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A SYSTEMS APPROACH TO THE PROBLEM OF
EXPANSION OF MIDDLE SCHOOL FACILITIES
IN RURAL TURKEY

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Ibrahim Rifat Okcabol

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Major professor

Kenneth L. Neff

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A SYSTEMS APPROACH TO THE PROBLEM OF EXPANSION OF MIDDLE SCHOOL FACILITIES IN RURAL TURKEY

By

I. Rifat Okcabol

A DISSERTATION

Submitted to
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ABSTRACT

A SYSTEMS APPROACH TO THE PROBLEM OF EXPANSION OF MIDDLE SCHOOL FACILITIES IN RURAL TURKEY

By

I. Rifat Okcabol

The Problem

Turkey has rural problems in common with other developing countries. Rural people generally are illiterate and poor. There is a scarcity of resources, allocation of existing resources is inadequate, and the average amount of schooling is low.

Expansion of five year education into eight year education is now required by the Turkish national Law of Basic Education, but for a large number of primary graduates there are not enough middle schools in rural areas, and the Turkish education system is not currently able to meet the demand for this educational expansion.

The Purpose

The main purpose of the study was to develop a model to study the costs of expanding the existing school system to one providing eight years of schooling for rural people. A systems approach technique is utilized to

develop a model to investigate: (1) the cost of expanding school facilities and personnel in rural settings, and (2) some alternative solutions to these expansion problems.

Another purpose was to illustrate how a model of a system can be constructed and used to approach, analyze and search for solutions to educational planning problems.

The Simulation Model

A mathematical model was developed to represent the operation of the rural education system as a collection of interacting sectors: students, personnel, physical facilities, and control.

The model represents the system through the values of parameters and program variables which are descriptive of the real situation at discrete points in time.

For each sector, a set of equations was developed to describe the relationships among the services produced and resources required. A second set of equations describes required expenditures for rural education.

A six-step procedural algorithm was developed to define possible school sites and potential students in a given subprovince.

A computer program reads parameters of the model and descriptive data, and produces a variety of reports for each school within a subprovince, and subtotals are aggregated to represent each subprovince and province in the experiment.

Application of the Model

The model was applied to Kayseri province to demontrate its utilization. The application consisted of an execution of the computer program to produce selected information for each school site, and summary information for each subprovince and province. Findings obtained from the experimental run can be summarized as:

1. The requirements of providing busing and boarding services for a given number of students are reported along with a unit cost comparison to enable the implementor/decision maker to compare costs of specific items for these services.

2. Many questions about cash flow, land and building size, personnel, utilities, enrollment, etc., for providing expansion can be answered from the set of tables obtained from the computer output.

3. A variety of questions can be answered by running a series of experiments, and by changing the values that some parameters of the model take on (costs, population, school, demography, student distribution, etc.)

4. A number of experiments can be conducted, when a parameter is difficult to estimate, applying a minimum or a maximum value to understand its effect and estimate

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it better.

It is hoped that this study may serve to encourage widespread applications of the systems approaches to educational problems in Turkey and elsewhere.

DEDICATED TO

Children who never had the joy of going to school

ACKNOWLEDGMENTS

The author wishes to express his particular appreciation to Dr. Martin G. Keeney, his project director and committee member, who gave his time and encouraging advice throughout the struggles from which this study originated.

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CHAPTER I

INTRODUCTION

The main purpose of this study is to examine the expansion of the existing Turkish school system to one providing eight years of schooling for rural people. A systems approach will be used to develop a model and investigate:

(1) Problems of expanding school facilities and personnel in rural settings, and

(2) Some alternative solutions to these problems.

This chapter states why and how this study was conducted, and provides some background information about the Turkish education system.

Education in Turkey

The Turkish Constitution holds the state responsible for providing its citizens with education, and the Ministry of Education, with its general directorates and various offices, carries this responsibility. In its efforts to fulfill the administrative function at the primary school level, the Ministry of Education cooperates with the provincial authorities (see Appendix A for definitions of terms).

The Turkish school system consists of three years of preschool, five years of primary, six years of secondary (in two parts, middle school and lycee), and two or more years of postsecondary education.

Preschooling exists only in large cities, and with only a small enrollment compared to the total school population. Compulsory coeducational primary schools are common throughout the country.

Secondary education is composed of general-academic education and vocational-technical education, but the Law of Basic Education requires the integration of primary and middle school education into basic education.

Postsecondary education includes two different groups of institutions: the universities, and various higher schools (teacher training schools, school of tourism, etc.).

The education system in Turkey has two main operations: the administration of its component parts, and the production of materials and trained personnel. The production activities include training in various higher schools explained above, and manufacturing various tools such as laboratory items, school furnishings etc., at instructional material centers. Figure 1 is a descriptive diagram which attempts to portray the components of the entire system.

