mysore and it is understood that recently the Government of Madras have decided to insist on all rice mills adopting the parboiling technique evolved by the Institute.

The Committee understand that the extended application of the technique will not only yield more wholesome food but also save the country a few lakhs of tons of rice per annum. *The Committee suggest that early steps should be taken to secure the application of the new technique throughout the country.*

(l) *Rice Bran Oil*

50. Rice bran contains on an average 16 per cent. of oil. So far there is no industry for extracting this oil. A solvent extraction process using alcohol as solvent has been developed for extracting the oil from bran. Rice bran oil is an edible oil of high quality. The residual oil in the bran is less than 1 per cent. and the defatted bran is a good cattle feed. The other by-products are sugar and wax. The Committee were informed that a flourishing industry yielding crores of rupees could be built on this process. They were also informed that the question of putting up a ten ton plant was under examination. *The Committee consider that the matter is sufficiently important to merit immediate implementation.*

(m) *Baker's Yeast*

51. Baker's yeast is not being manufactured in India at the present time and she is depending on imports from other countries. A process has been standardised for the manufacture of high grade Baker's yeast with molasses as the starting material which is available in plenty in the country. Messrs. United Breweries have taken up the process for commercial exploitation.

The Committee understand that when this plant goes into operation, the entire demands of the country can be met, thereby resulting in saving in foreign exchange.

(n) *Ginger Cocktail*

52. The Institute has developed a process for the manufacture of Ginger Cocktail, which is a non-alcoholic beverage based on fruit juices, indigenous herbs and extract of ginger. The process has been released to the industry.

(o) *Calcium Fortification of Salt*

53. The work of the Institute has shown that salt is a good vehicle for calcium and in that form it is well distributed with most of Indian foods. In collaboration with the Central Salt Research Institute, the Institute has recently standardised conditions for the production of calcium fortified salt. The addition is so adjusted that while the taste and uses of the salt are not affected, the usual daily consumption would cover a good part of the normal deficiency in our diet. The Committee are given to understand that the fortified salt will be slightly costlier than the usual bazar salt, but will more than make up by improved health.

(p) *Fumigation of stored grains and impregnation of Jute Bags*

54. A technique has been evolved for combating infestation, which occurs during storage and movement of the grains in jute bags from areas of production to the marketing centres. A cheap insecticidal composition known as 'Impregmol' has been developed which can be used to impregnate jute bags. Another technique for fumigating grains with ethylene dibromide has been developed and standardised. It is claimed that the result has been very successful. Besides, a new technique of fumigating called 'Durofume Process' has been evolved which eliminates as well as prevents infestation. The processes have been taken over by Messrs Infestation Control Corporation and they are using them in several States in India. It is understood that a large number of godowns in the Bombay State has been fumigated according to the formula released by this Institute.

C. Vanaspati and adulteration of ghee

55. The question of the use of Vanaspati is agitating the minds of the public for a long time. There are two aspects of the question viz. whether it is deleterious to health and in any case, whether a suitable colour should not be added to it to put an end to its use as an adulterant. At present it is being widely used in adulterating ghee.

As regards Vanaspati's effect on health, the Committee were informed that no experiments had been carried out at any of the National Laboratories. The representative of the Ministry stated during his evidence that a study of the problem was being undertaken by the Nutrition Research Laboratory, Hyderabad. *The Committee regret to note that in spite of the controversy raging over a number of years about deleterious effects of Vanaspati on health, none of the research laboratories or institutes have yet conducted research and given their findings thereon. The Ministry should lose no time in bringing home to the concerned laboratories the urgent need of completing research in this respect and furnishing results early.*

As for the second point relating to the discovery of colouring material for vegetable ghee, it was stated that no suitable colouring material had been found out to satisfy certain conditions. They had been able earlier about 1952 to devise a material, pink in colour, which was quite harmless but it would appear that the Ministry of Food and Agriculture wanted the colouring material to be yellow. No reasons were forthcoming as to why pink colour was not acceptable. The research itself seems to have been abandoned in 1952. The reasons for abandoning the research were unaccountable. A note received regarding a suitable colouring material or chemical to be used as an additive to Vanaspati is enclosed as Appendix III. From this note it would appear that the colourless chemical compound found by the NCL is non-toxic, but that more elaborate tests are in progress at the CDRL. The colourless chemical is to be used as an additive to Vanaspati. If there is to be any adulteration of ghee with Vanaspati

containing the additive, the presence of Vanaspati in that ghee could be detected easily by a simple test.

As early as 1952 the Government of India in their resolution on the report of the Ghee Adulteration Committee had deferred their decision on the use of a visible colouring material as an additive to Vanaspati till the results of the various experiments which were being carried on in the country for finding out a suitable colouring medium for Vanaspati were available. Evidently the matter had not been seriously pursued thereafter.

The Committee are of opinion that there has been too long and inexplicable a delay in enforcing the use of a suitable additive to Vanaspati. While the use of a colourless additive may go to eliminate to some extent the deception practised extensively in passing off as pure ghee a product adulterated with Vanaspati, it cannot help common folk, who are unable to resort to the tests, from being deceived. The Committee have not been given any reasons for rejecting the pink colouring material, which was stated to be harmless. They are of the view that either pink or some other colouring material equally good, should be used as an additive to Vanaspati, so that whether by itself or as an adulterant, Vanaspati could be identified easily by mere sight and all room for deception obviated.

VII. CENTRAL SALT RESEARCH INSTITUTE, BHAVNAGAR

A. Scope and Functions

56. The Central Salt Research Institute was formally inaugurated by the Prime Minister on the 10th April 1954. The functions of the Institute are (i) to work out methods for improving the quality of salt (ii) to work out improved methods of production of salt for domestic and industrial uses (iii) to conduct researches on the recovery of the by-products as such and to utilize them for the manufacture of other industrially useful products and (iv) to render technical advice and assistance to the salt and other allied industries.

B. Some of the important items of work done by the Institute

(a) *Free Flowing Table Salt*

57. The Institute has developed a process for the manufacture of a good quality of free flowing table salt from marine salt and crude sambhar salt.

(b) *Mixed Fertilizers and Light Magnesium Carbonate*

58. A process has been developed to convert the magnesium salts of marine bittern into magnesium carbonate and at the same time to fix the potash content in the form of a mixed potash fertilizers by a carbonation-ammoniation process. The Committee were informed that the magnesium carbonate obtained by this process had been found to be very light and could be utilised in numerous industries.

(c) *Exploitation of Sambhar Bittern*

59. Separation of sodium sulphate, sodium chloride and sodium carbonate from Sambar bittern has been effected by two processes. The Committee understand that both the processes have been tried on a pilot plant scale and that one of them has proved to be quite economical. Further investigations have shown that by treatment of the bittern with gypsum available in Rajasthan in abundance, there is a possibility of recovering more sodium sulphate.

(d) *Potassium Salts*

60. Sea bittern, a waste product of the marine salt industry forms a vast potential source for the recovery of potassium salts. It is understood that for every thousand tons of sea salt, about 20 tons of potassium chloride can be recovered. Investigations for the recovery of potassium sulphate and potassium chloride have been carried out and small scale work completed. The results have been published. The pilot plant work is proposed to be taken up soon.

(e) Sodium Sulphate for Bihar Khari Salt

61. The dark crust scrapped from the surface of the earth in certain regions of Bihar, known as Khari Salt has been found to contain about 75 per cent. of its weight of sodium sulphate and 10 per cent. to 15 per cent. magnesium sulphate. The quantity available in one region is estimated at 15,000 tons per annum. The Institute has developed a method for the recovery of sodium sulphate from Khari Salt. The overall recovery of sulphate from Khari Salt is 90 per cent.

(f) Pharmaceutical Magnesium Salts

62. Conditions for the preparation of solid magnesium citrate and solutions of magnesium citrate with good keeping quality and conforming to B.P. standards have been determined.

(g) Dairy Salt

63. Dairy salt prepared in the Institute proved to be satisfactory from chemical and bacteriological stand-points. A pilot plant producing 3-5 cwts. per day was set up in the Institute for the purpose and the material is being supplied through a co-operative society.

(h) Trace elements in Sea Water

64. Systematic work on the determination of trace elements in Indian Ocean has been undertaken. The data being collected is stated to be of fundamental importance from the view point of Oceanography.

C. Commercial exploitation of the results of research

65. The Study Group of the Committee were given to understand that though the Institute had developed several techniques for the production of by-products of salt, the techniques had not been adopted by the salt industry. It was explained that the salt industry was not well-organised and the producers of salt were chary of investing money on production of by-products of salt. The Committee see no reason why the industry should be reluctant to accept the researches if they are proved demonstrably profitable. *They suggest that vigorous steps should be taken to enthuse the manufacturers of salt to take up production of by-products of salt.*

VIII. NATIONAL BOTANIC GARDENS, LUCKNOW

A. Scope and Functions

66. The National Botanic Gardens, Lucknow occupy the site of an old garden, popularly known as Sikandar Bagh, which was one of the government gardens of Uttar Pradesh and had for a long time served the dual purpose of a nursery and public park. The Sikandar Bagh was taken charge of by the CSIR on 1st May, 1953 and renamed as the National Botanic Gardens. The scope and functions of the National Botanic Gardens (NBG) include:—

- (i) Botanical research including plant breeding, developing new varieties of economic importance and horticultural research;
- (ii) Research on cultivation of medicinal, fibre yielding and essential oil-bearing plants;
- (iii) Maintenance of a national herbarium particularly for collection and preservation of rare species of plants of economic and scientific interest;
- (iv) Maintenance of an arboretum;
- (v) Maintenance of a museum;
- (vi) Training of botanists and horticulturists; and
- (vii) Supply and exchange of plants within the country and outside.

B. Reclamation of alkaline (Usar) land

67. One of the major projects embarked upon by the Institution is reclamation of alkaline land at Banthra, Lucknow District by biological and agronomic methods. The Committee understand that in U.P. alone there were 30 lakh acres of alkaline land and 50 lakh acres of eroded land which produced nothing but patches of poor type of grass in the rainy season. As a result of experiments conducted by the Gardens a large number of wild plants were found to possess the property of absorbing the alkaline content of the soil. The work of reclamation had been successfully undertaken by applying this method at Banthra, 13 miles from Lucknow in an area of 150 acres acquired from the U.P. Government for the purpose in 1956. The Central Government had also given Rs. 50,000 as capital and another Rs. 50,000 for recurring expenditure for this project. The total area reclaimed till now was 120 acres plus another 40 acres belonging to the Ministry of Defence on the other side of the Kanpur road. The success of the experiment had fully convinced the U.P. Government

of the utility of the project and they had placed another 500 acres of 'Usar' land near Banthra at the disposal of the Director of the Gardens for reclamation. Of this also, 250 acres were being reclaimed.

The Committee are glad to note that these experiments have yielded successful results. They understand that this simple process is capable of wide adoption in different regions with some modifications needed to meet local conditions. *In the context of the persistent shortage of food in the country, the Committee would like that a comprehensive plan is drawn up for reclaiming alkaline land all over the country without loss of time. The Committee desire to state that once the researches have proved successful it should not be the business of the research institute to take up their large scale application. The actual reclamation of 'Usar' lands based on these researches should be the responsibility of the landowners or any other organisation created for the purpose.* This position has been already made clear in para 66 of the Committee's seventy-sixth Report on the Ministry of S.R. & C.A. Part I—CSIR.

C. Training

68. The National Botanic Gardens provide botanical and horticultural training to *malies*. Daily lectures and practical demonstrations in gardening practice are held. As a part of this training, courses are conducted for teaching them regional languages and for imparting a basic knowledge in elementary science. It was claimed that as a result of such training some of the class IV staff were enabled to get promotions to higher grades. Training was also provided to workers on the 'Usar' land in the reclamation process.

The Committee are glad that training facilities have been provided to the lower staff in the Gardens in the different aspects of work. They suggest that similar activity should be encouraged in the other institutions of the CSIR. In this connection, the Committee would like to invite attention to the following recommendation made in para 36 of their Seventy-sixth Report on the Ministry of S.R. & C.A. Part I—C.S.I.R.

"The Committee recommend that the National Laboratories should have a planned training programme for their Class IV staff. They also recommend that the question of reserving a certain percentage of posts in Class III to be filled up in suitable cases by promotion from Class IV staff when they come up to the requisite standard should be sympathetically considered.

The Committee are of opinion that training at the national institute should not be confined to the lower courses only but should also include some higher courses for the training of botanists and horticulturists which is stated to be one of its functions.

IX CENTRAL DRUG RESEARCH INSTITUTE, LUCKNOW

A. Scope and Functions

69. The Central Drug Research Institute, Lucknow was opened by the Prime Minister in February 1951. The essential functions of the Institute are:—

- (i) promoting drug research in general;
- (ii) testing and standardising drugs discovered in the Institute and providing expert advice for the further development and production of these drugs;
- (iii) offering facilities and advice to scientists, universities, other interested institutions, industries and individuals who may not be in a position to carry out or complete investigations on matters relating to drugs;
- (iv) organising controlled clinical trials of drugs in hospitals and clinics; and
- (v) disseminating scientific knowledge relating to drugs.

