

ETHIOPIA

Production Infrastructure for Education

Project Findings
and
Recommendations

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United Nations Educational,
Scientific and Cultural
Organization

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E T H I O P I A

Production Infrastructure for Education

Project Findings and Recommendations

Report prepared for the Government
of Ethiopia by the United Nations
Educational, Scientific and
Cultural Organization (Unesco)
acting as Executing Agency for the
United Nations Development
Programme (UNDP)

United Nations Educational,
Scientific and Cultural
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Terminal Report
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ABBREVIATIONS

AWRAJA	Province
EMPDA	Educational Materials Production and Distribution Agency
EELPA	Ethiopian Electric Light and Power Authority
IBRD	International Bank for Reconstruction and Development
IDA	International Development Agency
P.U.	Production Unit
R.E.O.	Regional Education Office
SEPC	Science Equipment Production Centre
SIDA	Swedish International Development Authority
SSEPC	School Science Equipment Production Centre
WEREDA	Administrative Region within a Province

TERMINAL REPORT

I. INTRODUCTION

Project Background and Justification

1. The post-revolutionary development programme of the Ministry of Education provides for new educational curricula and structures. These are embodied in a tentative ten-year Frame Plan which calls for a considerable quantitative change in educational units and the involvement of various target groups.
2. In particular, the programme emphasizes the need to provide students with practical experience at all levels to help meet local and regional community needs, and stresses the close relations which must be developed between school and community with particular attention to, and priority for, action undertaken in the rural scene.
3. The following comprise the main target-areas of the Frame Plan:
 - a) Universal Primary Education in six years;
 - b) Lower Secondary Education in four years;
 - c) Higher Secondary Education in two years;
 - d) A non-formal (adult) education system catering for 80% of the adult age-group by 1985;
 - e) An educational radio system;
 - f) A range of supporting programmes and projects which include Awraja Pedagogical Centres (106 in number) and Secondary School Production Units (14).
4. In addition to promoting a more practically-oriented curriculum and providing facilities for practical work-experience within the schools, the Minister of Education is in the process of identifying specific actions which can be taken within the education system to relate the educational programme to the objectives of national development and to local needs, particularly in rural areas. Among the actions currently being undertaken are timber and water education projects which, by promoting joint school-community action in tree planting and in the improvement of rural domestic water supplies, are making a contribution to meeting priority rural needs. Both projects have led to a demand for additional hand tools of the type which can be produced by secondary school production units.

5. The need to rapidly expand low-cost and domestically-based sources of supply, with a reduction of the foreign exchange component for tools, equipment and furniture, has long been recognised and the Ministry of Education has set on foot a number of measures to help overcome this problem. Taken together, these measures form an overall strategy which includes:

- a) Practical training in formal and non-formal education to help the younger generation and the adult population to contribute more effectively to the nation's productive activity;
- b) Extension and expansion of facilities under the Ministry and within the schools to achieve self-sufficiency in educational supplies;
- c) The linking of these actions to development activity in other sectors of the economy so as to provide a more appropriately-oriented manpower supply which will stimulate production in rural and urban areas.

6. In practice, virtually all supplies of science equipment for the education system have come from abroad. This is partly explained by the fact that local capacity to supply furniture and hand tools has been well below the level of demand created by the expanded programme of education. By establishing a centre for science equipment, setting up production mechanisms within the school programme for wood and metal products, and providing training and practical experience within the 14 production units which should lead to higher employment levels and self-employment in small-scale industries, the Ministry of Education hopes to improve the picture.

Objectives

7. The overall objectives of the project were:

- To establish one secondary-school production unit in each of seven Administrative Regions for the production of basic school furniture and hand tools;
- to help meet increased post-revolutionary educational demands in Ethiopia by promoting large-scale production of schools and furniture;
- to provide for the expansion and development of the secondary-school system and more widespread provision of laboratories and workshops under credit agreements with IBRD/IDA;

- to set up Production Units as extensions to these facilities in order to make available working space and machines for the development of a production line;
- to arrange for students to use the new facilities to apply the technical skills they have acquired in practical courses to actual production activity and enable them to relate these technical skills to the production process;
- to establish a new facility in Addis Ababa for the production of science equipment for educational units;
- to introduce an active programme for the rapid expansion of primary education in rural areas with the assistance of SIDA and IBRD/IDA and within the context of co-operative action between the Government and communities, whereby communities are assisted in the organization of locally-based construction activity, with the Government taking responsibility for the provision of staff, equipment and supplies.

Official Arrangements

8. In 1976, the Government presented a request to the United Nations Development Programme for assistance in establishing seven production units and making available expert and consultant services, as well as training personnel. UNDP approved this two-year (two experts, 12 m/m each) project request in March 1978, and Unesco was designated as Executing Agency. The Project Document was signed by the Government, Unesco and UNDP on 24 August, 21 September and 4 October 1979 respectively. It foresaw a total UNDP contribution of \$ 477,900, increased to \$ 526,866 in Revision E of September 1982, and a total Government contribution of 1,631,980 Birr.