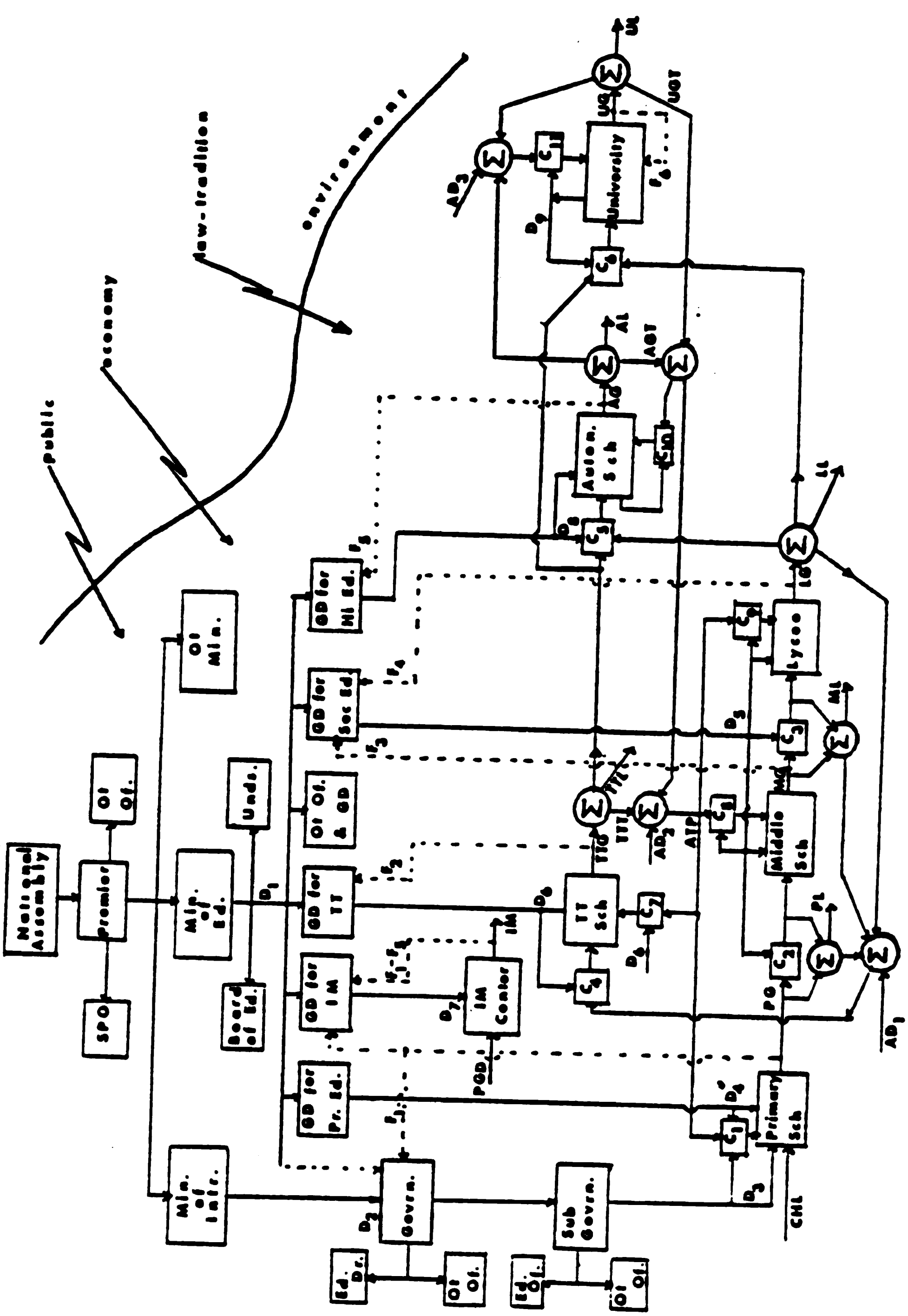

FIGURE 1. Turkish Education System

Explanation for Parameters and Abbreviations in Figure 1

AD_1 .. AD_3	:	Additional entries
AG	:	Autonomous school graduates
AGT	:	AG who teach
AL	:	AG who do not teach
ATP	:	Available teacher pool
Auton.	:	Autonomous
C_1 .. C_{11}	:	Control decisions of related components
CHL	:	Primary school entry
D_1 .. D_8	:	Implementation decisions of related components
Dr.	:	Director
Ed	:	Education
F_1 .. F_5	:	Feedback information
GD	:	General Directorates
Govrn.	:	Governor
Hi	:	Higher
IM	:	Instructional materials
Intr.	:	Interior
LG	:	Lycee graduates
LL	:	LG who join labor market
MG	:	Middle school graduates
Min.	:	Ministry
ML	:	MG who join the labor market
Of.	:	Offices
Ot	:	Other
PG	:	Primary school graduates
PGD	:	Purchased goods
PL	:	PG who join the labor market
Pr.	:	Primary
Sch	:	School
Sec	:	Secondary
SPO	:	State Planning Organization
TT	:	Teacher training
TTG	:	Teacher training school graduates
TTL	:	TTG who join the labor market
TTT	:	TTG who teach
UG	:	University graduates
UGT	:	UG who teach
UL	:	UG who join the labor market
Unds.	:	Undersecretary to the Ministry of Education

Education Prior to the Formation of the Republic

The Republic of Turkey descends historically from the Ottomans whose forefathers were Oguz Turks. Oguz Turks were primarily nomads, and their education system was informal, regional, and partial to Oguz tribal culture, lacking books, schools, and teachers [1].

After the 11th century when Turks converted to Islam, and especially during the early centuries of the Ottoman period, education in Turkey was solely Islamic in nature. Primary education was under the control of the ulema (religious leaders) and all attempts at reform failed.

In 1824, for the first time in Turkish history, Sultan Mahmut II decreed that primary education was the state's responsibility and he established the Ministry of Education. Despite this decree, the ulema's control over primary education continued for a few decades more [2].

When a series of reforms took place in the middle of the ninteenth century, the Ottomans turned to France for inspiration and guidance. Primary education was made compulsory by law in 1869. Before the Ottoman empire collapsed in 1923 there were primary schools in most urban centers. Every large city also had one or more middle schools, and some cities had lycees. However most rural communities did not have any school at all.

Education Since the Establishment of the Republic of Turkey

Immediately after the new Republic was established in 1923, law no.430 incorporated the entire education system under the Ministry of Education. Constitutional Law No. 491 was then enacted stating that primary education was compulsory for all Turks, and free in state schools [3].

The early years of the Republic were an institutional building period, 90 percent of the population were illiterate, and education was designed not as a means for mass education but rather as a first step on a ladder to secondary and higher education. Programs of primary schools were designed to be uniform throughout the country.

In the 1950's there were enrollment increases. During this decade enrollment in primary, secondary, and vocational-technical education increased 100 percent, 230 percent, and 40 percent respectively. During the first planning period in 1963, educational policy did not change, but at the beginning of the third five-year planning period (1973-77) educational problems started receiving special attention.

Educational Administration

The Ministry of Education has full control over Turkish education. However, all universities and some higher schools have academic and, to a certain extent, administrative autonomy.

The General Directorate for primary education controls primary schools through school inspectors located at local education offices, with the cooperation of provincial authorities. Primary school teachers are assigned to provinces and are then distributed among the schools by provincial authorities.

The General Directorate for secondary education is directly in charge of each individual middle school and lycee. Secondary school inspectors are based at the Ministry of Education and visit schools for a short period of inspection every few years. Secondary school teachers are assigned to the particular schools directly by the Ministry of Education.

Schools are administered by school principals who are responsible for ongoing school operations, student affairs, and evaluation of teachers.

There are educational committees in every province, subprovince and village to advise administrators and help school authorities on primary education problems.

Teachers

By Constitutional law no private higher schools or teacher training schools are permitted. Various types of teacher training schools are operated by the Ministry of Education through several general directorates, namely for religious education, teacher training, vocational and technical higher education, girls technical education, and boys technical education. Any post secondary school graduate may also be hired as a teacher by the Ministry of Education.

Financial Resources

The national budget is the main source of funds for educational expenses. The Department of Treasury supplies education's share following approval of the national budget in the Parliament. Another small source of funds is a portion of municipal income.

Needs for Study

Turkey has rural problems in common with other developing countries. Rural people generally are illiterate and poor. Although the expansion of five year education into eight year education is required by the Law of Basic Education and supported by Turkish educators and The Turkish State Planning Organization, there is, a scarcity of resources, and allocation of existing resources is inadequate. The rural population is larger than the urban population, but the average amount of schooling is lower and at the present time the Turkish education system is not able to meet the educational needs of rural people and provide them equal opportunities for education.

Nationwide, 40 percent of the related age group receive middle school education. The third five-year plan aims at expanding this ratio to seventy five percent over the next two decades [4].

Purpose of the Study

The main pupose here is to develop a model with which to study the costs and resources required for the expansion of education in rural Turkey to eight years. In general, the model should assist the researcher to:

1. Investigate expansion in rural settings,

2. Investigate some alternative solutions to these problems. In particular the use of 'busing' and 'boarding' to make schools more accessible to school age children.

The working hypothesis for the present study is that a systems approach for analyzing the problems might help to:

1. Understand the overall system and its components better,

2. Identify where critical decisions have to be made, and

3. Identify the kinds of data that are needed.

Operational Working Procedures

In order to develop a system model aimed at helping to solve the expansion problems in rural areas, the operational procedures cited below will be followed:

1. Needs analysis: provide an explicit description of existing needs,

2. System identification: find the variables, and interrelationships among them, which will represent the behavior of the system,

3. Problem formulation: develop an explicit statement of what the system must do in order to provide the expansion,

4. Generation of system alternatives: include alternative ways of structuring and operating the system,

5. Simulation: test some alternatives by use of the computer.

The modėl is a quantitative description of the mechanisms by which resources are transformed into physical facilities for expanding middle school education for rural people. It is applicable to one or more individual schools, and provides accumulated totals at the subprovince or province level. No attempt is made in this study to define the academic goals or quality of education, but only to analyze costs for furnishing the facilities needed for expansion.