B. Research Results

70. The Study Group of the Committee were informed that the Institute had taken up studies by modern scientific methods of about three dozen medicinal plants reputed to be efficacious in maladies commonly occurring in India. Work on synthetic drugs and pharmaceutical preparations and antibiotics had yielded good results. The Institute has patented fourteen processes. Some of these are referred to below:—

(i) An economic process was evolved to obtain the active glycosides from leaves of *Digitalis* by using indigenous solvents. Pilot plant investigations are to be taken up by a private firm in accordance with an agreement effected with it through NRDC on 13th March, 1959. *Digitalis* Glycosides are effective in the treatment of heart diseases.

(ii) Active fractions of Psoralen and Isopsoralen were isolated from '*Psoral corylifolia*', which was reputed to be efficacious in leprosy in Ayurvedic system of Medicine. A mixture of these fractions had shown good effect in idiopathic or causeless type of Leucoderma. Large scale trials were underway.

(iii) Hayatin was isolated from *Cissampelos pareira* and in the form of its methiodide had been found to be muscle relaxant. Pilot plant investigations were yet to be made.

(iv) Palatable protein concentrates from oil cakes of mustard and til had been produced on a laboratory scale. Pilot plant work had

been taken up in 1958 in the Central Food Technological Research Institute, Mysore. If large scale trials are successful, considerable saving in foreign exchange would result since they could be used as effective substitutes.

The Committee find that though the experiments leading to these results were completed three to four years ago, little progress has been made in their commercial exploitation in the absence of pilot plant facilities at the Institute and to some extent due to lack of clinical facilities. They consider that there had not been proper appreciation of the need for translating research results into practical utilisation.

C. Development and Popularisation of Indigenous Drugs

71. A matter of importance is the desirability of maintaining a close contact between the CDRI and the researches carried on according to Ayurvedic and Unani systems. It cannot be denied that there are a number of drugs in the indigenous systems which are quite efficacious and some of which have been taken by the foreign pharmacologists and incorporated in their pharmacopoeia. *The Committee suggest that the CDRI should give this work due place in its programme.*

72. The Study Group of the Committee were given to understand that indigenous substitutes for imported drugs were not being utilised in the country primarily due to the medical practitioners' prejudice to the use of indigenous drugs. *The Committee suggest that suitable steps should be taken jointly by the Ministries of S.R. & C.A. and Health to resolve this difficulty. The Committee further suggest that a list of indigenous drugs standardised and tested may be prepared by the Institute and furnished to all Governments and local dispensaries/hospitals. Government may issue instructions to the authorities concerned that indigenous drugs which have been found to be effective substitutes for imported drugs should be prescribed by Government hospitals|dispensaries.*

73. *The Committee suggest that the CDRI may bring out a small brochure giving in a complete and simple form a description of the properties and uses of each of the indigenous drugs produced and standardised by the Institute and the extent to which they can be substituted for foreign drugs.*

74. *The Committee are also of the view that in order to popularise indigenous drugs among medical men and women, properties and uses thereof should be taught in medical colleges.*

X. CENTRAL BUILDING RESEARCH INSTITUTE, ROORKEE

A. Scope and Functions

75. The Central Building Research Institute, Roorkee was opened on the 12th April, 1953. The work of the Institute covers four principal groups of problems, viz. (1) building materials, (2) methods of construction, (3) performance of buildings and (4) survey and information. Its objectives may be summarised as follows:—

- (i) To bring about more economical use of existing building materials and to foster the development of new building materials from indigenous raw materials and industrial wastes.
- (ii) To investigate the performance and improve the design of structures in the interests of economy and safety.
- (iii) To study various problems in Soil Mechanics and Foundation Engineering with a view to suggest rational methods of design and consequent economies in the cost of construction.
- (iv) To study the provisions needed for efficient living or working conditions in respect of heating, cooling and ventilation, lighting, acoustics, plumbing, space utilization and layout.
- (v) To study building methods and operations and their organisation with a view to the improvement of economy and efficiency.
- (vi) To improve and economise in the design and architectural planning of buildings.

The activities of building industry are two-fold in character:—

- (i) development and manufacture of various building materials; and
- (ii) use of materials in actual construction of buildings.

Accordingly, the Central Building Research Institute concerns itself with production and testing of building materials as well as with construction and testing of structures.

B. Shell Structures

(a) *Doubly Curved Shells*

76. The Central Building Research Institute has developed a new type of roof which uses very little of cement and steel and is at the same time much cheaper than the traditional reinforced concrete

roof. The savings in cost, cement and steel are estimated to be of the order of 25 per cent, 49 per cent and 46 per cent respectively. The roof consists of precast doubly-curved shell-panels made of lime-surkhi concrete with reinforced concrete edge-beams without reinforcement in the body of the shell. The method adopted is simple and the shell "casts itself" inside a wooden frame.

The Committee understand that this type of roofing was adopted in a one crore housing project, where about 1700 houses were completed in much shorter time than would have been the case with the traditional construction of roofs with cement and steel. The Plan Projects Committee has also recommended it as an economical roof for slum clearance. *They trust that this new technique which leads to economy in time as well as in material at present in great shortage in the country would be increasingly adopted in housing and other projects.*

(b) *Shell structures for godowns.*

77. The Team for Evaluation of Building Projects appointed by the Committee on Plan Projects had recommended the use of shell type structures for the roofing of godowns for storage of grains. The CBRI was closely associated with the work of this team. Such a roofing was cheaper and led to saving. By adopting this design instead of the orthodox type of steel trusses with G.I. sheeting for the storage accommodation of 30 to 32 lakhs tons, the saving in overall cost was expected to be of the order of Rs. 1.8 crores, including a saving of 56,000 tons of steel. Since the designing of shell structures was comparatively new to India, the CBRI conducted training courses for imparting training to engineers in this technique.

The Committee are glad to learn that the improved methods of construction of grain godowns as well as buildings and other structures and the economies resulting therefrom have been recently brought to the notice of the States by the Prime Minister for wider adoption of the techniques. *The Committee trust that these methods will be adopted increasingly in construction work of public and private sectors.*

C. Village Housing

(a) *Designing*

78. The Study Group of the Committee were informed that the Institute had undertaken studies on scientific planning of village houses providing for necessary comforts with the use of traditional building materials. As a result, designs were evolved for houses and village schools. A need was felt for more extensive studies on the subject particularly of the local problems which varied from place to place. The Institute had proposed the setting up of regional stations in the Third Plan to conduct research on regional basis. Such detailed studies would be made after these units were set up.

(b) *Non-erodable Mud Plaster.*

79. The main problem in the improvement of the existing conditions of the village houses is of finding a suitable non-erodable plaster in the absence of which considerable damage is done to them by rains. The Institute has developed a cheap process of preparing a mud plaster for use on village houses. Mud was stabilised by the addition of cut-back (bitumen diluted with kerosene oil) and some paraffin wax. *As this method would greatly improve village housing, the Committee recommend that the process should be given wide publicity in the different regional languages particularly among the Community Development Blocks.*

D. Processes developed and licensed(a) *Brick and Block making machine*

80. The Study Group of the Committee were shown a hand operated brick and block making machine developed at the Institute which worked on a continuous cycle of operations.

The machine presses two bricks at a time, with four men working on it, two for turning the lever, one for filling the mould and one for removing and stacking the bricks. The output per man hour is about 62 which means an output of about 1500 bricks per day. The machine costs about Rs. 900 and is claimed to be more economical than similar imported machines. The Study Group were given to understand that three firms were expected to take up large scale production of these machines. *The Committee suggest that wide publicity should be given to this machine throughout the country.*

(b) *Foaming Agent*

81. Foaming agent is the most important component of foamed concrete. There are several foreign proprietary foaming agents available in the market. At present the country is importing a foaming agent for making thermal insulating blocks of foamed concrete. Investigations made at the Institute have resulted in the development of a suitable foaming agent from indigenous raw materials.

Commercial exploitation of the foaming agent has been given to the Hindustan Housing Factory by NRDC. *The Committee suggest that the question of restricting the import of this article may be examined by the Ministry of Commerce and Industry.*

(c) *Pretensioning Bed and a Simple Screw Jack*

82. Two portable pretensioning beds—one of 5 tons and the other of 25 tons capacity—have been designed by the Institute. These are suitable for casting roofing units upto a span of 20 feet. They are simple in design and cost only a few hundred rupees to build. Hydraulic jacks are at present imported at great cost for use in pre-stressing.

A manually operated simple screw jack which can tension two wires at a time has been developed by the Institute for which a patent has been filed. The Study Group were informed that commercial production was expected shortly and that the screw jack when produced would result in the saving of foreign exchange. The pretensioning beds built at this low cost would bring pre-stressing within the resources of the small builders.

E. Bricks from Black Cotton Soil

83. Another process which has been developed by the Institute is for making bricks from black cotton soil. The heavy clay makes mixing and pugging very laborious and the bricks develop cracks during drying and firing. These difficulties were overcome by the addition of a suitable percentage of powdered grog (calcined clay). Large scale trials were under way in Bhopal and Indore and the process was expected to provide the answer to the problem of finding good bricks economically in these areas. *The Committee suggest that similar trials may be undertaken in other areas also.*

F. Co-ordination

84. The Study Group of the Committee which visited the Institute were given to understand that collaboration and co-ordination among the various institutes engaged in building research was not as close as was desirable. *The Committee would like to stress the need for such collaboration and co-ordination and suggest that suitable steps may be taken towards that end.*

XI. NATIONAL CHEMICAL LABORATORY, POONA

A. Scope and Functions

85. The National Chemical Laboratory was formally opened by the Prime Minister on the 3rd January, 1950. The scope and functions of the laboratory embrace all the chief applications of chemistry with due attention to fundamental research itself and include (1) potentialities, (2) development of new industries, (3) utilisation of by-products of existing industries, (4) fundamental research and application of results of fundamental research problems of industry, (5) analysis and testing, (6) aid to industries by provision of information and advice and where necessary experiments and demonstration of industrial operations and (7) training of research workers in specialised fields of chemistry and technology, particularly in fields in which facilities are not available in existing scientific institutions.

B. Items of research and their commercial exploitation.

86. The Laboratory has undertaken a large number of items of research since its inception. A brief account of some of the important items of work is enclosed in Appendix IV.

87. The Committee were informed that the following processes developed by the NCL had been licensed out to industry:

(i) Citric acid	1958
(ii) Liquid Rubber	1958
(iii) Nicotine Sulphate	1959
(iv) Pressure Sensitive adhesive tapes	1959
(v) Can-sealing composition	1959

An offer for a process for the manufacture of vitamin 'C' has been accepted by the NRDC and another process on foundry core oil has been released to industry free.

88. The Committee were informed that the following processes which for one reason or another could not be undertaken in the private sector could be undertaken by the Government:—

- (i) Vitamin 'C'
- (ii) Rigid filters
- (iii) Water dispersible DDT in paste form

- (iv) Neem bitters
- (v) Refined neem oil
- (vi) Denaturants for alcohol from neem oil
- (vii) Kamla seed oil.

The Committee cannot overstress the need for commercial exploitation of the above processes and therefore suggest that the question of undertaking them in the public sector, if the private sector does not show satisfactory response, may be considered by Government.

XII. CENTRAL LEATHER RESEARCH INSTITUTE, MADRAS

A. Scope and Functions

89. The Central Leather Research Institute was opened on the 15th January 1953. The main function of the Institute is to assist the Indian leather industry through fundamental and applied research, training of leather technologists and dissemination of technical knowledge.

Researches on the various aspects of leather manufacture may be classified into three broad categories: (1) fundamental work on the histology of hides and skins; physical structure and properties of hide and skin fibres; chemical constitution of hide and skin proteins; (2) applications of chemistry, physics, bacteriology, microscopy and other branches of science in tanning and process control; vegetable tannins, mineral tanning agents and tanning auxiliaries; and (3) developmental research, including investigations on adaptation of processes and manufacture of leather auxiliaries from indigenous materials; pilot plant work; trials on tanning auxiliaries and their performance in industrial practice.

B. Some of the important items of work done by the Institute

(a) *Wattle Bark*

90. Vegetable tanning materials are in short supply in India and tanning industry largely depends on the imported wattle bark and its extract. The value of the imported materials is estimated to be over a crore of rupees. The Committee understand that intensive and extensive studies have been made at this Institute which has succeeded in locating promising substitutes from the indigenous tanstuffs. *The Committee suggest that vigorous steps should be taken in consultation with the Forest departments of various States to make these substitutes available on a commercial scale so that the import of wattle bark and its extract can be obviated.*

(b) *Processes for the manufacture of different leathers*

91. The Study Group were informed that processes had been developed for the manufacture of the following kinds of leather:

- (a) Good quality upper leather like Box, Willow, specially like Glazed Kid, Suedes, Crushed Kid, Gold Kid, Silver Kid etc.
- (b) Industrial leathers, such as Picking Bands, Roller Skins, Round belts.

- (c) Sports Goods leather like Foot-ball and Volley-ball leathers.
- (d) Other leather such as Upholstery leather, clothing, gloving and white leathers, Fancy leathers.
- (e) Leathers intended for Defence purposes.
- (f) Reptile leathers.
- (g) Chamois leathers.

It was stated that these processes had been demonstrated to the tanners all over the country.

(c) *Tanning Agents*

92. Suitable tanning agents like basic aluminium salts, zirconium salts, mineral sulphonyl chlorides have been developed for tanning purposes.