II. PROJECT ACTIVITIES AND ACHIEVEMENTS

A. Organization and Division of Workload

9. One Science Equipment Production Centre was to be located in Addis Ababa, with eleven regional secondary school production units in the different capitals of the Administrative Regions. Additional technical capacity was also to be developed within the Ministry of Education to produce educational equipment.

10. Construction of the units in the Administrative Regions was to be covered by domestic funds. In 1979, equipment and tools were ordered for seven units (four were equipped from UNDP, and three from domestic funds), with installation expected by September 1980. Equipment and tools for the remaining four units (three from UNDP funds and one from domestic funds) were ordered in 1979, with installation scheduled for December 1979. These four units operated a skeleton production programme, using existing hand tools produced by the technology sections of the schools until the additional machinery and equipment were installed.

11. Orientation and in-service training of school staff involved in Production Unit activities were conducted throughout 1979 and 1980 by EMPDA staff and the staff of the Curriculum Division.

12. In the same period EMPDA staff prepared an overall output strategy to incorporate the work of these school production units in an integrated plan to supply equipment, tools and furniture to schools from various sources, and to make this work-force available to the Ministry of Education. This plan emphasized maximum decentralisation of supply sources and maximum use of local materials. It also included an accounting and control system for the production units concerned.

Science Equipment Production Centre

13. EMPDA Management and staff, together with representatives of the Science Curriculum Development Centre, and in collaboration with the consultant, elaborated a detailed proposal for the initial production programme, and defined requirements for machinery, equipment, tools and working space within the budget ceilings allocated in the project. In addition, during 1979-80, EMPDA Management prepared a medium-range financing and budgeting plan for the Science Equipment Production Centre.

Government Input

14. Government input can be summed up as follows:-

- provision of management personnel within EMPDA, with specific responsibilities for the overall management and co-ordination of Production Units and the Science Equipment Production Centre;
- provision of a technical manager for the Science Equipment Production Centre;
- provision of production personnel on the scale, and of the type, indicated by the production plan for science equipment developed with the assistance of the consultant;
- provision of buildings for Secondary School Production Units and machinery and equipment for four of those units; and
- payment of operational costs for the Science Equipment Production Centre and for the Secondary School Production Units.

UNDP/Unesco Inputs

15. UNDP/Unesco undertook responsibility for:

- (i) provision of one consultant (12 m/m) experienced in the production of low-cost science equipment in an operational unit in a develop-

ing country. The consultant developed a proposal for a production organization based on facilities already existing in the metal-work and woodwork shops allocated for this purpose and incorporating additional equipment and work space provided within the project. He was also required to assist with the specification of the additional equipment to be supplied under the project.

- (ii) provision of a production technician. The incumbent possessed qualifications in production technology for woodwork and metal-work and practical workshop experience related to the production of low-cost school equipment and tools, and assisted the Educational Material Production and Distribution Agency (for a period of 12 m/m) in the formulation of unit management procedures, and in developing production routines within the units. He was also required to provide practical assistance at the school level for the layout of workshops, the installation and maintenance of machinery and the development of production systems for the basic items being produced. In this way a number of instructional notes for EMPDA were built up, which were subsequently incorporated into an operational manual for Production Units.

Equipment

16. A sum of U.S.\$ 324,000 was earmarked for purchase of machines, equipment and tools for the SEPC and P.U.'s. An additional U.S.\$ 19,800 was set aside for the installation of machinery in the Production Units.

B. Development of Production, Informational Activities and Price Policy

17. From the time of his arrival in Ethiopia (12 August 1980), the adviser worked with two different counterparts and with the staff in all departments at the Educational Materials Production and Distribution Agency, to establish the 14 Regional Production Units.

18. Project activities included the drawing up of plans for the purchase of machines and equipment, finding of material for the electrical installations, receiving and distribution of all material, designing of new furniture and making of prototypes, placement of machines, electrical installation of machines, writing of a manual for operation and maintenance of the machines delivered to the units, quality control, visits to the units for inspections and provision of advice and staff training. During the first year of the contract, the tender list had to be checked in accordance with the budget allocated for the programme.

19. The purchasing of the machines and hand tools took a little longer than expected but was completed to the adviser's satisfaction in the middle of 1981. The machines, hand tools and electrical material arriving from all over the world were divided into seven plots, and boxes were made at the store department under the adviser's supervision.

Production Unit Buildings

20. All of the factories have now been built and all machines and equipment delivered to the site. However, due to problems with purchasing procedures, power connections, and the non-availability of timber and other materials, all units are not yet fully operational. As against this, the workshops at Jimma and Asella are in production and have been since the programme started.

Machines, Hand Tools and Electrical Materials

21. Machines and equipment have now been delivered to the following 12 workshops:-

Asmara Eritrea, Mekele Tigray, Dessie Wollo, Arba Minch Gomo Goffa, Debre Maricos Godjam, Harrar Hararge, Bedele Elubabor, Nedjo Wollega, Bale Goba, Awasa Sidamo, Ambo Shoa and Gondar.