Demographic and other data for the model have been gathered mainly from governmental agencies. Educated guesses are used to supply any currently missing information. Accuracy of data is not a serious matter in this study, since it is the construction and operation of a model that is of primary concern. The implementation of the model in a given situation will of course require complete and more accurate data.

Organization of the Study

This study is organized as follows:

Chapter I includes a description of education in Turkey, the need for a study, the purpose of this study, and the operational working procedures.

Chapter II is a review of related literature in terms of general systems theory, systems approach, and systems approach in education.

Chapter III is devoted to working procedures to help solve the problems of expanding physical facilities and personnel for rural middle schools and to develop a simulation model which can be used in this effort.

Chapter IV describes the experimental runs and application of the model.

Chapter V contains a summary of the work and its conclusions.

Summary

The motivation for this study is to examine the costs of expanding the existing Turkish school system to one providing eight years of schooling for rural people. A systems approach will be used to develop a model to investigate (1) costs of expanding school facilities and personnel in rural settings, and (2) some alternative solutions to these expansion problems.

It is expected that the model and techniques of this study may help decision-makers analyze and solve educational problems. It is also an illustration of how a model can be constructed and used.

FOOT NOTES

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CHAPTER II

REVIEW OF RELATED LITERATURE

A review of related literature was conducted to identify and examine the systems approach as a methodology for solving educational problems. The entire body of the literature is very extensive and diverse in scope. Therefore the section which follows is not intended to be a comprehensive review of the "systems approach", but a framework for using a systems approach concept in education. Illustrative types of educational studies which have employed this concept are cited. The aim of this chapter is to establish a background for the model developed here for studying the expansion of rural education in Turkey.

General Systems Theory

The development of general systems theory by Bertalanffy was based on his synthesis of the similarities he observed in various disciplines, such as physics, chemistry, biology, economics, and gestalt psychology. Bertalanffy [1] emphasized the problems of organization, wholeness, and dynamic interactions in his synthesis. With respect to what constitutes a system, he said:

> "System" is a model of general nature, that is, a conceptual analog of certain rather universal traits of observed entities... A system may be defined as a set of elements

standing in interaction among themselves and with the environment [2].

Various viewpoints toward systems theory have been expressed by numerous authors. The position of Young is:

> Now general systems theory is unusual in the context because although it too may be described as a body of orienting theory or an approach, it can also be taken as a general theoretical framework providing an organized context for a variety of other more specific theories [3].

Bertalanffy suggests:

> The goal of a general systems theory is clearly circumscribed. It aims at a general "wholeness" of the entire system in which many variables interact and in which their organization produces strong interactions. It does not deal with isolated process [4].

Boulding states:

> General systems theory is a name which has come into use to describe a level of theoretical modelbuilding which lies somewhere between highly generalized construction of pure mathematics and the specific theories of the specialized disciplines [5].

Mesarović [6] concludes: general systems theory is then a theory of general models.

General systems theory is considered as the theoretical framework or global perspective that provides an organized context. This is compatible with Knezevich's definitions for the terms "theory" and "system".

> A theory (model) is a cluster of interlocking and interactive concepts systematized into an abstracted intellectual pattern capable of interpreting generalizable trends and interrelationships that prevail within a set of varied facts within reality (or a part of it) [7].

Systems Approach

There has been a developing body of concepts called the systems approach that is useful to describe, analyze, predict, or at least obtain knowledge of a system. A systems approach is not new, and there is evidence which suggests that much of modern systems theory has been borrowed from the past. Hare reports:

> The system concept is as modern as ancient Egypt, where a crude form of today's system theory played a role in the construction operation of the pyramids [8].

Numerous strategies have evolved for systems approach, but there is no single approach. Pfeiffer offers the following:

> There is no such thing as the systems approach if that implies the existence of a formula or a special set of rules for handling problems. A wide range of procedures are available, and which turns out to be the most helpful depends on the nature of the problem under investigation [9].

McGivney [10] stated that, fundamentally, systems approach is concerned with elements such as (1) quantifiable objectives and alternatives, (2) their costs and benefits, and (3) an adequate time period for analysis. Blendinger further argued that because of changing circumstances of the times, understanding the concept of systems approach is important in order to comprehend the phenomenon of change. Thus he pointed out that the systems approach:

> is a way of seeing one's environment. It is an attitude of mind. The concerns of the systems

> approach are with interrelated parts and with how these parts together accomplish the purpose for which the system exists. The techniques of analysis and design are central to systems approach [11].

The technique of the systems approach can be stated as comprising three elements: (1) analysis, (2) design, and (3) documentation. Hartley indicates:

> The concept (essential feature) of a systems analysis may be defined as an orderly way of identifying and ordering the differentiated components, relationships, processes, and other properties of anything that may be conceived as a unified whole [12].

Manetsch and Park state:

> We define the "systems approach" as a problem solving methodology which began with a tentatively identified set of needs and has as its result an operating system for efficiently satisfying a, perhaps redefined, set of needs which are acceptable or "good" in light of trade-offs among needs and resource limitations that are accepted as constraints in the given setting. There are two prominent attributes of this approach: (1) it overtly seeks to include all factors which are important in arriving at a "good" solution to the given problem and (2) it makes use of quantitative models to assist in making rational decisions at many levels where it is appropriate to use such tools [13].

Recognizing that there is no single systems approach and that the type of the problem determines what will be included in the study, it is nevertheless important to identify a generalized procedure. A number of important principles, according to Pfeiffer [14] are:

> 1. Identification of boundaries of a problem. (Define the problem.)
> 2. Specification of subfunctions and alternatives in relationship to the system.
> 3. The use of a model to clarify and to

yield information.

4. Identification of the systems approach as a cyclical and continuing process.

The conceptual perspective of the systems approach is well stated by Laszlo:

> The systems approach does not restrict the scientist to one set of relationships as his object of investigation; he can switch levels, corresponding to his shifts in research interest. A system science can look at cell or an atom as a system, or it can look at the organ, the organism, the family, the community, the nation, the economy, and the ecology as systems, and it can view even the biosphere as such. A system in one perspective is a subsystem in another. But the systems view always treats systems as integrated wholes of their subsidiary components and never as the mechanistic aggregate of parts in isolable relation [15].

One of the advantages of a systems approach is modeling the real world for the purpose of systems analysis and design. In general, modeling is the approximated representation of the real world. The concept of model is indicated by Ackoff and Sasieni, as follows:

> Models are representations of reality. If they were as complex and difficult to control as reality, there would be no advantage in their use. Fortunately, we can usually construct models that are much simpler than reality and still be able to use them to predict and explain phenomena with a high degree of accuracy. The reason is that although a very large number of variables may be required to predict a phenomenon with perfect accuracy, a small number of variables usually account for most of it. The trick, of course, is to find the right variables and the correct relationships among them [16].