(d) *Raw Hides and Skins*

93. Methods have been devised to check the common defects such as salt stains and red heat caused in the curing and preservation of hides and skins. The optimum conditions for preservation of hides have been worked out. Khari salt, a natural earthy product containing a lot of undesirable elements valued at Rs. 30 lakhs is being used for curing goat skins meant for export. A clean synthetic mixture with better preservation properties has been prepared at this Institute to substitute this Khari salt.

(e) *Leather Auxiliaries*

94. A great variety of leather auxiliaries, such as commercial fat liquors, enzyme bates, leather finishes etc. are imported. Processes have been worked out for the manufacture of a number of leather auxiliaries with indigenous materials. Some of these materials are syntans from coal tar distillation products, fat liquors from edible and non-edible oils, pigment finishes, enzymatic bates, enzymatic unhairing agents, shoe polishes and stains, mineral and vegetable tanning extracts, synthetic leather oils, etc.

(f) *Leather Boards*

95. A systematic work for the past few years is stated to have resulted in the development of processes in the manufacture of leather boards from leather waste. These leather boards have been tested repeatedly and reported to be good for insole purposes in the shoe and chappal manufacture. This process is now ready for release to the

industry. Further work is being done on this problem for putting the leather boards to other uses such as flooring, packing, etc.

C. Commercial exploitation of the results of research

96. The Committee were informed that the following articles usually imported at present were being produced on pilot plant scale:

1. Belting Cement
2. Enzyme Depilant
3. Enzyme Bates
4. Latex Cement
5. Hide Power
6. Syntans
7. Fat Liquors
8. Emulsifiers.

Of these products, production of fat liquors was taken up by a commercial firm for producing it on a large scale. *The Committee suggest that commercial exploitation of the other articles should be expedited.*

XIII. CENTRAL ELECTRO-CHEMICAL RESEARCH INSTITUTE, KARAIKUDI

A. Scope and Functions

97. The Central Electro-Chemical Research Institute was formally declared open on the 14th January, 1953. The functions of the Institute are:—

- (i) to foster basic or fundamental research in chemical reactions promoted by electricity;
- (ii) to undertake investigations to increase the productive capacity and efficiency of existing industries;
- (iii) to set up pilot plants for demonstrating promising laboratory researches, having industrial potentialities;
- (iv) to evaluate raw materials, and standardise finished products;
- (v) to collect technical information and data pertaining to industrial statistics and disseminate the same;
- (vi) to train technologists; and
- (vii) to organise and maintain a museum for display of electro-chemical products and flow charts of important processes.

B. Some of the important items of work done by the Institute

98. The Committee understand that the Central Electro-Chemical Research Institute has completed research on the following items:

- (1) Cuprous Oxide
- (2) Calcium Gluconate
- (3) Copper Powder
- (4) Zinc
- (5) Para Aminophenol
- (6) 2 : 4 diaminophenol
- (7) Primary wet cell.

(8) Salicylaldehyde

(9) Benzaldehyde

Of the above items, cuprous oxide and copper powder, have been handed over to the industry for exploitation.

A new electro-analytical technique named 'Redoxo-Kinetic Titration' has been worked out. A new technique for wave length calibration of the spectrophotometer has been evolved. An instrument has been devised for measuring the thickness of the electroplates. *The Committee suggest that the CSIR should endeavour through NRDC to see that these processes are utilised commercially without undue loss of time.*

99. The Study Group of the Committee were informed that a number of other researches were under way, including the following:—

- (a) production of calcium carbide from Neyveli Lignite and Tinnvelly Limestone;
- (b) zinc and lead from Zawar ores of Rajsthan;
- (c) preparation of metal powders;
- (d) codeposition of metals having high corrosion resistance;
- (e) preparation of lead dioxide electrodes for industrial electrolysis;
- (f) recovery of caustic soda and sulphuric acid from sodium sulphate for direct reuse in rayon industry;
- (g) hydroxylamine from nitric acid;
- (h) production of light weight and high capacity storage batteries; and
- (i) increasing the bright light period of dry cells.

C. Miscellaneous

100. The Study Group of the Committee which visited the Institute were informed that the Karaikudi Railway Station had neither any retiring rooms nor even a waiting room. The Institute had no Guest House either. Karaikudi is a small place. *Since an institution of all India importance is located there, the Committee suggest that these necessary amenities should be provided early.*

XIV. MISCELLANEOUS

A. Indian Scientists and Technically Qualified Persons abroad

101. The Committee understand that the data in respect of Indian scientists and technically qualified persons working outside India and those receiving training abroad was analysed by the National Register Unit of the CSIR recently and the figures as on 1st August, 1959 are as follows: ..

	Number	Percentage to total number
1. Full-time students and trainees (including paid research workers and paid apprentices).	788	46
2. Part-time students and trainees	121	6
3. Full-time employed		
(a) In more advanced countries	760	40
(b) In Burma, Ceylon, Africa, etc.	152	
TOTAL	1,911	1

102. The representative of the Ministry in his evidence before the Committee stated that apart from the question of remuneration, an important factor which accounted for the reluctance on the part of some of the Indian scientists abroad to return to India was the process of selection, which the applicants had to go through. A large part of the employment was in the public sector. He added that the process was too lengthy and susceptible to inordinate delays with attendant irritation and disappointment. He expressed the view that if some machinery was evolved to reduce the delays caused in the process of selection and appointment of applicants to posts under the public sector, it would greatly improve matters. The Committee regret to note that the talent of promising Indian scientists and technically qualified persons is not fully utilised for the benefit of the country due, in some measure, to the tardy and cumbersome procedures. *The Committee agree with the view expressed by the representative of the Ministry and*

suggest that suitable machinery should be evolved for reducing the delays caused in the process of selection and appointment of candidates to posts in the public sector.

B. CSIR Pool of Scientists

103. The Government of India have constituted a pool for temporary placement of well qualified Indian scientists and technologists returning from abroad until they are absorbed in suitable posts on a more or less permanent basis. Persons with Indian qualifications who have outstanding academic records are also considered for appointment but as the Pool is intended primarily for facilitating the utilisation of Indian scientists and technologists abroad, the proportion of persons with Indian qualifications who may be thus appointed does not ordinarily exceed 25 per cent of the total number of posts in the Pool. The CSIR is the controlling authority of the Pool. In all matters relating to the administration of the Pool, the Council is advised by a Committee consisting of DGSIR who is the *ex-officio* chairman, 14 members representing the various Ministries of the Government of India, a representative of the University Grants Commission and two non-officials representing private industry. It has been provided that a person appointed to the Pool will ordinarily be given a salary of Rs. 350|- p.m. but higher salary up to Rs. 600|- p.m. may be given on the recommendation of the Selection Committee, where necessary, taking into account the qualifications and experience of the candidate. In exceptional cases, a salary in excess of Rs. 600|- p.m. may be offered with the prior approval of the Government of India. This salary will continue to be paid till the officer secures a more or less permanent post, or is seconded to some other organisation. The authorised strength of the Pool at its initial constitution has been fixed at 100. Selections for the Pool are made by a Special Recruitment Board consisting of Chairman or a Member of the UPSC, one representative each of the Ministry of Home Affairs and CSIR and three scientists and technical men.

104. The Committee were informed that the Special Recruitment Board after considering the cases of 1,382 candidates selected 123 for the Pool but offers were issued to 119. It was explained that in respect of two candidates it was felt that in view of their high qualifications etc. it would be more appropriate to offer them suitable permanent appointments. In regard to the other two, it was found after the selection that they already held appointments in India. The Committee learnt with regret that out of 119 candidates, who were issued offers of appointments, only a few candidates—a dozen and a half—had accepted the offers. Certain candidates were selected on the basis of the information given by them that they would come back to India in June, 1959 but they did not turn up. Subsequently, while some stated that they would come back later in June 1960, others declined to come on the salaries offered. *The Committee consider the position disheartening and they recommend that the CSIR should carefully analyse the reasons for the poor response to the offers made and see whether any*

modifications are necessary in the existing scheme. It would helpful if the Indian Embassies would keep in close touch with the Indian scientists abroad and be of assistance in securing their services to the country. The CSIR may make use of the Embassies for this purpose.

C. Incentives and Encouragement to Research Workers

105. *In view of the important role played by science and technology in the modern civilisation, it is very necessary that the spirit of research is consciously fostered in the country. The chain of National Laboratories established throughout the length and breadth of the country no doubt plays a very vital role in this regard. These National Laboratories and similar other institutions, specially in the public sector, should create and maintain an atmosphere conducive to research. The scientific workers working in these institutions, who by their devotion to work and initiative, make original contribution to the field of scientific research, should be given proper encouragement and suitable incentives. The Committee cannot fail to take note of the recent case of suicide by Dr. M. T. Joseph of the Indian Agricultural Research Institute which brings this problem into sharp focus; for he only typifies the hard lot of many other qualified scientists who are suffering for want of opportunities and encouragement. Care will have to be taken to see that the slow-moving procedures of Government departments do not act as damper to the enthusiasm and initiative of the young scientific workers.*

D. Equipment and Stores

(a) Delay in Supply of equipment by DGS&D

106. The Committee were informed by the representative of the Ministry that there was a general complaint by the Directors of the National Laboratories about delays in the supply of equipment by the DGS&D. *The Committee suggest that the question of delays be taken up by the CSIR with the DGS&D. They also suggest that the possibility of further delegation of powers in making local purchases for urgent needs and of improving the liaison between the CSIR and the DGS&D may be carefully examined.*

(b) Designing and fabrication of scientific equipment by National Laboratories

107. The Committee are glad to learn that as far as possible scientific equipment required for pilot plant investigations is designed and fabricated by the National Laboratories themselves. The approximate savings in foreign exchange as a result of the equipment designed and fabricated by them are estimated to be Rs. 35.23 lakhs. *The Committee suggest that this trend should be consciously encouraged and the import of scientific equipment from abroad kept to the unavoidable minimum and gradually eliminated.*

E. Disposal of Effluents

108. The Committee understand that the problem relating to the disposal of textile mill effluents received through the Ahmedabad Textile Industry's Research Association has been referred to the Central Public Health Engineering Research Institute, Nagpur and the National Chemical Laboratory, Poona. The Estimates Committee have referred to this problem in para. 92 of their Thirty-seventh Report on the Ministry of Health.

In view of the importance and urgency of the matter, the Committee suggest that the problem referred to by the ATIRA may be investigated with the utmost expedition. The Committee also suggest that the CSIR should take up the problem of disposal of leather tanning effluents.

F. Scientific Policy Resolution

109. The Government of India in a Resolution dated the 4th March, 1958 set out the aims of their scientific policy. In pursuance thereof a conference of scientists and educationists etc. was held in July 1958 to consider the question of implementation of the Resolution. A copy of the Resolution together with a note showing the action taken on the recommendations made by the conference is given as Appendix V.

(a) Talent search

110. The conference *inter alia* recommended that—

“Search for scientific talent should start at the higher secondary school level by instituting suitable machinery to select and place scholars in appropriate institutions. 15 to 20 per cent. of the students admitted to the universities and other institutions of higher education (including national laboratories) should be given scholarships, the value of which should be enough to cover all legitimate expenses of the scholars.”

This recommendation was sent to the Ministry of Education of the Government of India and to all the States for comments. The Ministry of Education have pointed out that it is not possible to implement the recommendation made at the conference and instead they propose to award 10,000 merit scholarships for post-matriculation studies during the Third Plan period.

111. Certain State Governments have however suggested alternative schemes for implementation of the recommendation. The Government of Uttar Pradesh have started a scheme of student scientific research competition and instituted 7 prizes of Rs. 200

each for graduate students and 10 prizes of Rs. 100 each for students of higher secondary schools and high schools in that State. The scheme has been circulated to State Governments for considering the possibility of adopting similar schemes keeping in view the local conditions in each State.

112. *The Committee consider that a scheme of talent search directed towards spotting scientific talents at a fairly early stage of student life and fostering these by providing suitable incentives, adequate facilities and proper guidance, is bound to yield results in the long run. They therefore urge that a comprehensive scheme of talent search should be expeditiously formulated and implemented in consultation with the State Governments.*

(b) *Research facilities and recognition of research*

113. The representative of the Ministry informed the Committee that in view of the fact that the amount provided for junior fellowships was too little, these were being converted gradually into senior fellowships. *The Committee are of the view that some recognition in the form of higher initial salary should be given to persons with research work to their credit, vis-a-vis the direct entrants to service who may not have spent any time on research. The question may therefore be examined by the Ministry with a view to evolve a suitable scheme in this regard.*

114. In the note given in Appendix V, the Ministry have stated that well established industrial concerns could assist research fellows and guarantee them jobs on completion of their research work. It was stated that the response to this suggestion had been poor so far. The Committee are of the view that sustained efforts are called for in this direction. *The Ministries concerned should therefore make conscious efforts to persuade the industry, both in the public and the private sectors, to contribute generously towards the promotion of scientific research and offer suitable employment for research personnel as in other advanced countries. This can be facilitated by ensuring that the research projects selected are such as are of direct utility to the industry concerned, for then the experience gained by the research scholars can be usefully employed in that industry.*

115. When the Study Group of the Committee visited CBRI, there were told that if some of the P.W.D. and M.E.S. Engineers were deputed to CBRI and similarly if some of the research workers in the CBRI would take to field work for short periods, it would profit both the wings of building engineering. Such a procedure would hold good equally in the case of CRRI. *The Committee are of the view that important advantages, such as promoting close relationship between research and field workers necessary for co-ordinated activity, engendering keenness on the part of field*

workers to apply research results and bringing to the research workers an awareness and appreciation of practical problems, could be secured by a scheme whereby research workers are given opportunities for field work and field workers take up research in suitable cases for some period. The Committee learn that the Panel of Scientists has made a similar suggestion. The Committee therefore recommend that the Ministry of Scientific Research and Cultural Affairs should examine the suggestion carefully in consultation with the Ministries concerned with a view to devise a suitable scheme incorporating this idea.