The first seven listed were supplied as part of the UNDP/Unesco contribution.

Electrical Installation

22. There have been no problems so far with power distribution from EELPA. Jimma and Asella P.U.'s and Ambo, Nejo, Dessie, Awasa and Asmara will have their machines connected very soon. But the remaining seven workshops in Goba, Arba Minch, Harrar, Bedele, Mekele, Gondar and Debre Maricos are still trying to overcome such problems as overloaded generators, old generators, or the expense of making the power connection.

23. In certain cases some of the units are situated too far from a suitable transformer, or the existing transformer is already being used to its full capacity by other factories. As a result of these problems of power distribution from EELPA, several meetings have been held in Debre Maricos, Gondar, Awasa and Addis Ababa with the EELPA technical department responsible for the different areas, but few effective remedies have been found, either because the KW. is too low in the area or too expensive to enable the Regional Education Offices to solve the difficulty immediately. Awasa, where the connection is 4,500 Birr. and Debre Maricos (16,000 Birr.) are two examples. In addition, Gondar suffers from too low current and unstable distribution.

Present Production

24. The furniture made at present does not last long; at many schools it has collapsed, and most of the parts cannot be used again. The reason for this is that all over Ethiopia today most of the furniture factories are using wet timber, which contains a high percentage of moisture, and this causes problems when furniture starts to dry.

25. After the wood has dried, for example, the wood around the nails begins to crack, joints are loosened, and the furniture collapses. Thus, it is very important to ensure that timber be dried in a suitable shelter for some time before it is used for furniture.

26. One solution to this problem is to make use of a shed constructed of a simple wood frame covered with corrugated iron sheets on the roof and on two sides; all surfaces should be painted black to absorb extra heat from the sun. Such a shed gives very good results and the furniture produced from the wood stored in it lasts longer. Secondly, the assembly work at the site has to be improved and a consistent use made of jigs; moreover, all parts which are going to be nailed should be predrilled, to ensure that unskilled people at the site do not misplace nails and split and crack the furniture before use. Thirdly, it is not always true that the cheapest furniture constitutes a saving for the future. Unfortunately, the number of schools built each year outstrips the allocated budget for furniture so no funds for making more expensive, but durable, furniture are available.

27. In the 1980-81 period, Jimma produced furniture for 39 Primary Schools, and Asella for 29 Primary Schools, at the cost of 2,682 Birr per school. This has prevented the other P.U.'s from starting up, besides which furniture for 584 Primary Schools has been farmed out to contractors.

28. About 95% of the furniture needed has been produced and the remaining 5% will be delivered by contractors very soon.

29. In 1981-82, furniture for 177 Primary Schools was produced at the following P.U.'s and at other sources:-

- Asella Arsi, P.U. for 60 Primary Schools;
- Jimma Keffa, P.U. for 35 Primary Schools;
- Metu Ellubabor, Bedele Technical School for 25 Primary Schools;
- Nekemte Wollega, Nejo Technical School for 25 Primary Schools;
- Bale Goba, P.U. for 5 Primary Schools;
- Asmara Eritrea, Asmara Technical School for 12 Primary Schools;
- Furniture for 448 Primary Schools has been asked for from contractors, some of whom have already begun delivery.

Primary School Furniture Production for 1982-83

30. Although EMPDA planned to have the Regional Production Units begin their work in September 1982, it is now clear that production will not start until some

time in the middle of 1983. This means that the programme is not completed, and that continued support from UNDP/Unesco is definitely needed.

New Design Furniture

31. The adviser designed and produced four different types of Primary School furniture. All designs were printed in separate reports as appendices to four six-monthly reports. The adviser's main goal was to make the furniture as efficient and as inexpensive as possible in line with the concept of knock-down furniture. All the jigs for machine work in the shop, as well as at the site, have been made as prototypes.

32. Much of the adviser's time has been spent at the School Science Equipment Production Centre experimenting with different designs and testing new types of furniture and jigs for the assembling work, and pipe-benders for round, square and reinforced-bars material. All of these have been created as prototypes. The test designs in different materials and prototypes were made in as durable a way as possible and the World Bank project within the Ministry of Education has, in fact, opted for the furniture designed by the adviser.

33. Quality control of the furniture produced can be ensured by first, controlling the prefabricated parts at the factory, and secondly, controlling assembled parts at the site before they are used. As to the actual process of making furniture, the following seven prerequisites should ensure best results:

- a) Efficient construction of the building and the factory itself with appropriate distribution of space;
- b) Use of good quality machine and hand tools;
- c) Optimal placement of machines in the shop to streamline shop-processing;
- d) Use of good quality timber to ensure tenability and durability;
- e) Effective designing of the knockdown furniture;
- f) Prefabrication of the furniture; and
- g) Issuance of clear instructions for the assembling process at the site.

Visits and Missions

34. The adviser visited several wood-workshops in and out of Addis to become acquainted with working methods in furniture factories in Ethiopia. In addition, he visited different schools in Ethiopia to inform himself concerning school needs in furniture design suited both to classrooms and students.