Koenig, Keeney, and Zemach's description for mathematical model is:

> Sets of equations which show the

interdependence of the sets of complementary variables that characterize the process or processes under consideration. If the equations are all algebraic in form (linear or nonlinear), the model is characterized as a static model in contrast to a dynamic model which contains at least one differential (difference) equation of any order. If all differential (difference) equations in the model are presented in first-order form, the model is referred to as a state-space model. Dynamic models of this latter form are the most tractable mathematically and computationally. For this reason, they have evolved as the basis for analysis, simulation, control, and optimization concepts and procedures in modern system theory. A state-space model describes the behavioral characteristics of a system as a set of relationships among time functions representing its inputs, outputs and internal state. For discrete time points, the equations have the general form

x(t+1) = f(x(t),a(t),b(t),c(t))
y(t) = g(x(t),a(t),b(t),c(t)) where x(t) are system states
a(t) are parameters
b(t) are exogenous variables
c(t) are control inputs
y(t) are response variables
x(t+1), a(t), b(t), c(t), and y(t) are finite

x(t) and x(t+1) are said to represent the internal state of the system at times t and (t+1), respectively, and Y(t) represents the output or response of the system to its state, parameters, and inputs at time t. If a model of this form is to be derived for a socio-economic system, the total system must be viewed as a collection of interacting subsystems or components no more or less real than the system of interconnected springs and levers in a machine. A model of any such system is developed systematically from the structural features of the system, presented in terms of mathematical models of the components themselves, and a mathematical model of their interconnection pattern. The fundamental axiom of system theory is that the mathematical models of the components identified in the structure are independent of how the components are interconnected. This implies that the various components can be conceptually removed from the system and studied in isolation and that their corresponding models

> serve as " building blocks" sufficiently simple to be modeled. It is precisely this feature that makes system theory a universal tool of science [17].

One may construct models to predict future events. Such models are presented as "simulation models." According to Naylor simulation involves "setting up a model of a real situation and performing experiments on the model." [18] simulation models are mathematical models which consist of a combination of ingredients such as: components, variables, parameters, functional relationships, constraints, and criterion functions. According to Shannon a simulation model is an experimental and applied methodology which seeks to:

> 1. Describe the behavior of systems;
> 2. Construct theories or hypotheses that account for the observed behavior;
> 3. Use these theories to predict future behavior, that is, the effects that will be produced by changes in the system or in its method of operation [19].

Through manipulating controllable variables in the models and iteration loops in a simulation program, one may obtain a number of alternative solutions to a problem.

Systems Approach in Education

Mann [20] advanced the notion that in terms of the general systems theory, a school can be recognized as a system since it has the following six elements found in all systems: (1) sets of interrelated objects, (2) an environment, (3) inputs, (4) process, (5) output/outcome, and (6) feedback. He further stated that component subsystems are generally utilized to regulate the responses of open systems to the demands of the environment. Knezevich lists ten factors which indicate why systems approach is imperative for improvement of education. This list includes:

> (1) Clear delineation of long- and short-range objectives capable of being translated into operationally meaningful activities and subsequent evaluation.
> (2) Recognition of the dynamic nature of objectives and sensing when new ones have emerged or when a reordering of priorities among existing objectives is imperative.
> (3) Recognition of change as normal in viable organizations operating within an environment in ferment and creation of methods to facilitate prudent change.
> (4) Generation of alternative means to utilizing resources to attain objectives.
> (5) Creation of models to study part or all of the system.
> (6) Utilization of quantitatively oriented tools and procedures in analysis of systems.
> (7) Deduction of a high priority in the time schedule of top-echelon administration to planning and programming activities.
> (8) Employment of interdisciplinary teams of specialists in problem analysis, new systems design, operations evaluation and the like.
> (9) Consideration of coordination of the ever growing number of educational specialists within the system as a matter of high-echelon concern.
> (10) Implementation of sophisticated, objective, and scientifically oriented procedure in decision making [21].

The majority of the educational literature that was reviewed emphasizes the application of the systems approach, usually referred to as systems analysis, to education. The concepts described by most authors were those derived from generalists, such as Churchman and Bertalanffy [22]. Some literature by Immegart; Immegart and Pilecki; and McManama [23], provide particular terminology for usual processes. System analysis in education has been emphasized by such authors as Banghart, Knezevich, Kaufman, and Read [24]. Blauberg, Sadowsky and Yudin put some definitions in the following way.

> We define the systems approach as explicit description of procedures of representing objects as systems and of methods for their investigation (description, explanation, prediction, design, etc.) General systems theory will be interpreted as an interdisciplinary field of scientific research whose goals are: (a) to work out generalized models of systems; (b) to elaborate a logico-methodological apparatus for describing the functioning and behavior of systems objects; (c) to formulate generalized systems theories of various types, including theories of systems' dynamics, goal-oriented behavior, historical development, hierarchic structure, and control processes. Finally, systems analysis will be taken to mean systems methodology for the solution of management problems [25].

The emphasis in educational literature on the use of the systems approach has been in administration (management) and instruction. Attempts to implement the systems approach in the instructional systems are represented by the studies of Cogswell, O'Neill and Blodgett [26].

The systems approach in school administration is applicable to areas of school finance, personnel management, school facilities, and other administrative functions. A major emphasis has been in the area of school finance, with attention to the planning, programming, budgeting systems (PPBS). Clark, O'Brien, and Case [27] applied systems approach to develop a model for urban education. The model has the capability to handle the introduction of known data such as available money, staff allocation, and present school plant. Another general model is the effort by Reisman [28] to develop a mathematical model to describe the flow of students in and out of a university system and to follow the progress of students through the system. The development of a descriptive model of this type forfeits detail, but enables the educator to observe the interrelationships of several subsystems.

A simulation model called "Comprehensive Analytical Models for Planning in University Systems (Campus)" has been built for the faculty of Arts and Sciences at the University of Toronto to present the implementations of resource allocations as related to enrollments, resource demands, space requirments, and budgetary calculations. As with many applications, "CAMPUS" involves mathematical models, information systems, and planning, programming, budgeting. Judy and Levine offer the following summary of the capability of the model:

> The model simulates university operations over a time period of any length. Loaded into

> the computers, the model accepts descriptions of the university's structure and statements of the levels of activities that the university is expected to perform. With these inputs, the model computes the resulting resource requirements of staff, space, materials, and money. These requirements are displayed by several computer-prepared reports and graphs [29].

The work at Toronto is no longer a pure research effort because it has been implemented as a normal part of the operations of the University through the Office of Institutional Research.

Koenig, Keeney, and Zemach [30] developed a theoretical systems model to predict the resource requirements at an institution of higher education for various administrative policies and enrollments. They considered financial aid as one of the control variables in an institution of higher education and predicted the enrollment as the sum of three components: transition enrollment, new enrollment and the enrollment induced by financial aid. The university system is viewed as consisting of five major sectors or subsystems namely; student, academic production, non-academic production, personnel, and physical facilities sectors. These components are governed by the "administrative control" component which is the source of policy and human decision.

The Western Interstate Commission for Higher Education (WICHE) is a public agency through which 13 western states work on common problems in higher education. The National Center for Higher Education Management Systems (NCHEMS) at WICHE has developed a Resource Requirments Prediction Model (RRPM-1), an institution-oriented, computer-based simulation model that projects the cost of operating a college campus over a ten year time frame. RRPM-1 may be viewed as a management tool that will assist higher education decision makers in understanding the future implications of planning decisions. The structure of RRPM-1 is stated by Hussain as follows:

> 1. RRPM-1 is a deterministic and descriptive simulation model. It is not stochastic, nor is it an optimization model.
> 2. RRPM-1 is a cost accounting model. It does not consider revenue or benefits.
> 3. Student flow and faculty flow are not generated within the model. Student enrollment is exogenous, and faculty is calculated by using staffing coefficients for faculty.
> 4. The results of RRPM-1 (as with any model) are a product of its structural relationships (assumed to be continuous and linear in most cases) and of its input values, which are in some cases crucial and yet difficult to predict [31].

To evaluate RRPM-1 Gulko, and Hussain state their findings as follows:

> RRPM locates inaccuracies in information and forces us to ask how can we correct our input... RRPM has great potential as a planning tool that can improve resource management in higher education... RRPM has its greatest potential as a campus planning tool. In fact, one of the greatest benefits that may come from the model is a medium for improving communication among all levels of decision-making process [32].