(c) *Popularisation of Science*

116. In order to popularise important scientific ideas and scientific know-how, the Ministry propose to bring out a popular science digest and a series of popular pamphlets on science in Hindi and English. During evidence, the representative of the Ministry stated that it had been recently decided to entrust the work of bringing out the popular science digest to the CSIR which was considered to be a more suitable body for the purpose. *The Committee suggest that these schemes should be finalised and implemented expeditiously. The question of bringing out such publications in the regional languages also with the co-operation of the States may be taken up early.*

G. Scientific Delegations

(a) *Number and Expenditure incurred*

117. A statement showing the number of scientific delegations to foreign countries sponsored by the Ministry (Scientific Research Wing) during the years 1956-57, 1957-58 and 1958-59 and expenditure incurred on each delegation is attached as Appendix VI.

(b) *Reports*

118. The Ministry have stated that the reports submitted by the delegations are circulated to the Ministries concerned (including the Cabinet Secretariat) and also State Governments (in cases where it was found necessary) for necessary action. *The Committee consider that mere circulation of these reports is not sufficient. It is necessary that the Ministry, having sponsored a delegation, should in the first instance themselves carefully scrutinise the reports, assess the applicability of the recommendations and thereafter maintain a close follow-up of at least the important recommendations.*

119. *The Ministry may also consider the question of publishing the important recommendations of such delegations together with the action taken thereon.*

(c) *Prof. Thacker's Report—Re-orientation of Science Education*

120. Prof. Thacker, leader of the Scientists' Delegation to USSR, in his report has made the following suggestions:—

- (i) A reappraisal of basic educational issues, and evolution of a closely integrated programme covering all stages of scientific education from the school to the post-graduate level.
- (ii) Closer co-ordination between all agencies concerned with scientific and technological research in the country, and a suitable machinery therefor.
- (iii) Measures for the rapid utilisation of research processes and techniques developed and found satisfactory.
- (iv) An organisation for designing and developing research equipment (including precision instruments) and pilot plant.
- (v) A Central Institute for Scientific and Technical Information to serve as a clearing house for information from all sources, national and international.

The Committee generally agree with these views. They feel that it is the system of science education in U.S.A., U.S.S.R. and other advanced countries which has enabled them to make such phenomenal progress. It is essential to reorientate the system of science education in India to make it more purposeful and productive of similar achievements. *They recommend that a high powered commission may be appointed early to make a reappraisal of science education in all its aspects particularly curricula, selection of students, equipment, training facilities and research so that it may be possible to lay the foundation of a sound system of science education as in other scientifically advanced countries.**

NEW DELHI;

The 29th March, 1960.

The 9th Caitra 1882 (Saka).

H. C. DASAPPA,

Chairman,

Estimates Committee.

Note: Replying to the discussion on the demands for grants (1960-61) relating to his Ministry, the Minister of Education announced in Lok Sabha on the 16th March, 1960 that the Government proposed to appoint a high-powered Science Commission to survey the whole field from the school to the university stage with a view to improve science teaching at all levels.

APPENDIX I

(Vide para 3)

Statement showing sanctioned estimates, finally modified grants and the actual expenditure of certain National Laboratories/Institutes during the last three years as also the sanctioned estimates for 1959-60.

(Rs. in lakhs).

	Sanctioned Estimates	Finally modified grants	Actual Expendi- ture
1	2	3	4

(1) CENTRAL ROAD RESEARCH INSTITUTE, NEW DELHI

1956-57			
Recurring	10.480	10.550	9.934
Capital	3.500	7.753	2.800
Pilot Plant	..	0.827	0.750
TOTAL	13.980	19.130	13.484
1957-58			
Recurring	11.020	10.490	10.546
Capital	5.000	8.600	8.355
Pilot Plant	4.000	2.500	2.395
TOTAL	20.020	21.590	21.296
1958-59			
Recurring	13.559	12.190	11.364
Capital	11.000	4.172	3.155
Pilot Plant	2.000	1.298	1.221
TOTAL	26.559	17.660	15.740

1	2	3	4
	<u>1959-60</u>		
Recurring	14·730		
Capital	9·000		
Pilot Plant	1·000		
TOTAL	<u>24·730</u>		
 (2) NATIONAL METALLURGICAL LABORATORY, JAMSHEDPUR			
	<u>1956-57</u>		
Recurring	11·580	13·780	13·773
Capital	5·000	1·134	1·020
Pilot Plant	10·000	0·326	0·290
TOTAL	<u>26·580</u>	<u>15·240</u>	<u>15·083</u>
	<u>1957-58</u>		
Recurring	12·790	14·860	14·911
Capital	4·000	5·520	4·789
Pilot Plant	7·000	1·530	1·526
TOTAL	<u>23·790</u>	<u>21·910</u>	<u>21·226</u>
	<u>1958-59</u>		
Recurring	16·233	18·372	18·341
Capital	7·120	4·765	4·035
Pilot Plant	6·710	5·534	5·319
TOTAL	<u>30·063</u>	<u>28·671</u>	<u>27·695</u>
	<u>1959-60</u>		
Recurring	18·375		
Capital	5·690		
Pilot Plant	6·310		
TOTAL	<u>30·375</u>		

1	2	3	4
(3) CENTRAL GLASS & CERAMIC RESEARCH INSTITUTE CALCUTTA			

1956-57			
Recurring	9.950	11.100	11.072
Capital	4.000	2.524	2.130
Pilot Plant	4.000	0.136	0.160
TOTAL	17.950	13.760	13.360

1957-58			
Recurring	10.880	11.540	11.632
Capital	4.500	6.630	6.629
Pilot Plant	4.000	0.650	0.298
TOTAL	27.380	18.820	18.559

1958-59			
Recurring	13.010	13.330	13.162
Capital	5.350	13.581	4.346
Pilot Plant	2.750	1.462	1.456
TOTAL	21.110	28.373	18.964

1959-60			
Recurring	15.653		
Capital	5.850		
Pilot Plant	3.550		
TOTAL	25.053		

(4) CENTRAL FUEL RESEARCH INSTITUTE, JEALGORA			

1956-57			
Recurring	18.950	17.030	17.736
Capital	2.950	7.400	7.610
Pilot Plant	10.000	3.740	3.130
TOTAL	31.900	28.170	28.476

1	2	3	4
1957-58			
Recurring	18·590	18·240	18·281
Capital	5·600	3·740	3·134
Pilot Plant	21·410	8·890	8·801
TOTAL	45·600	30·870	30·216
1958-59			
Recurring	22·008	21·248	21·100
Capital	11·880	3·263	2·223
Pilot Plant	25·000	25·000	21·997
TOTAL	58·888	49·511	45·320
1959-60			
Recurring	23·917		
Capital	9·500		
Pilot Plant	30·000		
TOTAL	63·417		

(5) CENTRAL FOOD TECHNOLOGICAL RESEARCH INSTITUTE,
MYSORE

1956-57			
Recurring	12·580	11·110	12·164
Capital	4·950	9·880	6·270
Pilot Plant	4·000	1·000	0·740
TOTAL	21·530	21·990	19·174
1957-58			
Recurring	12·610	13·670	13·127
Capital	2·500	5·250	5·198
Pilot Plant	6·910	4·660	4·915
TOTAL	22·020	23·580	23·840

1	2	3	4
	1958-59		
Recurring	15·512	16·552	15·709
Capital	6·000	4·086	2·485
Pilot Plant	4·000	2·414	2·218
TOTAL	25·512	23·052	20·412
	1959-60		
Recurring	17·280		
Capital	5·000		
Pilot Plant	4·000		
TOTAL	26·280		

(6) CENTRAL SALT RESEARCH INSTITUTE, BHAVNAGAR

	1956-57		
Recurring	3·110	2·270	2·019
Capital	1·410	0·360	0·320
Pilot Plant
TOTAL	4·520	2·630	2·339
	1957-58		
Recurring	2·580	2·750	2·773
Capital	0·250	0·320	0·313
Pilot Plant	0·540	0·690	0·540
TOTAL	3·370	3·760	3·626
	1958-59		
Recurring	3·247	3·200	3·096
Capital	0·130	1·452	1·221
Pilot Plant	0·200	1·239	0·733
TOTAL	3·577	5·891	5·050

1	2	3	4
	<u>1959-60</u>		
Recurring Capital	4.240		
Pilot Plant	1.640		
	0.500		
TOTAL	<u>6.380</u>		

(7) NATIONAL BOTANIC GARDENS, LUCKNOW

	<u>1956-57</u>		
Recurring Capital	5.625	6.690	6.616
	5.500	5.950	4.880
TOTAL	<u>11.125 12.640 11.496</u>		

	<u>1957-58</u>		
Recurring Capital	6.620	7.180	7.225
	4.000	6.010	6.007
TOTAL	<u>10.620 13.190 13.232</u>		

	<u>1958-59</u>		
Recurring Capital	9.080	8.974	8.977
	4.000	4.500	4.498
TOTAL	<u>13.080 13.474 13.475</u>		

	<u>1959-60</u>		
Recurring Capital	10.825		
	4.000		
TOTAL	<u>14.825</u>		

(8) CENTRAL DRUG RESEARCH INSTITUTE, LUCKNOW

	<u>1956-57</u>		
Recurring Capital	14.380	14.400	13.972
Pilot Plant	0.600	0.952	0.920
	7.000	3.488	3.770
TOTAL	<u>21.980 18.840 18.662</u>		

1	2	3	4
1957-58			
Recurring Capital	15.640	14.320	14.355
Pilot Plant	0.600	0.550	0.435
TOTAL	17.240	15.570	15.087
1958-59			
Recurring Capital	16.538	16.635	16.480
Pilot Plant	0.600	0.950	0.941
TOTAL	18.738	18.485	17.977
1959-60			
Recurring Capital	17.816		
Pilot Plant	0.600		
TOTAL	21.816		
(9) CENTRAL BUILDING RESEARCH INSTITUTE, ROORKEE			
1956-57			
Recurring Capital	9.475	6.580	6.310
TOTAL	7.600	1.380	1.180
1957-58			
Recurring Capital	7.470	7.740	7.783
TOTAL	3.500	5.470	4.540
1958-59			
Recurring Capital	10.155	10.453	10.376
TOTAL	3.900	2.412	2.337

1	2	3	4
		1959-60	
Recurring Capital	12·900		
	6·920		
TOTAL	19·820		

(10) NATIONAL CHEMICAL LABORATORY, POONA

	1956-57		
Recurring Capital	21·490	20·490	17·621
Pilot Plant	3·000	0·930	0·740
	10·000	3·070	2·320
TOTAL	34·490	24·490	20·681

	1957-58		
Recurring Capital	20·810	23·530	23·544
Pilot Plant	1·000	2·105	0·944
	10·000	3·835	1·644
TOTAL	31·810	29·470	26·132

	1958-59		
Recurring Capital	24·565	24·215	23·811
Pilot Plant	3·057	2·524	2·016
	9·125	4·061	3·684
TOTAL	36·747	30·800	29·511

	1959-60		
Recurring Capital	26·286		
Pilot Plant	3·400		
	5·600		
TOTAL	35·286		

1	2	3	4
(11) CENTRAL LEATHER RESEARCH INSTITUTE, MADRAS			
1956-57			
Recurring	9·740	9·020	8·815
Capital	5·790	1·389	0·730
Pilot Plant	1·000	0·991	0·730
TOTAL	16·530	11·400	10·275
1957-58			
Recurring	9·400	8·610	8·591
Capital	3·000	1·630	1·498
Pilot Plant	2·500	1·560	0·862
TOTAL	14·900	11·800	10·951
1958-59			
Recurring	10·752	9·569	9·411
Capital	2·215	1·788	1·583
Pilot Plant	2·330	0·643	0·404
TOTAL	15·297	12·000	11·398
1959-60			
Recurring	11·200		
Capital	3·500		
Pilot Plant	2·500		
TOTAL	17·20 0		

**(12) CENTRAL ELECTRO-CHEMICAL RESEARCH INSTITUTE,
KARAIKUDI**

1956-57			
Recurring	8·330	4·970	4·561
Capital	4·000	1·960	1·340
Pilot Plant	8·000
TOTAL	20·330	6·930	5·901

1	2	3	4
1957-58			
Recurring	6.460	5.835	5.870
Capital	3.000	3.000	2.997
Pilot Plant	3.000	0.300	0.184
TOTAL	12.460	9.135	9.051
1958-59			
Recurring	7.696	7.467	7.452
Capital	3.000	2.369	2.159
Pilot Plant	2.400	0.673	0.133
TOTAL	13.096	10.509	9.774
1959-60			
Recurring	9.662		
Capital	5.400		
Pilot Plant	2.000		
TOTAL	17.062		

APPENDIX II

(Vide Para 20)

Note giving the latest position regarding refractories, with special reference to the success achieved and the way in which they are being utilised for commercial exploitation.