Seminars

35. A seminar was held in Awasa at the newly established Production Unit for selected heads from all of the 14 regions. During this seminar the adviser tested the manual for the operation and maintenance of the machines. All the newly selected heads were very satisfied with it and requested a copy for their own use, as well as one for the workers.

36. In 1981-82, the adviser also participated in two seminars arranged by the Swedish International Development Authority, concerning school buildings and furniture production.

School Science Equipment Production Centre (Science Kit)

37. The consultant worked on the project for three months during 1981, and for two months in 1982. These working periods gave rise to two Technical Reports, both of which have been distributed.

38. The adviser and the consultant also worked together part-time at SSEPC to solve some initial problems in connection with items included in the Science Kit. The machines ordered by the consultant have been delivered to the Centre. Because of space problems, not all of the machines have been installed.

39. Today, production of the Science Kit items is as follows:-

- Face I - 100 kits completed, but, of 130 items, 8 imported items have not been received.
- Face II - 150 kits completed, 90 items produced locally, 40 imported items have not been received.
- Face III - 771 kits completed, 40 imported items have not been received.
- Face IV - 1,000 kits are under production and 26 locally-made items are ready.

Arrangements have been made to purchase necessary items from foreign companies and an order for 1,000 kits should be received in the near future.

Price Policy

40. A comparison in prices between the old furniture, in one school, with the new design furniture, goes definitely in favour of the new wood material. However, because of price differences for timber throughout the country, it is very difficult to estimate a joint price for the school furniture for Ethiopia as a whole.

41. The following table compares prices for the old furniture, made at present, and that for the new design furniture at a time when the price of one m³ Zigba was 600 Birr.

Reading horizontally, the figures in the different columns concern respectively:

- 1) Old furniture
- 2) New design furniture
- 3) New design, combined wood furniture and round tube
- 4) New design, combined wood furniture and square tube

For one school of four classrooms the following is needed:

224 stools	at	6.13			
75 benches	at		11.20	27.44	32.40
112 desks	at	17.72	16.06	36.93	38.02
5 teachers tables	at	29.63	31.39	56.20	58.48
10 teachers chairs	at	13.37	16.61	40.72	40.72
8 notice boards	at	4.20	4.20	4.20	4.20
4 blackboards	at	19.17	19.17	19.17	19.17
1 cupboard	at	160.00	160.00	160.00	160.00
1 store shelf	at	250.00	250.00	250.00	250.00
		4,159.89	2,874.33	6,036.23	6,501.38
		1)	2)	3)	4)

42. It would seem advisable to make one bench for three students, instead of, as is currently the case, stools for three students. The difference can be seen in the table by comparing columns 1 and 2. If effected, the change would mean a saving of 1,200 Birr per school.

43. In regions where timber is very expensive, combined furniture would appear to be the best solution and, in any event, differences between 1-2 and 3-4 will not be very large given current timber prices.

III. CONCLUSIONS AND RECOMMENDATIONS

Conclusions

44. At the time of its formulation, the project had been confined to rather modest objectives with respect to the physical establishment of production units. However, within these terms it has successfully attained the goal of setting up the basic infrastructure for a programme of school furniture production which the Ministry of Education plans to expand further with IDA assistance.

45. Government inputs have been over-fulfilled in terms of national staff and building and other facilities provided to the project. On the UNDP side, although delays have occurred in the filling of the Unesco expert post and in the procurement of equipment, all inputs have been delivered as foreseen in the most recent project revision.

46. All equipment supplied from UNDP and Government budget has now been received and installed in regional Production Units which total 14, all of which are operational, with the exception of two in Debre Markos and Arba Minch, where electrical power connections have still to be made. As to the other 12 operational units, production has started in the majority of them, although at a reduced rate.

47. With regard to the project's second component, i.e. the establishment of a Science Equipment Production Centre in Addis Ababa, a centre has indeed been set up and science kits have been produced, but not yet distributed, pending finalization of the Users' Manual by the Department of Curriculum of the Ministry.

48. The following problems or constraints have, however, been encountered, some of which are still adversely affecting project implementation:

- (i) Power supply to the school Production Units has proven to be more time-consuming and, in some cases, more difficult and costly to arrange than was foreseen initially. Because of delays in making these units operational, the expert was unable to visit all of

them in order to monitor their progress. In addition, training programmes for the staff were limited to heads of these units.