Other current projects at the center include a student flow model to chart curricular response to projected student population needs, and space analysis manuals to assist in the evaluation of needs and requirements for physical expansion of institutions.

In his dissertation, Akalin [33] used the systems approach in analyzing the Turkish education system and developed a mathematical model for approximating the state of the system related to need and supply of secondary core subject teachers at a given time. Other attempts are represented by the studies of Keeney, Koenig, Van Dusen, Ecevit, Kwak, Crawford, and Dunbar [34].

Summary

The prime contribution of systems concepts to science and technology is to present a comprehensive way of thinking that is applicable to any field of knowledge. Many authors in various disciplines indicate that the systems approach has been of value in understanding specific systems and providing another viewpoint in problem solving. Another advantage is that it enables researchers to represent the real world by means of modelling.

Hence, since education is recognized as a system itself, a systems approach may be utilized effectively in solving educational problems too. The aim of the present study is to extend the systems approach in education to the problem of expanding Turkish education in rural settings.

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CHAPTER III

A SYSTEMS APPROACH

In this study a systems technique is utilized to investigate the costs of providing facilities and personnel for eight year schooling in rural areas. Expansion of five year education into eight year education is required by the Law of Basic Education and is supported by the Turkish educators and the Turkish State Planning Organization, but the Turkish education system is not able to meet the educational needs of rural people, and provide equal opportunities in education. In this chapter the rural education system is examined and a simulation model is developed to identify the design of a desired system in rural settings. The model is applicable to an individual school, a subprovince, or a province for descriptions of resources required for expansion.

The chapter is divided into five parts. First, a needs analysis is carried out to provide an explicit description of existing needs. Second, a system is identified in very general terms to form a link between the needs and a solution. In the third phase, interacting variables that are considered to be important in system performance are defined in detail, including their limits and their constraints in the system. Fourth, some alternative models are generated to represent the desired system. In the fifth and final phase a simulation model is developed to test the alternatives by use of the computer.

Needs Analysis

The purpose of this phase is to: (1) establish that the needs exist and (2) develop an explicit description of existing needs which can lead to a formulation of objectives for the system.

Population

Turkey has a high rate of population growth. In the last twenty-five years her population has doubled (Table 1). Despite heavy migration to certain urban centers, most of the population is still living in rural areas. Population projections of the third five-year plan indicate that migration to urban centers will continue and, if nothing happens to slow this migration trend, about twenty-one millon people will be living in rural areas by 1980 and, when migration reaches steady-state, about seventeen million by 1995. Rural Diversity

There are about eighty-thousand rural settlements. Only 36,115 of these settlements have village status with elected headmen [2]. The rest of them are scattered settlements with no more than a handful of houses [3].

TABLE 1

Population by Year and Location [1]

Year / Location	1940	1950	1960	1970
Urban	3,216,000	3,924,000	7,200,000	12,682,000
*Rural	14,605,000	17,023,000	20,555,000	22,923,000
Total	17,821,000	20,947,000	27,755,000	35,605,000
Rural	82.0	81.3	74.1	64.4

* 10,000 is the upper limit for rural classification.

There is also a diversity of geographical structure and wealth in rural Turkey. About 17 percent of the rural families are landless, 50 percent have some land but too little to generate sufficient income to support a farm family, another 32 percent have sufficient land for subsistence, and less than 2 percent own portions of land large enough to generate income to support farm families [3]. This last group can easily afford to send their children to urban centers for education and a family with substantial land and with relatives in a nearby urban center may support their children's education by having them stay with those relatives while attending school. However, more than 65 percent of all rural families have little likelihood of providing their children with further education after primary school unless they receive assistance.

Economic Development

As early as 1835 in Turkey, it was noticed that there would be no economic innovation without a wide educational base [4]. Turkey is a developing country with the majority of her population living in rural areas. Wealth differences between urban and rural areas are widening to the benefit of urban areas, and migration is taking place towards urban centers. Despite this, the rural population is expected to remain high.

Essential to continued development, and to the equal distribution of wealth, is a continuing improvement of rural conditions. Modernization of agriculture and appropriate industrial technology are two means for rural development. Research findings show that education is associated with agricultural modernization. In developing areas people who have had some education appear more willing to accept new methods and techniques than their less educated peers [5].

Basic Education

The Law of Basic Education, No.1739 [6], states that the combination of primary and middle school education will be called national basic education. Completion of the first five years of basic education will lead to a primary certificate while completion of eight years of education will earn a basic education certificate.

A functional aim of basic education is to improve curriculum in such a way as to provide pupils with universal and environmental knowledge, with skills and attitudes best suited to their abilities and to prepare them both for further education and a working life. It is necessary that basic educational opportunities be extended to the rural areas from the point of view of social justice and equality of opportunity for education, so all children between ages 7 and 14 will be provided an eight year education as a minimum educational level required for continued development.

Curriculum

The founder of Turkey, Mustafa Kemal Ataturk, once stated that "primary and secondary education must provide the practical science and technology that is necessary for a developing society, so that graduates would be able to find jobs and gain higher earnings" [7]. Despite this warning, the present curriculum does not provide this kind of education.

There is no special rural education in Turkey, that is, the curriculum is similar in both urban and rural schools. Most subjects are considered irrelevant by rural students and unrelated to rural experience. Nonformal education (health, family planning, handcraft, etc.) is limited to only a few thousand rural settlements.

Administration

The state performs its executive functions in a highly centralized manner, and educational administration is no exception. Cohn evaluates this situation as "the Turkish bureaucracy is a source of strength and stability and, at the same time, one of the major constraints on the nation's development." [8]

In every action they take, school principals and local education officers are bound by the regulations of the Ministry of Education. In general, education officers may have had some training in pedagogy, however, school principals lack special training in administration.

Teachers

The distribution of teachers and administrators among schools as to their quantity and quality is unbalanced, favoring urban areas. One-teacher schools whose instructor teaches five grades simultaneously are common at the primary level in rural areas.

Most of the middle school teachers come from urban middle class families, and sometimes they have values different from those of rural people. If there is not a large number of teachers, a teacher may feel isolated in a rural community. As an educated human being, every teacher wishes to meet his/her social, personal and self realization needs, but these are seldom fulfilled in rural settlements. After a few years of rural experience teachers often want to be transferred to an urban area.

Teachers' salaries are not sufficient to provide even a moderate standard of living, and at the secondary level there are no extra benefits for teachers working in rural areas. By law a secondary school teacher has to teach at least fifteen to eighteen hours per week, but most teachers teach about thirty hours a week because of the lack of teachers at the secondary level. This heavy work load does not allow enough time for adequate classroom preparation, but does provide additional income for teachers.

Usually teachers are not helpful to rural people beyond the classroom, since they have few skills to contribute to rural life.

Students

In 1973, primary school enrollment was about 100 percent in urban centers. The lower ratio of rural primary enrollment decreased the overall ratio to 90 percent (Figure 2). Before the 1970's the ratio of success to enrollment was quite low. For every hundred students enrolled only about 29 completed primary education in five years (Table 2). The rest of the students either repeated the same grade or dropped out. Most of the failure took place in the first three years. This has been changed and now students advance to the next grade automatically in the first three years of primary education. The success rate for the fifth grade students on the other hand was 87 percent, and about 50 percent of primary school graduates entered middle schools.