The work on refractories has been carried out in two National Laboratories viz. National Metallurgical Laboratory, Jamshedpur and Central Glass and Ceramic Research Institute, Calcutta. The latest position in this regard is as follows:—

NATIONAL METALLURGICAL LABORATORY, JAMSHEDPUR

Studies on different types of refractory raw materials like fire clays, magnesites, magnesium silicate rocks, chromites, dolomites, kyanite, Travancore beach sand, zircon and sillimanite have been carried out and the results have been published in about 35 research papers in various technical journals which have wide circulation in the industry. As a result of the development work carried out in the laboratory, certain patents have been taken out. The position as regards their commercial exploitation is indicated against each.

1. Carbon bonded graphite crucibles. Leased out to two parties on non-exclusive basis for commercial exploitation. One party is well ahead with plans for putting up the factory.
 2. Clay bonded graphite crucibles. Offered to six parties for exploitation on small industries scale. Accepted by one party so far.
 3. Dense mullite and hot face insulation refractories from Kyanite. Leased out on exclusive basis to one party.
 4. Forsterite refractories from magnesium silicate rocks.
 5. Established dolomite refractories.
 6. Chemically bonded and metal clad or unclad basic refractories.
- Non-technical note has been given wide circulation by National Research Development Corporation. Some parties have shown interest in their commercial exploitation but final decision for leasing out these processes has not been taken as yet.
- Non-technical note is being finalised by NRDC.

- | | | |
|--|---|---|
| 7. Dense carbon aggregates from carbonaceous materials. | } | Non-technical notes sent to the NRDC for finalisation. Possibilities of setting up Pilot Plant are being exploited. |
| 8. Carbon pastes for Soderberg electrodes. | | |
| 9. Chrome magnesite refractories from low grade chrome ores. | | Non-technical note is being finalised. |
| 10. Flux for union melt welding . | | Data is being collected for preparing non-technical note. |
| 11. Process developed but not patented. | | |
| Carbon blocks | | Total demand is being assessed. A scheme for manufacture is being prepared for commercial exploitation of process. |

CENTRAL GLASS & CERAMIC RESEARCH INSTITUTE, CALCUTTA

The following processes have been successfully developed and completed at the Institute in the field of refractories:—

- (1) *Utilisation of waste mica for the manufacture of heat insulating bricks.*

The patent of this process has been already assigned by the NRDC to the following firms for commercial production:—

- (i) M/s Bhupal Mining Works, Bhilwara, Rajasthan.
- (ii) M/s Reliance Fire Bricks & Pottery Co. Ltd., Calcutta.
- (iii) M/s Mohan Mica Exports, Gudur, Andhra Pradesh.

It is learnt from Messrs Bhupal Mining Works, that they propose stopping production on the ground that there is not sufficient demand for such bricks in the country in view of the fact that vermiculite is still being imported in sufficient quantity to produce vermiculite bricks by some refractory manufacturers. The matter has been taken up by the firm with the NRDC and Development Wing of the Ministry of Commerce and Industry.

- (2) *Improvements in or relating to the manufacture of hot face insulating bricks*

National Research Development Corporation is taking action for the commercial utilisation of this patent.

(3) *Spinel refractories for cement kilns*

The work on this process has been published for the benefit of industry. The extent to which this work is being utilised by the industry is not exactly known.

Besides the above, as a result of investigations and tests carried out at the Institute, import of certain types of refractories has been cut down due to the results published on the assessment of indigenous refractories against similar types of foreign refractories.

APPENDIX III

(Vide Para 55)

Note regarding the invention of a suitable colouring material or chemical to be used as additive to Vanaspati

Colourisation of Vanaspati with a view to detecting its adulteration with ghee has been engaging the attention of many workers. Investigations were also taken up at the National Chemical Laboratory, Poona, Central Drug Research Institute, Lucknow and the Central Food Technological Research Institute, Mysore.

2. A suitable colour for the purpose in view has to satisfy the following criteria:—

- (i) it should be inexpensive and easily available;
- (ii) it should not be toxic;
- (iii) it should be added in small quantities and yet detectable by simple tests in a home;
- (iv) it should not be easily removable from vanaspati;
- (v) even 5-10 per cent adulteration should be detectable.

3. To find out a colour satisfying all the requirements is by no means easy and a colour answering all these requirements has not been found out so far.

4. However, a colourless chemical compound 3, 5, 3', 5'—tetra-tert-butyl-4, 4'-Dihydroxy-diphenylmethane has been found by National Chemical Laboratory, Poona, as suitable, satisfying all requirements, for use as an additive to 'vanaspati' to enable the detection of adulteration of 'ghee' with 'vanaspati'. Work is proceeding to confirm the initial results. 'Vanaspati' admixed with this compound has the following properties:—

- (i) Addition of 1 mg. to 100 g. of 'vanaspati' does not impart any colour to 'vanaspati'. A sample of this (5 ml.) when shaken for about one minute with methylated spirit (3 ml.) and saturated lime water (0.5 ml.) or 10 per cent sodium carbonate solution (0.5 ml.) gives a purple colouration. This test could, therefore, be carried out at home by any housewife.
- (ii) Because of its solubility in oil and insolubility in even, strong alkali, the compound cannot be removed once it is added to 'vanaspati' either by aqueous or alkaline washing.

- (iii) Decolourising carbons do not remove the compound from the 'vanaspati'.
- (iv) Heating 'vanaspati' containing the compound upto 200° does not bring about any decomposition.
- (v) The compound has an additional advantage as an anti-oxidant when added to 'vanaspati'. Under the standard experimental conditions for the testing of antioxidants, the compound gave a value of 7½ hours in 0.01 per cent addition and 37 hours in 0.5 per cent addition.

5. A preliminary test on acute toxicity has shown that the compound is non-toxic, and more elaborate tests are now in progress at the Central Drug Research Institute, Lucknow.

6. A vegetable colouring material, 'Ratanjot' (*Onosma echoides*) root dye has also been suggested. The work on the determination of its chronic toxicity on animals is in progress at the Central Drug Research Institute, Lucknow. There appears to be some difference of opinion about the toxicity of this colour and until this is finally decided, it may not be accepted as a suitable colour. This material, however, appears to be unstable and can be removed by treatment as all vegetable colours are.

APPENDIX IV

(Vide para 86)

A brief account of some of the important items of work done by the National Chemical Laboratory, Poona

(a) *Heavy Chemicals*

A process has been worked out for converting ferruginous apatite occurring as workable deposits in Singhbhum into a water-soluble concentrated fertiliser containing nitrogen and phosphorous. Titanium tetrachloride has been prepared by chlorination of bauxite sludge, a waste product of the aluminium industry, and the chloride converted into white rutile titania. The chlorination of minerals is of particular interest from the point of view of the utilisation of chlorine obtained as a by-product in the electrolytic manufacture of caustic soda.

(b) *Minor Metals*

In collaboration with the Department of Atomic Energy, work on rare earths and minor metals is in progress, using modern techniques of chromatography and liquid-liquid extraction. Reactor grade zirconia and high purity hafnia have been prepared from Indian zircon by a new process. The preparative chemistry of minor metals and their characteristic compounds is being studied.

(c) *Radioactive Tracer Techniques*

Radioactive tracers have been used for testing paint and varnish films, studying the effect of radiations on polymerization reactions, and the production of mutants of micro-organisms and seeds. In collaboration with the Armed Forces Medical College, radioactive tracer technique has been used in connection with diagnostic studies of the thyroid function and an investigation of the causes of anaemia using chromium 51 and Vitamin B12 containing radioactive cobalt.

(d) *Solid State Physics and Chemistry*

The NCL has done pioneering work in these fields. X-ray, electron diffraction and infrared techniques are in use for structure analysis, e.g. of new oxidic semi conductors and ferro-electrics which have recently been used in solid state devices. Factors affecting electrodeposition and surface structures and textures of electro-deposited and vapour deposited metal or alloy surfaces have been studied by electron diffraction, electron microscopy and optical microscopy, the work being closely linked with kinetic studies of corrosion of metals and alloys in dry and wet environments.

(e) *Surface and Colloid Chemistry*

Based on a study of the properties of surface-active agents, new formulations giving stable DDT suspensions of high covering power and insecticidal activity have been evolved under the auspices of the Indian Council of Medical Research. The shape, size and weight of macromolecules are being studied by light scattering, viscometric and sedimentation techniques, especially in connection with technically important problems involving cellulose, gelatine and synthetic resins. A project recently undertaken, based on work initiated in Australia, is a fundamental study of the prevention of the evaporation of water in arid regions by spreading films of long-chain alcohols.

(f) *Synthetic Resins*

A sulphonated cation-exchange resin from polymerised cashewnut shell liquid has been prepared on a pilot plant scale and is now undergoing large-scale trials for water softening. Lacquers for food containers based on cashewnut shell liquid have been found to be satisfactory in laboratory tests and are now being submitted to prolonged storage tests. An auto-hardening oil for binding sand cores has been found to be satisfactory substitute for imported oils. A process for making rigid filters for tube wells is ready for commercial exploitation. Various stages for the production of polyvinyl chloride (PVC) from alcohol are being submitted to chemical engineering and pilot plant studies. It is hoped that the work will ultimately lead to the establishment of PVC manufacture in the country without the need for purchasing "know-how" from abroad.

(g) *Rubber Technology*

A process for the preparation of liquid rubber, which can be used for casting printing rollers and for hard rubber linings, has been leased out to industry. Work on cyclised rubber, fire proof and flame proof rubber, rubber base adhesives, and heat-conducting rubber lining is in progress.

(h) *Rayon-grade Pulp*

Under the auspices of the Cellulose Research Committee a project has recently been undertaken on the production of rayon-grade pulp from raw materials available in India. It is hoped that the viscose industry, which is now well established in the country, will be provided in the course of the next two or three years with technical data for the economic production of cellulose pulp of appropriate quality.

(i) *Fixed Oils*

Inedible oils such as nim, karanja, nageshwar and polang, which cannot be refined by conventional methods, have been refined by alcohol extraction, and they should be suitable for hydrogenation and soap manufacture after this treatment. A process has been developed for the production of oleic and stearic acids from nim oil. It has been stated that Sodium nimbinate, isolated from nim biters, has been found to be a potent and therapeutically useful diuretic. Coating compositions, including air-drying wrinkle

finishes, have been developed from kamala seed oil. Kamlolenic acid, the characteristic acid of this oil, is a suitable intermediate for the production of macrocyclic compounds of value in perfumery. A process has been developed for the recovery of nickel and fat from spent-nickel catalysts in the vanaspati industry.

(j) *Synthetic Drugs and Vitamins*

A mixture of phosphorus oxychloride and zinc chloride is a valuable condensing agent for the synthesis of ketones useful as drug intermediates. Improved methods have been developed for the preparation of hexylresorcinol, 4-hydroxy-coumarin, dicoumarol and stilbestrol. Conditions for obtaining maximum yields in the series of steps leading to pyridoxine (vitamin B6) have been worked out. The bacterial oxidation of sorbitol to sorbose and the chemical conversion of sorbose to vitamin 'C' have been carried out on a pilot plant scale after extensive laboratory experiments and the process is now ready for commercial exploitation.

(k) *Transfusion Gelatin*

Since blood or plasma is difficult to obtain and preserve on a large scale, the production of plasma substitutes for the treatment of shock has been extensively studied in many countries. A new enzymic process for the preparation of transfusion gelatin was developed on a laboratory scale and the material was found to give satisfactory results in animal tests, which were carried out in collaboration with the Armed Forces Medical College, Poona. Pilot plant work on the production of transfusion gelatin was undertaken to determine the reproducibility of the preparation in large-scale experiments and to obtain sufficient material for clinical trials, which are required to establish the efficiency of the product.

(l) *Nicotine from Tobacco Waste*

It has been estimated that about 4.5 million pounds of Tobacco waste is available every year in India. A process for the extraction of nicotine sulphate from tobacco waste, which is an effective insecticide against green fly, white fly and snails has been developed by this Laboratory, and leased out to a firm which has already gone into production. The process is protected by Indian and foreign patents.

(m) *Essential Oils and Perfumery Materials*

India has large resources of essential oil bearing plants, but these are now being exported, either as crude raw materials or after preliminary processing, and the country is importing at the same time several crores of rupees worth of perfumery products and aromatic chemicals. Realising the importance of this trade, the NCL initiated a research programme in 1951 which has developed rapidly. The programme includes systematic chemical investigation of the constituents of essential oils of potential commercial importance, as well as a study of methods of synthesis of perfumery materials. Indian and foreign patents have been taken on costus root oil, jasmone, dihydrojasmone, civetone and exaltone.

(n) *Natural and Synthetic Colouring Matters*

Work in these fields has been recently undertaken and a school of research is being organised. Under the auspices of the Indian Lac Cess Committee, the chemistry of lac dye, millions of pounds of which are being thrown away every year, is being investigated.