- (ii) In many cases, building facilities to accommodate the Production Units are insufficient as they do not provide enough room for storing raw materials or for assembly work. Only two out of fourteen Production Units possess assembly- and store-rooms.
- (iii) The shortage of dry timber, the use of which is essential to avoid subsequent cracking in the school furniture, represents a major technical problem for each unit. The problem is furthermore compounded by the urgency of achieving a full production rate for the furniture, to meet the rapidly increasing needs of the schools constructed by the Ministry. As the process of drying the timber takes more than 12 months, the EMPDA and the Production Units face difficult problems in establishing production programmes to cope with the demand.
- (iv) The supply of parts, such as nails, screws, glue, varnish and tools to the Production Units, has been shown to be more time-consuming than anticipated because of their unavailability on local markets.
- (v) Distribution of science kits using prototypes developed with the assistance of the Unesco consultant, has not yet started as the Users' Manual, which is to be sent with them, has not yet been finalised by the Ministry of Education.
- (vi) New heads of Production Units need to be familiarized with the machines, and given advice on how to run and maintain them, even if Units are being strengthened with funds from the Education Credit Agreement and upgrading of the staff has been arranged for as the result of training programmes in Europe.
- (vii) Timber prices in the different regions of Ethiopia vary greatly and this needs to be taken into account in arriving at price-estimates for the different kinds of furniture.
- (viii) Currently-produced furniture is of very low quality and needs to be improved, as does assembly work.
- (ix) Transportation to and from the Production Units for the purpose of purchases remains a problem for production heads.

Recommendations

49. The following recommended goals are put forward in the belief that they should help resolve current difficulties and provide solutions to continuing problems encountered by Production Units:-

- 1) To expedite the procurement of electric power by EELPA to the Debre Markos and Arba Minch Units for the running of production machinery;
- 2) To attach all possible priority to the supply of dry timber to the Production Units, based on the long-term requirements which EMPDA is invited to plan ahead and communicate to the suppliers' authorities;
- 3) In light of the lack of timber in some areas, and the shortage of dry timber for production of durable basic school furniture in all areas, to secure greater diversification of raw materials so that parts of the school basic furniture can be made of hard-boards, chipboards and metal;
- 4) To procure kiln drying machinery for installation in Production Units in timber-producing areas;
- 5) To proceed expeditiously with plans for the on-the-job training of staff of the Production Units;
- 6) To arrange for bulk purchases of parts and materials of timber and other supplies (nails, hardboards, chipboards, varnish, glue, etc.);
- 7) To strengthen the maintenance unit of EMPDA as soon as possible;
- 8) To expedite finalization of the Users' Manual and its distribution, together with the science kits, to the Awraja pedagogical centres, and to set up appropriate procedures for reviewing both, in the light of experience gained in their utilisation;
- 9) To make, for each unit, one tube-bender of the kind constructed by the adviser, so as to offer these units the possibility of switching from wood to combined furniture where needed.
- 10) To teach secondary school students how to assemble furniture parts, so that they can accompany the lorry-carrying parts to the schools for which they are made, and help peasants to assemble them.

- 11) To have units produce three-seater benches and desks for the students as soon as possible, instead of two-seaters, and, in general, press forward with production of the new furniture.
- 12) To have units supplied with a pick-up truck in order to alleviate transport problems encountered.
- 13) To provide the adviser's counterpart with a scholarship abroad, so that he can acquire more knowledge concerning small-scale furniture production.

APPENDIX 1

PRESENT AND PROPOSED ORGANIZATION OF
EDUCATIONAL MATERIALS PRODUCTION AND DISTRIBUTION AGENCY

At present EMPDA⁺ is run by a General Manager appointed by the Government who is directly responsible to the Permanent Secretary at the Ministry of Education.

The structure of the Agency is as follows:-

Textbook Preparation and Publication Division

Science, Technical and Vocational Education Materials Preparation and Production Division