TABLE 2

Student Statistics in Turkey 1973-1974 [9]

School Type	Age Population	Enrollm.	Graduate [a]	Teacher	School	Sex F/M [b]	Success [c][d]
Primary	5,770,200	5,377,708	735,041	160,271	41,191	73	29-87
Middle	2,692,000	927,062	161,972	26,943	2,302	40	61-76

[a] Graduates numbers are taken in 1971-72.
[b] Female/male percentage in enrollment.
[c] Success rate (percent) to enrollment.
[d] Success rate (percent) in senior year.

In the middle school age group there are more rural children than there are urban children, but the enrollment ratios are reversed. Fidan [10], who collected data from a random sample of twenty-five thousand students, confirms that (1) students from urban areas are overrepresented in all types of secondary schools, (2) significantly fewer female students from rural areas attend secondary schools than male students from rural areas, (3) children of farmers are significantly underrepresented.

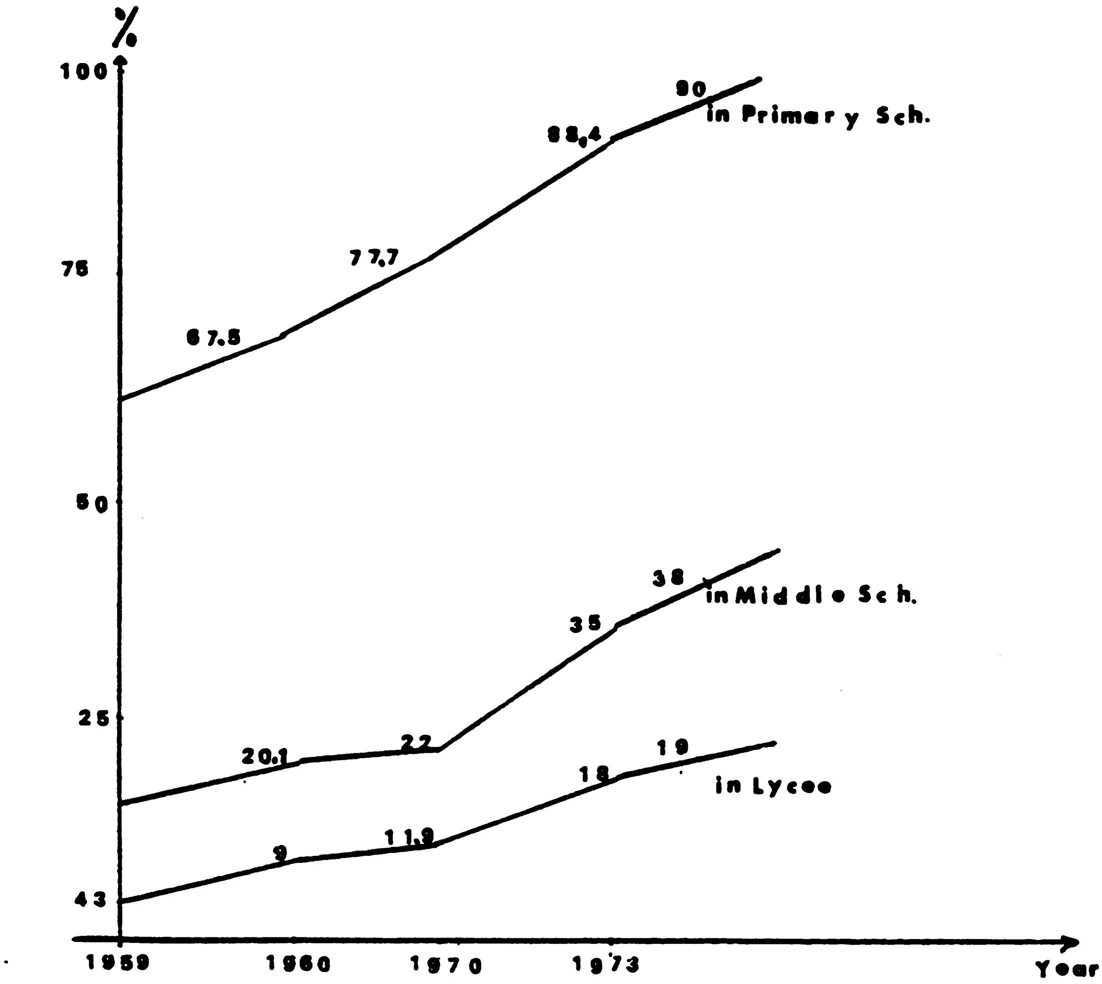

FIGURE 2. Ratio of Enrollment to School Age Population [11]

School Facilities

Only about 40 percent of the middle schools were located in or close to rural areas in 1971. There are insufficient numbers of middle schools and a large number of rural primary graduates. The fact that there were more than forty rural applicants for every vacancy in boarding schools is another indication that there is a scarcity of available middle schools for rural people.

There is a lack of educational materials in schools. Many schools operate with no workshop equipment, and no instructional aids. Although these materials are manufactured by the Ministry of Education, the quantities produced fail to meet the total demand.

Summary of Needs Analysis

Turkey has rural problems in common with other developing countries. Rural people are illiterate and generally poor. There is a scarcity of resources, and the allocation of available resources is inadequate. Most of the rural areas also have an inadequate number of secondary schools, income, health-care, and infrastructure. In general, the education system is elitist and selective, and functions with high levels of waste (dropouts, repeats).

Turkey has reached the level of providing most of her population with primary schooling. It has become an educational policy in Turkey that middle school level technical-vocational education be replaced with general academic education. Five-year education is to be expanded to eight-year education as a minimum requirment to enter any vocational school. According to the Law of Basic Education, an eight-year education is to be compulsory for Turkish people.

Both national and rural development require more education. The Constitution states that it is the state's responsibility to bring educational facilities to the people [12]. Many Turkish educators share the idea that eight-year schooling should be compulsory. The third five-year plan aims at expanding enrollment in middle schools from 40 to 75 percent in two decades.

In 1971 there were about 740,000 primary school graduates, 60 percent of whom lived in rural areas. For the school year of 1971-72 only about 350,000 primary school graduates enrolled in middle schools and most of them were urban graduates. There are over 200,000 eligible rural graduates who do not attend middle school, because there are no such schools available for them and many families in rural communities are not financially capable of sending their youth far away to an urban center for education.

Inequalities in terms of providing education have not changed significantly since 1950. Unless educational policies are revised in favor of the disadvantaged groups (rural people), educational opportunities will continue to be distributed unequally. Therefore, there is a major need for an expansion of basic educational facilities and personnel for rural people.

System Identification in General

The main concern of this study is the rural middle school, but it cannot be treated independently of any other rural or urban schools or the environment, because there are strong economic, social and political interactions both among the components of the educational system, and between the components and the environment. This interaction makes it important to consider every interacting variable. Here, information is sought to form a link between the needs generated by the expansion of basic educational facilities for rural people, and the costs of meeting those needs. Figure 3 shows interacting variables categorized according to their role as system input variables, output variables, and design parameters.