(o) *Bacterial Diastase*

The requirements of diastase for desizing in the textile industry are at present met by imports. A process for the production of bacterial diastase by submerged fermentation using cheap indigenous raw materials has been developed and is being studied on a pilot plant scale.

APPENDIX V

(Vide para 109)

Copy of the Scientific Policy Resolution together with a note showing the action taken on the recommendations made by the Conference of Scientists and Educationists etc., held to consider the question of implementation of the Resolution.

A. SCIENTIFIC POLICY RESOLUTION

New Delhi, the 4th March 1958/13th Phalgun, 1879

No. 131/CF/57.—The key to national prosperity, apart from the spirit of the people, lies, in the modern age, in the effective combination of three factors, technology, raw materials and capital, of which the first is perhaps the most important, since the creation and adoption of new scientific techniques can, in fact, make up for a deficiency in natural resources, and reduce the demands on capital. But technology can only grow out of the study of science and its applications.

2. The dominating feature of the contemporary world is the intense cultivation of science on a large scale, and its application to meet a country's requirements. It is this, which, for the first time in man's history, has given to the common man in countries advanced in science, a standard of living and social and cultural amenities, which were once confined to a very small privileged minority of the population. Science has led to the growth and diffusion of culture to an extent never possible before. It has not only radically altered man's material environment, but, what is of still deeper significance, it has provided new tools of thought and has extended man's mental horizon. It has thus influenced even the basic values of life, and given to civilization a new vitality and a new dynamism.

3. It is only through the scientific approach and method and the use of scientific knowledge that reasonable material and cultural amenities and services can be provided for every member of the community, and it is out of a recognition of this possibility that the idea of a welfare state has grown. It is characteristic of the present world that the progress towards the practical realisation of a Welfare State differs widely from country to country in direct relation to the extent of industrialisation and the effort and resources applied in the pursuit of science.

4. The wealth and prosperity of a nation depend on the effective utilisation of its human and material resources through industrialisation. The use of human material for industrialisation demands its education in science and training in technical skills. Industry opens up possibilities of greater fulfilment for the individual. India's enormous resources of manpower can only become an asset in the modern world when trained and educated.

5. Science and technology can make up for deficiencies in raw materials by providing substitutes, or, indeed, by providing skills which can be exported in return for raw materials. In industrialising a country, a heavy price has to be paid in importing science and technology in the form of plant and machinery, highly paid personnel and technical consultants. An early and large scale development of science and technology in the country could therefore greatly reduce the drain on capital during the early and critical stages of industrialisation.

6. Science has developed at an ever-increasing pace since the beginning of the century, so that the gap between the advanced and backward countries has widened more and more. It is only by adopting the most vigorous measures and by putting forward our utmost effort into the development of science that we can bridge the gap. It is an inherent obligation of a great country like India, with its traditions of scholarship and original thinking and its great cultural heritage, to participate fully in the march of science, which is probably mankind's greatest enterprise today.

7. The Government of India have accordingly decided that the aims of their scientific policy will be:—

- (i) to foster, promote, and sustain, by all appropriate means, the cultivation of science, and scientific research in all its aspects—pure, applied, and educational;
- (ii) to ensure an adequate supply, within the country, of research scientists of the highest quality, and to recognise their work as an important component of the strength of the nation;
- (iii) to encourage, and initiate, with all possible speed, programmes for the training of scientific and technical personnel, on a scale adequate to fulfil the country's needs in science and education, agriculture and industry, and defence;
- (iv) to ensure that the creative talent of men and women is encouraged and finds full scope in scientific activity;
- (v) to encourage individual initiative for the acquisition and dissemination of knowledge, and for the discovery of new knowledge, in an atmosphere of academic freedom;
- (vi) and, in general, to secure for the people of the country all the benefits that can accrue from the acquisition and application of scientific knowledge.

The Government of India have decided to pursue and accomplish these aims by offering good conditions of service to scientists and according them an honoured position, by associating scientists with the formulation of policies, and by taking such other measures as may be deemed necessary from time to time.

B. NOTE SHOWING THE ACTION TAKEN ON THE RECOMMENDATIONS OF THE CONFERENCE OF SCIENTISTS, VICE-CHANCELLORS OF UNIVERSITIES, EDUCATIONISTS, ETC., HELD IN JULY, 1958 TO CONSIDER THE QUESTION OF IMPLEMENTATION OF THE SCIENTIFIC POLICY RESOLUTION

The question of implementing the Scientific Policy Resolution was considered at a conference held in Vigyan Bhavan, New Delhi, on the 18th and 19th July, 1958. Leading Scientists, Vice-Chancellors of Universities and eminent educationists attended the conference.

2. The conference made recommendations under the following heads:—

- (1) Recruitment and retention of teachers of science and research workers at various levels;
- (2) Talent Search;
- (3) Expansion of opportunities;
- (4) Research *versus* immediate employment;
- (5) Proper co-ordination and full utilisation of available talent and resources;
- (6) Encouraging the study of Science;
- (7) Text-Books;
- (8) Instruments;
- (9) Documentation Centre; and
- (10) The Scientist in India should help in the task of creating a scientific outlook in the country by writing simple books in the major fields of science.

3. The action taken so far on these recommendations is as under:—

Recommendation 1: Recruitment and retention of teachers of science and research workers at various levels

The salary scales of teachers in science subjects and in Humanities and Social Sciences have been upgraded by the University Grants-Commission both for the university teachers as well as for those in affiliated colleges. The revised scales are as follows:—

University Institutions

Professors	.	.	.	Rs. 800—50—1250
Readers	.	.	.	Rs. 500—25—800
Lecturers	.	.	.	Rs. 250—20—500

Affiliated Colleges

Principals	Rs. 600-40-800
Heads of Deptts.	Rs. 400-25-700
Senior Lecturers	Rs. 300-25-600
Lecturers	Rs. 200-15-320-20-500
Demonstrators & Tutors	Rs. 150-200

On the basis of recommendation made by the All India Council for Technical Education, the following grades have been approved by the University Grants Commission for teachers working in technical institutions under Universities.

Designation of post	Class 'A' (Mainly post-graduate courses)	Class 'B' (Mainly Degree courses)
1. Director-Principal	Rs. 2000-2500 (with provision for additional pay of Rs. 500/- in exceptional cases).	Rs. 1300-60-1600 -100-1800
2. Professor (Senior Scale)	Rs. 1600-100-1800	Rs. 1000-50-1500
3. Professor (ordinary scale)	Rs. 1000-50-1500	Rs. 1000-50-1500
4. Asstt. Professors	Rs. 600-40-1000- 50/2-1150	Rs. 600-40-1000- 50/2-1150
5. Lecturers	Rs. 350-350-380- -380-30-590- EB-30-770- 40-850-with starting salary of Rs. 410/-.	Same as in Class 'A'
6. Workshop Supdt.	Rs. 600-40-1000- 50/2-1150	Same as in Class 'A'

As regards other technical institutions *e.g.* Engineering Colleges etc. controlled or aided by State Governments, the following scales have been approved:

(a) *Engineering colleges and other technical institutions conducting first degree courses in engineering/technology.*

Principal: The salary scale should be the same as for the Chief Engineer, P.W.D. of the State Governments concerned.

Professors: The salary scales should be the same as for the Superintending Engineer, P.W.D. of the State Government concerned.

Asstt. Prof./Workshop Supdt. Rs. 600—40—1000—50/2—1150

Lecturers Rs. 350—350—380—380—30—590 EB—
30—770—40—850.

(b) *Polytechnics conducting diploma courses.*

Principal Rs. 800—40—1000—50—1250

Heads of Deptt. Rs. 600—40—1000

Lecturers & Workshop

Supdt. Rs. 350—350—380—380—30—590—EB—30
—770—40—850.

Senior Instructor Rs. 250—10—300—15—450—25/2—500

Junior Instructor Rs. 160—10—300

At engineering and technological institutions conducting post graduate courses, the pay scale of professors in the senior scale would be adjusted between the pay scale of Chief Engineer and the Superintending Engineer in the P.W.D. of the State Government concerned. The post of professor in the senior scale would be equated to that of Additional Chief Engineer or in the case of States where no such post exists, an allowance, Rs. 250 p.m., is to be given in addition to the pay scales of Superintending Engineer.

The Central Government have also decided to bear the entire additional expenditure involved in the adoption of the above revised scales of salary at State Government and non-government institutions (excluding University institutions) for a period of five years in the first instance. The question of the manner in which that responsibility should gradually devolve on State Government, etc. will be considered at the end of the five year period.

The revised salary scales as indicated above will apply to the staff of both State Government and non-government technical institutions functioning in each State.

This matter was also discussed at the Chief Ministers' Conference held on the 13th May, 1959 at Delhi and there was general agreement in regard to the need for improving the salaries of teachers in technical institutions. The Conference recognised that if bright young men are to be attracted to the teaching profession, it was necessary to offer them terms comparable to the superior engineering services under the centre.

The All India Council for Technical Education also recommended certain measures for the improvement of service conditions in technical institutions to attract suitable persons to the teaching profession and to stop their flight to other professions. These are under consideration.

The terms and conditions of service of scientific officers and staff in the various National Laboratories of the Council of Scientific and Industrial Research have been reviewed and certain decisions governing the promotion of scientific workers to higher grades, special 'Merit' Promotions, Advance Increments to Scientific workers etc. have been finalised.

A scheme for grant of "Merit Promotions and Advance Increments" to scientists working in the Defence Science Organisation and the Indian Agricultural Research Institute has been approved by Government. Ministry of Defence and Department of Agriculture have decided to set up separate Departmental Promotion Committees to assess merit of candidates. The Scheme is being extended to the Geological Survey of India.

The scheme for grant of "Merit Promotion and Advance Increments" to scientists is expected to be extended also to Survey of India, Botanical Survey of India and Department of Anthropology; the proposal is at present under consideration.

The Government have also under consideration a plan for the improvement of the pay structure of the scientists employed in the various government organisations. The proposal includes fellowship scheme whereby the scientists and engineer will be given an opportunity to be trained in particular type of work in the organisation with a view to absorbing him eventually in a permanent cadre.

Recommendation 2: Talent Search

The views of the State Governments have been invited. The recommendation has also been forwarded to the Ministry of Education for implementation. In addition to measures enumerated above, the State Governments have been addressed to adopt a Scheme of 'Talent Search on the lines of the Scheme introduced by the Government of Uttar Pradesh.

Recommendation 3: Expansion of opportunities

This recommendation concerns the Ministry of Education in so far as the Universities are concerned, and has been forwarded to that Ministry for necessary action.

The University Grants Commission have taken various steps to encourage higher scientific education and research in Indian Universities. Some of the measures adopted by the Commission to develop scientific training and research are given below:

(i) The Commission have set apart funds for encouraging exchange of teachers. It has approved a scheme under which travel grants are given to university teachers for conducting research at centres other than their own *i.e.* in national laboratories, other universities and institutions of higher learning.

(ii) The Commission have given financial assistance for holding seminars and refresher courses in scientific subjects. A scheme for arranging refresher courses at places like the Atomic Energy Establishment and other centres of specialised research is under consideration.

(iii) The Commission have set up Review Committees on all Science subjects with a view to assess the extent and nature of impact the development grants had made hitherto and to suggest measures for the future improvement of teaching and research in these subjects.

(iv) A Scheme has been devised for grant of financial assistance for the publication of research material on various science subjects.

(v) *Scholarships and Fellowships:*

The Commission have initiated a scheme of awarding post-graduate research scholarships. Junior fellowships and Senior fellowships. 100 post-graduate research scholarships of the value of Rs. 200 p.m. and 70 post doctoral scholarships of the value of Rs. 300 p.m. each and 40 senior research fellowships of the value of Rs. 500 (or Rs. 600 for science subjects) have been sanctioned. In addition to the above, 100 merit scholarships of Rs. 100 p.m. each have also been sanctioned to be awarded on the results of B.Sc. examination.

(vi) The Commission have given special attention to the improvement of workshop facilities in various universities. Grants have been provided for workshop buildings, for purchase of workshop equipment and for additional staff, so that the universities could design, fabricate and maintain scientific equipment required for teaching and research.

(vii) The Commission have given special attention to the improvement of library facilities both in sciences and in Humanities. Grants have been given for the construction of new library buildings and for procuring reference books such as the back numbers of scientific journals. The Commission have appointed a Library Committee to recommend further measures for the improvement of libraries. The report of this Committee is awaited.

2. This recommendation also concerns the CSIR who have been taken the following steps towards implementation of the recommendation:

22 laboratories are now functioning under the Council covering most of the important scientific subjects. The Council has introduced a grants-in-aid Scheme for rendering financial assistance to research workers employed in institutions outside the national laboratories/research institutes. The scope of the Scheme has since been

expanded not only to cover specific research projects but also block grants for establishing schools of research in universities and other institutions, such as block grants to the Department of Chemical Technology, Bombay University, for establishing a Chair in Dyestuff Technology.

Besides, a large number of Senior and Junior Research Fellowships of Rs. 400 p.m. (Rs. 500 p.m. for specialised subjects) and Rs. 250 p.m. (Rs. 300 p.m. for specialised subjects) respectively besides the normal contingent grant are awarded every year. Similar Fellowships have also been introduced in the national laboratories/research institutes of the CSIR. In addition equipment grants are given by the Council for purchasing specialised items of equipment not normally available in an university laboratory.