Educational Material Purchase Procurement and Distribution Division

Administrative Services

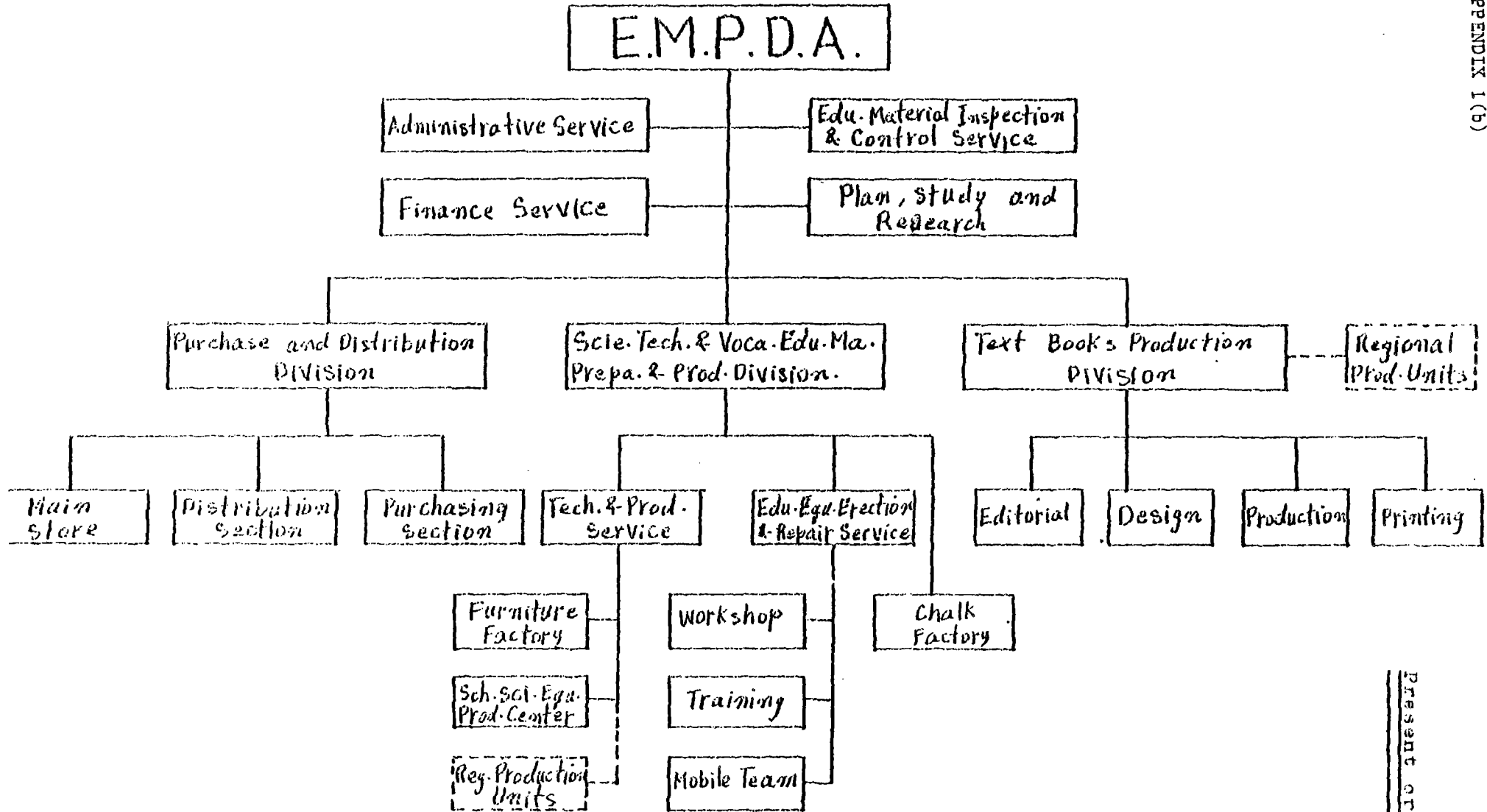
Educational Materials Inspection and Control Services

Research and Planning Services

Each division has well-defined responsibilities and tasks geared to the overall objectives of the Agency.

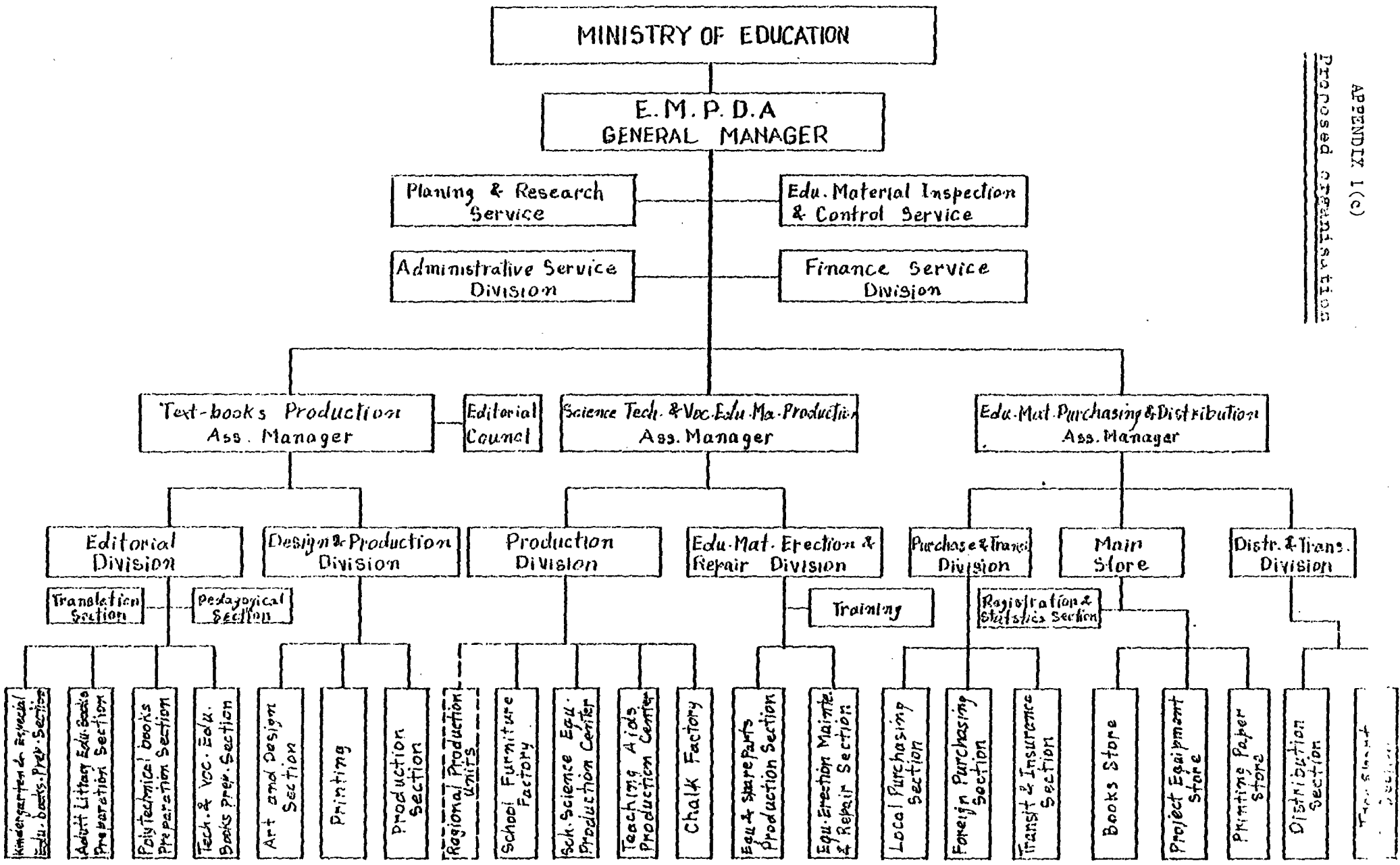
The Agency, through its above-mentioned Divisions, is engaged in the preparation, purchase and distribution of a wide range of educational materials, including textbooks, teaching aids, furniture, chalk, equipment, science kits, etc., required to implement the objectives of formal and non-formal education.