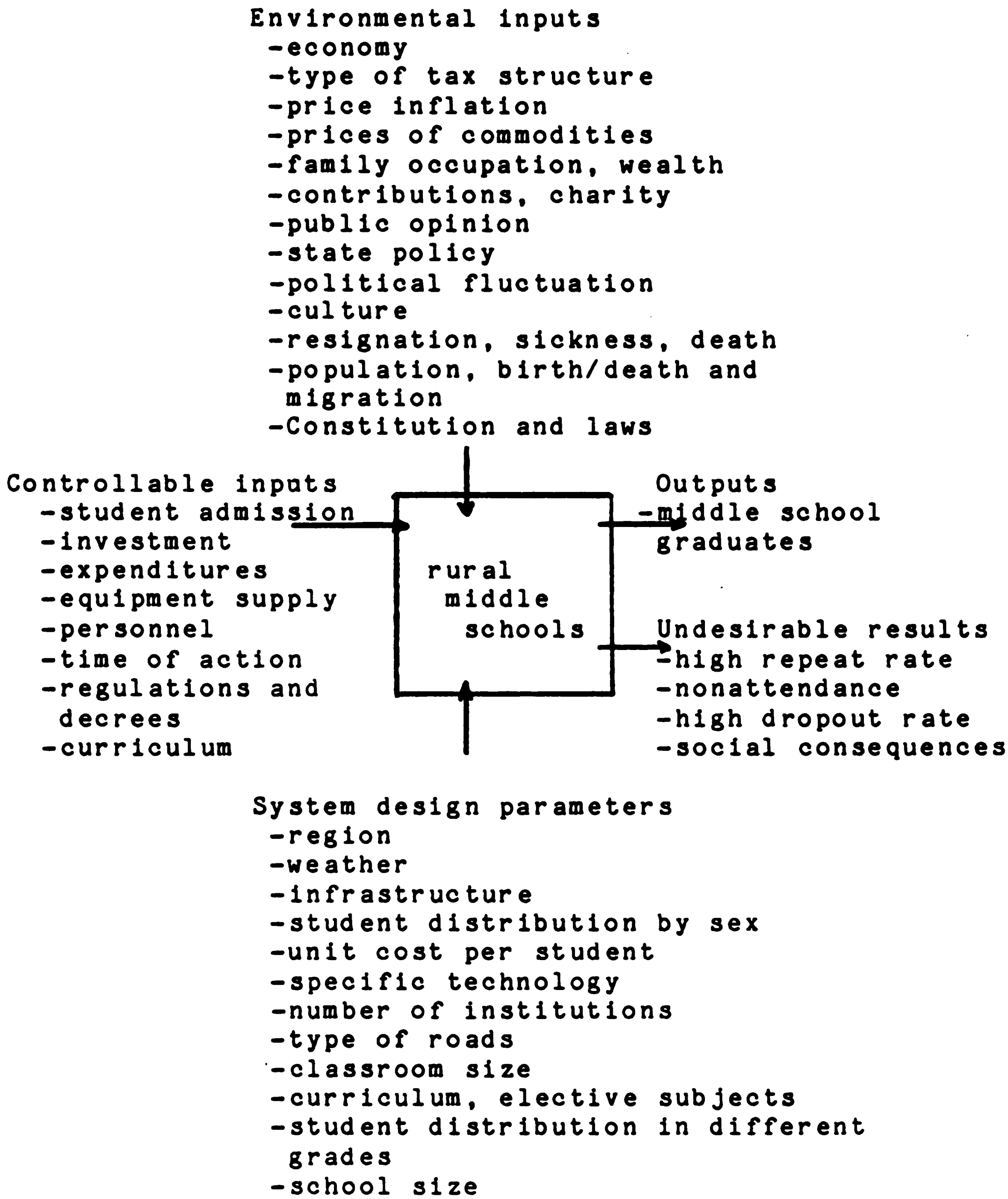

FIGURE 3. Interacting Variables in Rural Middle Schools

The system input variables are of two classes, environmental inputs and controllable inputs. Environmental input variables affect the system but they are not significantly influenced by it, at least in the short run. In the system these variables are the general, economy, price inflation, family occupation, etc. Controllable inputs, such as student admission, investment, curriculum, etc., are necessary for the system to carry out its intended functions as specified by the control component of the system, and are utilized to obtain the desired system performance.

The outputs of the system are the rural middle school graduates, with some undesirable results such as large numbers of repeaters, dropouts, nonattendance, and various adverse social consequences (alienation, disturbances, migration, etc.).

Design parameters specify the structure of the system. Some of them, such as regional and weather related variables, specific regional technology, infrastructure, and number of public institutions are fixed, whereas others such as classroom size and student distribution can be changed during the operation of the system.

Problem Formulation

To formulate the problem explicitly, interacting variables have to be studied in detail, including their constraints and their upper and lower limits within the system and over the system operation. The next several pages discuss these major variables (see items listed in figure 4). The purpose of this discussion is to further illuminate the nature of the variables and to indicate what assumptions or decisions will be made in terms of the model developed for this study. Some of the variables do not affect the model; assumptions will be made about the affects of others and educated guesses will be employed; and finally, actual data will be used for the remainder.

Omitted Variables

Many variables affect the system operation, but to keep the modelling within workable limits for this study, certain ones are assumed to have no effect on the model operation in terms of results wanted.

Constitution, Laws, and Decrees

The Constitution is the most important constraint and at the same time the strength of the Turkish government. It holds the state and the Ministry of Education responsible for training and educating people and requires the Ministry of Education to produce or to supply whatever is needed to open and to operate schools.

With the approval of two-thirds of the National Assembly changes can be made in the Constitution. Laws, on the other hand, can be changed by a majority vote in the Assembly. In the area of policy making, the initiative clearly belongs to the executive. Ozbudan's study [15] gives strong evidence that the Ministry of Education is quite powerful in policy formulation in education. Given public support, the Ministry of Education can increase its expenditures to produce more teachers and instructional materials through its production components when they are needed.

In order to implement the Law of Basic Education, there should be some changes in the responsibilities of the general directorates for primary education and secondary education to integrate the primary and middle schools under basic education. These changes could come through a new law or a new decree.

A decree is an operational command given by the Ministry of Education that defines what is to be done in a particular operation. Decrees and other policy related decisions are transmitted to the implementors, usually through the "Tebligler Dergisi" (Journal of Announcements), which every administrator and teacher is required to read and implement. The opening of a new school is effected by a decree from the Ministry of

Education in conformance with existing laws and the Constitution.

The model developed for the present study is not sensitive to such changes but rather assumes the basic centralized nature of the control component will remain the same. That is to say, however the control component may be organized, the utility of the model for purposes of problem analysis will remain intact.

Economic Factors

The Turkish economy is basically agricultural (the industrial sector including mining, manufacturing, and utilities is ranked second). Agriculture (including livestock, forestry and fishing) makes the largest contribution to the gross national product and employs nearly two-thirds of the labor force. There is a negative foreign trade balance. Agricultural-product-dependent exports do not even generate enough revenue to pay for necessary oil inports.

Family occupation and wealth are correlated with rural conditions. About 20 percent of rural families are landless and jobs in rural areas are limited. Income for most rural families provides only a bare subsistence.

Under the tax laws there is no education tax per se. When national goals and priorities are set, allocations are made from the national budget.

Contributions, charities or gifts are occasionally donated for educational usages. For instance, land may be granted by the state or by local land owners for a school site, or a contribution of manual labor or materials such as brick, sand, etc., may be made by local people. These kinds of contributions are important when they occur but they are unpredictable, and cannot be incorporated in formal planning and so are omitted from this model.

Political and Cultural Factors

Public opinion and public attitudes toward education vary with regions, economic conditions, and educational levels of families. In general it is positive and high. The urban populace asks for and forces the state to provide more educational facilities, but the rural people are not effective in doing this.