Further, Professors of Universities who are due to retire are given assistance to give a final shape to their life's work in the form of an honorarium of Rs. 4000 p.a. plus Rs. 4000 to cover expenditure on the employment of a Research Assistant and other ancillary expenses.

Recommendation 4: Research versus immediate employment

The State Governments have been addressed in the matter. It is felt that people trained in scientific research should be absorbed in scientific research posts on fellowships of not less than Rs. 300 per mensem in the present context of living conditions. Well-established industrial concerns could assist by subsidising research fellows and guaranteeing them jobs on completion of their research fellowships. The Ministry of Commerce and Industry have therefore been requested to approach industry in this regard.

Recommendation 5(a): Proper co-ordination and full utilisation of available talent and resources

The views of the State Governments have been invited on this recommendation. The Planning Commission, Ministries of the Government of India, the Universities, etc. have also been addressed. Action to implement this recommendation will be taken as soon as their views are available.

Recommendation 5(b):

The views of the Ministries, Universities and the technical and research institutes have been invited on this recommendation. Steps to implement the recommendation will be taken after their views have been received.

Recommendation 5(c):

The Ministry of Home Affairs (Directorate of Manpower) *vide* their Resolution No. 8|4|57-M.P. dated the 14th October, 1958, have sanctioned the constitution of a Pool for temporary placement of

well-qualified Indian Scientists and technologists returning from abroad. Persons with Indian qualifications having outstanding careers will also be eligible for appointment to this pool in not more than 25% of the total number of posts in the Pool. The Council of Scientific and Industrial Research have selected some persons for appointment to the Pool.

Recommendation 5(d):

This recommendation is under consideration.

Recommendation 6: Encouraging the study of Science.

The Ministry of Education, who are concerned, have addressed the State Governments etc. for appropriate action in regard to Science teaching at the elementary stage, (*i.e.* from classes 1 to 8) by arranging popular lectures, where possible and Children Film Shows and Lantern Slides shows.

Recommendation 7: Text-Books

This recommendation concerns the Ministry of Education and has been passed on to them for implementation.

Recommendation 8: Instruments

This recommendation has been passed on to the Ministry of Commerce and Industry for implementation.

Recommendation 9: Documentation Centre

In order to give concrete shape to this recommendation, a Committee consisting of the following members was constituted by the Council of Scientific and Industrial Research to consider the various measures necessary for the setting up of Central Institute for Scientific and Technical Information:—

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|--|-----------------|
| 1. Dr. D. S. Kothari | <i>Chairman</i> |
| 2. Dr. S.R. Ranganathan | <i>Member</i> |
| 3. Dr. K. Venkataraman | „ |
| 4. Head, UNESCO Office, Delhi | „ |
| 5. Dr. U. P. Basu | „ |
| 6. Head, INSDOC | „ |
| 7. Dr. B. C. Guha | „ |
| 8. Shri B. S. Kesavan | „ |
| 9. Chief Editor, Publication Directorate, C.S.I.R. | „ |

The recommendations of the Committee are awaited.

Recommendation 10: The Scientist in India should help in the task of creating a scientific outlook in the country by writing simple books in the major fields of science.

This is an appeal by the Minister for Scientific Research and Cultural Affairs to the prominent scientists who participated in the discussions to help in the task of creating a scientific outlook in the country by writing simple books in regional languages in different fields of science. Arising out of this appeal Dr. M. S. Randhawa, Vice-Chairman, ICAR has agreed to write a book entitled "Evolution of Life". The details about this are being worked out.

APPENDIX VI

(Vide para 117)

Statement showing the No. of Scientific Delegations sent abroad during the years 1956-57, 1957-58 and 1958-59 and expenditure incurred on each delegation

Year	S. No.	Name of the delegation	No. of Delegates	Expenditure on each delegation
				Rs.
1956-57	1.	Conference on Nobel Laureates Conference at Lindau from 24-6-56 to 29-6-56.	One	4,487
	2.	10th International Congress of Entomology held at Montreal in August, 1956.	One	7,560
	3.	Symposium in Hydrology held at Dijon in 1956.	Two	6,360
1957-58	4.	General Assembly of the International Union of Geodesy and Geophysics held in Canada in 1957.	Two	7,441
	5.	Pan Indian Ocean Science Association held at Tanarive in 1956.	Two	10,800
1958-59	6.	Indian Scientists visit to U.S.S.R.	Fifteen	18,264
	7.	General Assembly of the International Mathematical Union and International Congress of Mathematics held at Scotland in 1958.	One	5,426

APPENDIX VII

Summary of recommendations/conclusions of the Estimates Committee

Serial No.	Reference to Para No.	Summary of recommendations/conclusions
1	2	3
1	13	The Committee cannot help feeling that the budget estimates in respect of National Laboratories/Institutes mentioned in para 1 were framed in an unrealistic manner. The need for taking suitable steps to avoid wide variations between the sanctioned estimates and the actual expenditure of these National Laboratories/Institutes is indicated.
2	4	The Committee are of the view that there is considerable scope for accelerating the pace of industrial application of the results of the researches. As a matter of fact, the most reliable criterion to judge whether various researches in National Laboratories/Institutes have been completed successfully would be to see whether the processes evolved have been commercially exploited or not. This can be achieved not so much by these Institutes as by the NRDC with the cooperation of CSIR, other Central Ministries and the various undertakings both in the public and private sectors. Without such application of the researches at the field level, there would be little justification for all the efforts made and expenses incurred on the institutions.
3	7	The Committee consider it rather unfortunate that the method of soil stabilisation successfully evolved by the CRRRI should have remained practically unutilised for years together, in spite of the fact that various Government agencies are engaged in the construction of roads all over the country. The Committee suggest that this

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method may be utilised by the C.P.W.D. in the Union Territories in all suitable cases and the States should also be approached for its adoption wherever possible. The Committee recommend that conditions should be created so that development work of new techniques can be carried out freely on a reasonably large scale.

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The Committee regret to observe that no appreciable progress has been made so far in the matter of taking positive steps by the Ministry of Transport to encourage construction of stabilised soil roads specially in the rural areas in view of the low construction and maintenance cost involved.

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The Committee suggest that the decision of the Government of India on the suggestion made by the Panel of Scientists of the Planning Commission regarding the creation of a fund for large scale experimental construction and development work and the setting up of an Assessment Committee to evaluate research results and to administer the fund may be expedited.

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The Committee suggest that the Ministry of Works, Housing and Supply should indicate what action they have taken in regard to the proposal to lower water table in Delhi in the light of conclusions furnished by the CRRI.

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The Committee are sorry to observe that no serious effort appears to have been made so far to apply techniques mentioned in para 12 on a large scale in spite of the fact that these techniques are capable of being utilised by the Government agencies in the Centre and the States. The Committee suggest that the question of large scale utilisation of these techniques at least during the Third Plan period should be examined by the Central Government in conjunction with the State Governments.

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The Committee suggest that the economics of the setting up of small units for iron and steel production in different parts of the country (taking into consideration the cost of transporting raw material) by the low shaft furnace process should be worked out jointly by the CSIR and the

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Ministry of Commerce and Industry and if the result is favourable, steps should be taken to set up a few such units to start with during the Third Plan period.

- 9 17 The Committee suggest that the proposal to incorporate the process for production of nickel-free austenitic stainless steels developed at the NML in the projected Alloy, Tool and Special Steels Plant to be set up in the public sector may be expedited as already much time has been lost in planning a Tool and Alloy Steel Project.
- 10 18 The Committee feel that with the development of nickel-free austenitic stainless steel and nickel-free coinage alloys in which nickel is replaced by electrolytic manganese, the potential demand for this metal is assured and suggest that early steps should be taken to develop the process industrially.
- 11 19 The Committee suggest that the question of manufacture of high tensile steel may be pursued vigorously by Government.
- 12 20 The Committee strongly urge that a higher priority should be accorded to the indigenous production of refractories to meet all the requirements within the country.
- 13 21 The Committee suggest that vigorous steps should be taken for the commercial exploitation of the process developed at the NML for the production of high purity electrolytic manganese dioxide suitable for use in dry cells.
- 14 27 The Committee suggest that the reasons for the reluctance on the part of industry to adopt the new saggars, the production techniques of which have been developed at the CGCRI, may be investigated and early steps taken to induce the industry to use the new saggars.
- 15 28 The Committee suggest that the progress on the programme of mineral development which has been rather slow may be speeded up.
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16	28	The Committee suggest that the information service in the CGCRI should be established expeditiously.
17	37	The Committee are of the view that special efforts should be made for the manufacture of products mentioned in para 37 on a commercial scale.
18	39	The Committee suggest that the decision on the proposal to set up a Tapioca Macaroni plant in Kerala may be expedited.
19	43	The Committee suggest that the decision on the proposal to set up a plant for the manufacture of Multi-purpose Food in Madras may be expedited.
20	49	The Committee suggest that early steps should be taken to secure the application of the new par-boiling technique developed at the CFTRI throughout the country.
21	50	The Committee consider that the proposal to set up a ten-ton plant for the production of rice bran oil is sufficiently important to merit immediate implementation.
22	55	The Committee regret to note that in spite of the controversy raging over a number of years about deleterious effects of Vanaspati on health, none of the research laboratories or institutes have yet conducted research and given their findings thereon. The Ministry should lose no time in bringing home to the concerned laboratories the urgent need of completing research in this respect and furnishing results early.
23	55	The Committee learn that about 1952 a material pink in colour for use as an additive to Vanaspati was found which was quite harmless. The Ministry of Food and Agriculture wanted the colouring material to be yellow. No reasons were forthcoming as to why pink colour was not acceptable. The reasons for abandoning the research were unaccountable. The Committee also find that as early as 1952 the Government of India in their resolution on the report of the Ghee Adulteration Committee had deferred their decision on the use of a visible

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colouring material as an additive to Vanaspati till the results of the various experiments which are being carried on in the country for finding out a suitable colouring medium for Vanaspati were available. Evidently the matter had not been seriously pursued thereafter. The Committee are of the opinion that there has been too long and inexplicable a delay in enforcing the use of an additive to Vanaspati. While the use of a colourless additive may go to eliminate to some extent the deception practised in passing off as pure ghee, a product adulterated with Vanaspati, it cannot help common folk, who are unable to resort to the tests, from being deceived. They are of the view that either pink or some other colouring material equally good should be used as an additive to Vanaspati so that whether by itself or as an adulterant, Vanaspati could be identified easily by mere sight and all room for deception obviated.

- 24 65 The Committee suggest that vigorous steps should be taken to enthruse the manufacturers of salt to take up production of by-products of salt.
- 25 67 In the context of the persistent shortage of food in the country, the Committee would like that a comprehensive plan is drawn up for reclaiming alkaline land all over the country without loss of time.
- 26 67 [†] _{re} The Committee desire to state that once the researches have proved successful, it should not be the business of the research institute to take up their large scale application. The actual reclamation of Usar lands based on these researches should be the responsibility of the land owners or any other organisation created for the purpose.
- 27 68 The Committee are glad that training facilities have been provided to the lower staff in the National Botanic Gardens in the different aspects of work. They suggest that similar activities should be encouraged in the other institutions of the CSIR.

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28	68	The Committee are of the opinion that training at the NBG should not be confined to the lower courses only but should also include some higher courses for the training of botanists and horticulturists which is stated to be one of its functions.
29	70	The Committee find that though the experiments leading to the research results mentioned in para 70 were completed three to four years ago, little progress has been made in their commercial exploitation in the absence of pilot plant facilities at the CDRI and to some extent due to lack of clinical facilities. They consider that there had not been proper appreciation of the need for translating research results into practical utilisation.
30	71	The Committee suggest that the CDRI should maintain close contact with the researches carried on according to Ayurveda and Unani systems.
31	72	The Committee suggest that suitable steps should be taken jointly by the Ministries of Scientific Research and Cultural Affairs and Health to remove the medical practitioners' prejudice to the use of indigenous drugs.
32	72	The Committee suggest that a list of indigenous drugs standardised and tested may be prepared by the Institute and furnished to all Government and local dispensaries/hospitals. Government may issue instructions to the authorities concerned that indigenous drugs which have been found to be effective substitutes for imported drugs should be prescribed by Government hospitals/dispensaries.
33	73	The Committee suggest that the CDRI may bring out a small brochure giving in a complete and simple form a description of properties and uses of each of the indigenous drugs produced and standardised by the Institute and the extent to which they can be substituted for foreign drugs.
34	74	The Committee are of the view that in order to popularise indigenous drugs among medical men

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and women, properties and uses thereof should be taught in medical colleges.