+ See chart of the EMPDA organization contained in Appendix 1(b).



————— Activities Performed within EMPDA
 - - - - - " Located outside EMPDA

Present Organization



APPENDIX 2

INTERNATIONAL STAFF

THORMAN, Rolf	Started 2.8.80	Concluded 31.12.82
BENGTSSON, Emil +	Started 17.1.81	Concluded 16.04.81
	Started 12.2.82	Concluded 15.04.82

+ Consultant

APPENDIX 3

National Staff

Ato Kebede Friesenbet	General Manager EMPDA
Ato Beyene Bekele	Head of Department 3
Ato Tekeste Yemane/ab	Assistant Head
Ato Babo Mkiso	Counterpart
Ato Abera Rumicho	Production Unit Head Jimma
Ato Amare Merpha	" " " Makele
Ato Gezahegu W/Selassi	" " " Asmara
Ato Wondyfraw Endeshaw	" " " Dessie
Ato Tesfaye G. Christos	" " " Harar
Ato Hailu Ayele	" " " Debre Maricus
Ato Tadesse Deribie	" " " Ambo
Ato Yewendwessen Haile	" " " Nedjo
Ato Germa-Aba-Fita	" " " Bedele
Ato Bekele Legesse	" " " Goba
Ato Befekadu Zeryihun	" " " Arba Minch
Ato Teshager Abebe	" " " Gondar
Ato Tadesse Haile Giorgis	" " " Asela
Ato Bahru K/Dawit	" " " Awasa

APPENDIX 4

Machine Accessories Needed by Each Unit in the Near Future

	<u>No. items</u>
Extra blades and knives	
Radial arm-saw	2
Jointer, surface planner	4
Thickness planner	4
Tilting arbor saw	2
Metal cutter	2
Band-saw blades length 50 m	1
Cutterhead for shaper	1
Knives and holders for shaper	1

For the future, each unit wishes to have the following machines and tools:

Belt-sanding machine	1
Machine for mortise and tenon	1
Pressing machine	
Grinder for knives for the jointer surface planner and thicknesser	1

Asella Arsi and Jimma Keffa need some additional machines in order to be as fully equipped as the other units:

Drillpress	1
Air compressor	1
Shearing machine	1
Woodturning lathe	1
Radial armsaw	1
Jointer, heavy duty	1

APPENDIX 5

Cost Calculation for Seven Production Units and School
Science Equipment Production Centre

<u>Seven Production Units:</u>		US \$
1.	John Gottfr. Schütte & Co. Germany (F.Rep. of) Hand tools	7,135.21
2.	Luna AB, Sweden Hand tools	6,281.56
3.	Luna AB, Sweden Machine tools	14,532.26
4.	SCM, Italy Machines	206,462.74
5.	Daimaru Ind. Co. Ltd, Japan Machines	4,868.87
6.	Felisatti, Italy Machines	7,560.88
7.	Felisatti, Italy Machines	1,143.10
8.	Schütte & Buneman, Germany (F.Rep. of) Machines	31,965.95
9.	Kennedy Int. Tools Ltd., (U.S.A.) Electrical material	5,785.96
10.	Local purchase, Ethiopia Electrical material	10,267.02
	Total	<hr/> 296,903.55 <hr/>

Appendix 5 cont'd.

<u>School Science Equipment Production Centre:</u>		US \$
1.	Luna AB, Sweden Machines	34,815.32
2.	Brohead-Garret, USA Machines	6,600.00
3.	Luna AB, Sweden Screw-Cutting Head	500.00
	Total	<hr/> 41,915.32 <hr/>

Equipment for 7 Production Units	US \$ 296,103.55
Equipment for School Science Equipment Production Centre	US \$ 41,915.32
Grand Total	<hr/> 338,018.87 <hr/>

APPENDIX 6

List of Major Items of Equipment Provided by the Project

Machines for the Seven Production Units:

- 14 Jointers surface planners
- 14 Drill-presses
- 14 Tilting arbor saws
- 7 Radial arm saws
- 7 Band saws
- 7 Thickness planners
- 7 Spindle moulders
- 7 Woodturning Lathes
- 7 Metal saws circular saws
- 7 Butt welders
- 7 Air Compressors
- 7 Bench Grinders
- 14 Orbital sanders
- 7 Pipe benders
- 7 Shearing machines
- 7 Arc Welding machines

Hand Tools:

- 21 Back Saws 12"
- 21 Copying saws, spring steel frame
- 35 Twist drills, CV-steel, 1/16 - 1/2"
- 35 Files flat mill, bastard cut 12"
- 35 Files round wood 10"
- 7 Electrical hand-drill 110-220 AC
- 35 Claw hammers, 16 lb.

Appendix 6 cont'd

- 21 Spoke-Shave 2 1/8" cutter cast^s
- 21 Callipers inside 6"
- 21 Callipers outside 6"
- 14 Saw sets
- 21 Riveting hammers 500 grs.
- 35 Leather gloves
- 21 Vice grip wrench 10"
- 7 Tap & Die m3 - m12 HSS metal boxes
- 14 Cold Chisels
- 35 Welding Steel brushes
- 35 Adjustable wrenches 10"
- 14 Adjustable pipe wrenches 10"
- 14 Smooth planes, 8" length cutter
- 21 Auger bits 6 mm
- 21 Auger bits 10 mm
- 21 Auger bits 14 mm
- 21 Auger bits 20 mm
- 35 Files, half round double cut 10"
- 35 Combination pliers 8"
- 42 Wood workers' vices, with handle
- 35 Files half round metal 8"
- 35 Files round metal 8"
- 91 T-bar clamps 60"
- 14 Jack planes, length 14 cutter 2"
- 21 Cross cut saws 26"
- 21 Braces, with self-centring chuck
- 14 Screw drivers
- 7 Phillips screwdrivers
- 21 Chisels wood 3/4"
- 35 Files, three square, wood bastard 10"

Appendix 6 cont'd

35 Files, bastard cut 8"
35 Files, round 10"
70 Goggles, safety, shatter proof
70 Zig-Zag rules aluminium 2 M
21 Oil stones
35 Hacksaw frames 10"
119 C-clamps
70 I-bars Clamps carbon steel, 0506
70 I-bars Clamps carbon steel, 0704
21 Ball Pein hammers 40 oz
35 Welding Helmets with slide in lens
35 Files triangular shape 6"
35 Flat files bastard cut 10"
21 Vernier Callipers

Electrical Material:

84 m NVY cable 4 x 16 m/m²
210 m NVY cable 4 x 10 m/m²
525 m NVY cable 4 x 6 m/m²
1120 m NVY cable 4 x 2.5 m/m²
7 p Circuit breaker 3 x 100 amps
21 p Circuit breaker 3 x 75 amps
49 p Circuit breaker 3 x 25 amps
14 p Circuit breaker 1 x 25 amps
182 m Conduit pipes 35 mm ϕ
1680 m Conduit pipes 19 mm ϕ
700 m Conduit pipes 16 mm ϕ
21 p Wire clips (staples)
140 p Junction box for switch 65 m/m ϕ
168 p Junction box for connection 85 m/m ϕ

7 p	Wire connectors 9 m/m ϕ
7 p	Wood screw 3"
7 p	Fisher 2"
84 p	Fluorescent lamp 40 watts complete
35 p	Switches with ground
49 p	Outlet with ground
2100 m	Wire 1 x 2.5 m/m ²
21 p	Insulating tape
28 p	Terminal cover 3 A.C.B.

School Science Equipment Production Centre:

1 p	Belt and disc sander, with accessories
1 p	High speed lathe, with standard accessories
1 p	Turret head lathe, with accessories
1 p	Thread sleeve
1 p	Tap holder
1 p	Screw cutting head
1 p	Parting tool
1 p	Tool bit
1 p	Revolving lathe centre
1 p	Lathe chuck
1 p	Treadle-operated guillotine shear
1 p	Metal bandsaw, with accessories
4 p	Rolls of bandsaw blades
1 p	Spot welding machine
1 p	Coolant pump
1 p	Fly press, with accessories
1 p	Combination die set, with extra equipment
2 p	Revolution counter
20 p	Slitting saw

Appendix 6 cont'd

- 1 p Belt stroke sander
- 1 p Scroll saw
- 8 kg Jig saw blades
- 1 p Injection moulding machine,with accessories
- 1 p Metal injection mould
- 4 p Polystyrene high impact
- 4 p Copolymer wide temp. range
- 1 p Plastic heat sealer