- 35 76 The Committee trust that the new technique of doubly-curved shell roof developed at the CBRI which leads to economy in time as well as in material at present in great shortage in the country would be increasingly adopted in housing and other projects.
- 36 77 The Committee trust that the shell type structures for the roofing of grain godowns etc. will be adopted increasingly in construction work of public and private sectors.
- 37 79 The Committee recommend that the process of preparing non-erodable mud plaster developed by the CBRI which would greatly improve village housing should be given wide publicity in the different regional languages particularly among the Community Development Blocks.
- 38 80 The Committee suggest that wide publicity should be given to brick and block making machine, developed at the CBRI, throughout the country.
- 39 81 The Committee suggest that in view of the development of a suitable foaming agent from indigenous raw materials by the CBRI the question of restricting the import of foreign foaming agent for making thermal insulating blocks of foamed concrete may be examined by the Ministry of Commerce and Industry.
- 40 83 The Committee suggest that large scale trials of the process developed by the CBRI for making bricks from black cotton soil which are under way in Bhopal and Indore may be undertaken in other areas also.
- 41 84 The Committee would like to stress the need for closer collaboration and co-ordination among the various institutes engaged in building research and suggest that suitable steps may be taken towards that end.
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- 42 88 The Committee cannot overstress the need for commercial exploitation of the processes mentioned in para 88 and suggest that the question of undertaking them in the public sector, if the private sector does not show satisfactory response, may be considered by Government.
- 43 90 The Committee suggest that vigorous steps should be taken in consultation with the Forest departments of various States to make the substitutes developed by the CLRI for imported wattle bark and its extract available on a commercial scale so that their import can be obviated.
- 44 96 The Committee suggest that commercial exploitation of the articles mentioned in para 96 (excepting fat liquors production of which has already been taken up by the commercial firm) should be expedited.
- 45 98 The Committee suggest that the CSIR should endeavour through NRDC to see that the processes mentioned in para 98 are utilised commercially without undue loss of time.
- 46 100 Since CECRI, which is of all-India importance is located at Karaikudi, the Committee suggest that retiring rooms/waiting room at the Karaikudi Railway Station and a Guest House at the Institute should be provided early.
- 47 102 The Committee regret to note that the talent of promising Indian scientists and technically qualified persons is not fully utilised for the benefit of the country due, in some measure, to the tardy and cumbersome procedures. They suggest that suitable machinery should be evolved for reducing the delays caused in the process of selection and appointment of candidates to posts in the public sector.
- 48 104 The Committee recommend that the CSIR should carefully analyse the reasons for the poor response to the offers made to the selected candidates for appointment to the CSIR pool and see whether any modifications are necessary in the existing scheme. It would be helpful if the
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Indian Embassies would keep in touch with the Indian scientists abroad and be of assistance in securing their services to the country. The CSIR may make use of the Embassies for this purpose.

- 49 105 In view of the important role played by science and technology in the modern civilization, it is very necessary that the spirit of research is consciously fostered in the country. The chain of National Laboratories established throughout the length and breadth of the country no doubt plays a very vital role in this regard. These National Laboratories and similar other-institutions, specially in the public sector, should create and maintain an atmosphere conducive to research. The scientific workers working in these institutions, who by their devotion to work and initiative make original contribution to the field of scientific research, should be given proper encouragement and suitable incentives. The Committee cannot fail to take note of the recent case of suicide by Dr. M.T. Joseph of the Indian Agricultural Research Institute which brings this problem into sharp focus; for he only typifies the hard lot of many other qualified scientists who are suffering for want of opportunities and encouragement. Care will have to be taken to see that the slow-moving procedures of Government departments do not act as damper to the enthusiasm and initiative of the young scientific workers.
- 50 106 The Committee suggest that the question of delays in the supply of equipment by the DGS & D be taken up by the CSIR. with the DGS & D. They also suggest that the possibility of further delegation of powers in making local purchases for urgent needs and of improving the liaison between the CSIR and the DGS & D may be carefully examined. 44
- 51 107 The Committee suggest that the savings in foreign exchange as a result of the equipment designed and fabricated by the National Laboratories should be consciously encouraged and the import of scientific equipment from abroad kept to the unavoidable minimum and gradually eliminated.

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52	108	The Committee suggest that the problem relating to the disposal of textile mill effluents, which has been referred by the ATIRA to the Central Public Health Engineering Research Institute, Nagpur, and the National Chemical Laboratory, Poona, may be investigated with the utmost expedition.
53	108	The Committee suggest that the CSIR should take up the problem of disposal of leather tanning effluents.
54	112	The Committee consider that a scheme of talent search directed towards spotting scientific talents at a fairly early stage of student life and fostering these by providing suitable incentives, adequate facilities and proper guidance, is bound to yield results in the long run. They therefore urge that a comprehensive scheme of talent search should be expeditiously formulated and implemented in consultation with the State Governments.
55	113	The Committee are of the view that some recognition in the form of higher initial salary should be given to persons with research work to their credit, <i>vis-a-vis</i> the direct entrants to service who may not have spent any time on research. The question may therefore be examined by the Ministry with a view to evolve a suitable scheme in this regard.
56	114	The Ministries concerned should make conscious efforts to persuade the industry, both in the public and the private sectors, to contribute generously towards promotion of scientific research and offer suitable employment for research personnel as in other advanced countries. This can be facilitated by ensuring that the research projects selected are such as are of direct utility to the industry concerned, for then the experience gained by the research scholars can be usefully employed in that industry.
57	115	The Committee are of the view that important advantages, such as promoting close relationship between research and field workers necessary for coordinated activity, engendering keenness on the

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		part of the field workers to apply research results and bringing to the research workers an awareness and appreciation of practical problems could be secured by a scheme whereby research workers are given opportunities for field work and field workers take up research in suitable cases for some period. They recommend that the Ministry of Scientific Research and Cultural Affairs should examine carefully the suggestions made by the Panel of Scientists on similar lines, in consultation with the Ministries concerned, with a view to devising a suitable scheme incorporating this idea.
58	[116	The Committee suggest that the schemes to bring out a popular science digest and series of popular pamphlets on science in Hindi and English should be finalised and implemented expeditiously. The question of bringing out such publications in the regional languages also with the cooperation of the States may be taken up early.
59	118	The Committee consider that mere circulation of the reports submitted by the scientific delegations sponsored by the Ministry of Scientific Research and Cultural Affairs to the Ministries concerned and also State Governments (in cases where it was found necessary) for necessary action is not sufficient. It is necessary that the Ministry having sponsored a delegation should in the first instance themselves carefully scrutinise the reports, assess the applicability of the recommendations and thereafter maintain a close follow-up of at least the important recommendations.
60	119	The Ministry may consider the question of publishing the important recommendations of scientific delegations together with the action taken thereon.
61	120	The Committee recommend that a high powered commission may be appointed early to make an appraisal of science education in all its aspects particularly curricula, selection of students, equipment, training facilities and research so that it may be possible to lay the foundation of a sound system of science education as in other scientifically advanced countries.

APPENDIX VIII

Analysis of recommendations contained in the Report

I. CLASSIFICATION OF RECOMMENDATIONS

- A. Recommendations for improving organisation and working
1, 5, 16, 27-30, 32, 33, 37-39, 41, 47-50 and 54-61 = 25
- B. (i) Recommendations resulting in economy
3, 20, 35, 36 and 51 = 5
- (ii) Recommendations for commercial exploitation of successful results of researches (which would result in the saving of foreign exchange)
9, 11, 12, 13, 17, 43 and 44 = 7
- C. Miscellaneous
- (i) Commercial exploitation of successful results of research (which would result in development of indigenous manufacture)
8, 10, 21, 24, 42 and 45 = 6
- (ii) Research
15, 22, 23, 52 and 53 = 5
- (iii) Others
2, 4, 6, 7, 14, 18, 19, 25, 26, 31, 34, 40 and 46 = 13

II. ANALYSIS OF THE MORE IMPORTANT RECOMMENDATIONS DIRECTED TOWARDS ECONOMY (INCLUDING SAVING IN FOREIGN EXCHANGE)

Serial No.	No. as per summary of recommendation	Particulars
1	2	3
1	3	Adoption of methods of soil stabilisation.
2	9	Expediting the proposal to incorporate the process for production of nickel-free austenitic stainless

1	2	3
		steels in the projected Alloy, Tool and Special Steels Plant.
3	11	Manufacture of high tensile steel.
4	12	According of higher priority to the indigenous production of refractories to meet all the requirements within the country.
5	13	Commercial exploitation of the process developed at the NML for the production of high purity electrolytic manganese dioxide suitable for use in dry cells.
6	17	Manufacture of the products mentioned in para 37 on a commercial scale.
7	20	Application of the new parboiling technique developed at the C.F.T.R.I. throughout the country.
8	35	Adoption of the new technique of doubly-curved shell roof developed at the CBRI.
9	36	Adoption of the shell type structures for the roofing of grain godowns etc.
10	43	Manufacture on a commercial scale of substitutes developed at the CLRI for imported wattle bark and its extract.
11	44	Commercial exploitation of the articles mentioned in para 96.
12	51	Encouragement of savings in foreign exchange as a result of equipment designed and fabricated by the National Laboratories and the gradual elimination of import of scientific equipment from abroad.

LIST OF AUTHORISED AGENTS FOR THE SALE OF PARLIAMENTARY PUBLICATIONS OF THE LOK SABHA SECRETARIAT, NEW DELHI-1.

Agency No.	Name and address of the Agent	Agency No.	Name and address of the Agent	Agency No.	Name and address of the Agent
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2.	Kitabistan, 17-A, Karla Nehru Road, Allahabad.	22.	International Book House Private Ltd., 9, Ash Lane, Bombay.	42.	M. C. Sarkar & Sons (P) Ltd., 14, Bankim Chatterjee Street, Calcutta-12.
3.	British Book Depot, 84, Hazratganj, Lucknow.	23.	Lakshmi Book Store, 42, M. M. Queensway, New Delhi.	43.	People's Book House, B-2-829/1, Nizam Shahi Road, Hyderabad Dn.
4.	Imperial Book Depot, 268, Main Street, Poona Camp.	24.	The Kalpana Publishers, Trichinopoly-3.	44.	W. Newman & Co. Ltd., 3, Old Court House Street, Calcutta.
5.	The Popular Book Depot (Regd.), Lamington Road, Bombay-7.	25.	S. K. Brothers, 15A/65, W.E.A., Karol Bagh, New Delhi-5.	45.	Thacker Spink & Co. (1938) Private Ltd., 3, Esplanade East, Calcutta-1.
6.	H. Venkataramiah & Sons, Vidyanidhi Book Depot, New Statue Circle, Mysore.	26.	The International Book Service, Deccan Gymkhana, Poona-4.	46.	Hindustan Diary Publishers, Market Street, Secunderabad.
7.	International Book House, Main Road, Trivandrum.	27.	Bahri Brothers, 188, Lajpat Rai Market, Delhi-6.	47.	Laxmi Narain Agarwal, Hospital Road, Agra.
8.	The Presidency Book Supplies, 8-C, Pycroft's Road, Triplicane, Madras-5.	28.	City Booksellers, Sohan-ganj Street, Delhi.	48.	Law Book Co., Sardar Patel Marg, Allahabad.
9.	Atma Ram & Sons, Kashmere Gate, Delhi-6.	29.	The National Law House, Near Indore General Library, Indore.	49.	D. B. Taraporevala & Sons Co. Private Ltd., 210, Dr. Naoroji Road, Bombay-1.
10.	Book Centre, Opp. Patna College, Patna.	30.	Charles Lambert & Co., 101, Mahatma Gandhi Road, Opp. Clock Tower, Fort, Bombay.	50.	Chanderkant Chimanja Vora, Gandhi Road, Ahmedabad.
11.	J. M. Jaina & Brothers, Mori Gate, Delhi-6.	31.	A. H. Wheeler & Co. (P) Ltd., 15, Elgin Road, Allahabad.	51.	S. Krishnaswamy & Co., P.O. Teppakulam, Tiruchirappalli-1.
12.	The Cuttack Law Times Office, Cuttack-2.	32.	M. S. R. Murthy & Co., Visakhapatnam.	52.	Hyderabad Book Depot, Abid Road (Gun Foundry) Hyderabad.
13.	The New Book Depot, Connaught Place, New Delhi.	33.	The Loyal Book Depot, Chhipi Tank, Meerut.	53.	M. Gulab Singh & Sons (P) Ltd., Press Area, Mathura Road, New Delhi.
14.	The New Book Depot, 79, The Mall, Simla.	34.	The Good Companion, Baroda.	54.	C. V. Venkatchala Iyer, Near Railway Station, Chalakudi.
15.	The Central News Agency, 23/90, Connaught Circus, New Delhi.	35.	University Publishers, Railway Road, Jullundur City.	55.	The Chidambaram Provision Stores, Chindambaram.
16.	Lok Milap, District Court Road, Bhavnagar.	36.	Students Stores, Raghunath Bazar, Jammu-Tawi.	56.	K. M. Agarwal & Sons, Railway Book Stall, Udaipur (Rajasthan).
17.	Reeves & Co., 29, Park Street, Calcutta-16.	37.	Amar Kitab Ghar, Diagonal Road, Jamshedpur-1.	57.	The Swadesamitran Ltd., Mount Road, Madras-2.
18.	The New Book Depot, Modi No. 3, Nagpur.	38.	Allied Traders, Motia Park, Bhopal.	58.	The Imperial Publishing Co., 3, Faiz Bazar Daryaganj, Delhi-6.
19.	The Kashmir Book Shop, Residency Road, Srinagar, Kashmir.	39.	B. M. Gopal Krishna Kone, (Shri Gopal Mahal), North Chitral Street, Madura.		
20.	The English Book Store, 7-L, Connaught Circus, New Delhi.	40.	Friends Book House, M. U., Aligarh.		