When a rural area is in poor economic condition its residents' beliefs and lack of awareness are sometimes exploited by politicians. These residents shelter themselves under religious promises, and they may have negative feelings for secular education. Forty years ago there were no religious schools in Turkey and there was no public pressure to have any. During the first twenty three years of the multi-party period (after 1950), seventy-one religious middle schools were opened, but in the last three years the number jumped to 334 [13], while Turkey was enduring her worst economic crisis. When the exploitation of beliefs decreases, people in deprived rural areas may see the other side of the coin and ask for more education, as is happening in urban and some rural areas.

State policy has been essentially unchanged since the formation of the Republic of Turkey. Although more educational opportunities are intended, many of the necessary steps have not yet been taken.

Political fluctuation exists due to the state of the economy and different political parties. All political parties agree that education is important and that it is the duty of the Ministry of Education to provide it. Some political parties promise that when they come into power, religious education will be more effective, but the likelihood of their coming into power is almost nil.

Cultural elements such as religion, ethnic background, language, habits, and technology vary by region. Islam religion and the official language, Turkish, are dominant in Turkey. Generally, non-Moslem people live in urban centers and have their own private schools. Non-Turkish speaking people more or less share other cultural elements with the rest of the population. By law, all ethnic groups are citizens by birth and schools are secular. Therefore, in schooling, cultural elements are not decisive, except for the Turkish language, which is an important factor. This can create hardships for the non-Turkish speaking population, but in this study, Turkish language is assumed common everywhere.

Sex Factor

Student distribution by sex is related to school and environment. Some rural people do not care for their daughters to be educated for social and economic reasons. The distance to school has a greater effect on attendance of girls than boys. However in the model it will be assumed that sex differences will not affect the model's operation.

School Programs

The Law of Basic Education consists of two sets of curricula, nonelective and elective. The nonelective curriculum will be the same in all middle schools, rural or urban. Subjects in this curriculum are: Turkish language and literature, mathematics, social studies, and general science (group 1 subjects, four hours per week each), and physical training and health, music, and vocational arts and job training (group 2 subjects, two hours per week each).

Six elective curriculum subjects from which students may select two courses (group 3 subjects, six hours per week) are foreign language, technical education, home economics, commercial training, agriculture, and music. It is unrealistic to think that these six subjects would be made available in rural schools since there will not be enough teachers for these subjects. Therefore, in rural schools it is assumed that the Ministry of Education may select the best two subjects according to regional needs and resources. In the model the curriculum is represented as 28 class hours each week.

Variables in the Model

Variables in this group are taken into account in the model one way or another.

Geograhpy and Infrastructure

Regional (location of settlements, distance between settlements and type of roads) and other fixed parameters such as weather related variables (distribution of rainfall, length of growing seasons, temperature), specific technologies for local communities, infrastructure, and the number of public institutions (schools, health centers etc.,) determine locations for school construction.

Population Factors

The population of Turkey is approximately forty million, about 55 percent of whom were living in rural areas in 1975. The birth rate in rural areas is higher than the national average of 5.3 percent and the death rate is about 2.5 percent, but in the future, urban population is expected to be greater than the rural population because of high migration to urban centers [14]. Migration from smaller settlements to larger ones in rural areas increases the number of villages with five-hundred or more inhabitants, while migration from rural areas to urban centers reduces the rural population.

During the last decade one of the Turkish development plan objectives was to control this migration and to avoid urbanization problems through development of rural centers. These centers are intended to function as buffer settlements between rural settlements and urban centers by generating job opportunities with their puplic institutions, such as education and health, as well as local industries.

A high birthrate, decreasing death rate and migration to cities are expected to continue, but with a state policy of developing these buffer rural centers, rural population is expected to stay about the same in coming decades. If buffer centers are not developed, the rural population will decrease, but the number of primary graduates will increase for a while because primary school dropouts have been decreasing gradually in recent years. With the further extension of basic education it is expected that dropouts may decrease even faster.

Resignation, leaving for an urban school job, death and sickness cause the system to lose some of its staff annually. The Ministry of Education anticipates making up for this loss by training and hiring more personnel.

Cost Factors

Price inflation is an inseparable factor which fluctuates with national and international economic situations. During the past five years Turkey has had a high inflation rate.

Commodity prices vary according to national and international supply and demand relations, government actions, and price inflation. The Ministry of Education buys school sites, school supplies and equipment when demand for them exceeds production, and constructs school buildings or appoints contractors for construction. Facilities seldom are rented.

Time

Time is not controllable, but the use of time for implementing decisions and production of required items can be scheduled.

There is a best combination of inputs and conditions of interaction for maximizing a specified output within a given period of time. One purpose of the model is to help locate this optimum by having variables become decision variables and thus controllable by the experimenter.

Design Parameters

Classroom size and other design parameters may vary from one experiment to another. In practice, an average classroom accommodates forty-five students but the number of students in a classroom may go as high as sixty. According to regulations, class size should be no more than forty persons.

In the model, school size is defined by the number of sixth grade classrooms and by the number of students per classroom. Besides classrooms, each school has other necessary rooms for library, workshop, physical education, laboratory, warehouse etc. Schools also have additional areas for corridors, restrooms, offices, and a playground. Their sizes are all related to the number of students in each school.

Student distribution in different grades is related to dropouts, repeats and irregular attendance. The nationwide ratios in completing the sixth, seventh and eighth grade levels of middle school are 61, 65, and 72 percent respectively (before 1973). The rural ratios are lower than this national average and boarding schools' are higher. When schools are located closer to students, the curriculum is made more attractive, and rural needs are better understood, ratios are expected to be much higher.

About 90 percent of rural primary school-age children enter school, but only half of them graduate. There are about four hundred thousand primary graduates in rural areas. When primary education achieves its goal of admitting virtually all available children and keeping most of them in schools until graduation, the student pool for middle schools will increase.

The Ministry of Education may regulate its admission policy to adjust admission to the available seats in middle schools.

Output

Rural middle school graduates are the desired outputs of the model. There are undesirable results associated with the middle school operation: some students repeat the same grade; some do not attend regularly; some drop out of school completely; and some may become alienated from the environment as a result of their education. These undesired results may be related to the quality of education, or to the degree of usefullness and appropriateness of the curriculum to rural needs. The model assumes that the quality of education, and the desired outputs will be no less than the nationwide level in the rural middle schools.

In order to meet long range government goals, rural schools should be designed to admit 75 percent of the rural primary graduates and hold most of them in school until graduation. This requires money for operational expenditures, investment in land, building, equipment, and teacher training, and the model is designed to assist in determining this amount.

<u>Summary Statement of Problems</u>

The problems can be summarized as :

1. The expansion of middle school facilities for rural people in such a way that 75 percent of the rural primary school graduates can be accommodated by the year 2000 A.D.

2. The determination of desirable school locations.

Measures of the performance criteria which will be relevant in choosing alternative system designs are:

1. Average investment cost (TL/student).
2. Average operation cost (TL/student).
3. Total costs.

Generation of System Alternatives

There are several types of schools which may be used in various combinations to provide rural education. These schools are:

<u>Local School</u>: a middle school in a rural settlement where there is sufficient threshold population.

<u>Busing School</u>: a middle school for which the Ministry of Education provides transportation to bring students from other settlements.

<u>Boarding School</u>: a middle school for which the Ministry of Education provides lodging facilities and food for students who do not live in the local community.

<u>Combined School</u>: a local middle school in which busing or boarding or both exist.

<u>Broadcasting School</u>: a middle school for which the Ministry of Education provides mass media such as television, radio, and printed materials with the help of local coordinators.

<u>Mobile School</u>: a school in which teachers are stationed in a center settlement and go to peripheral settlements to teach middle school subjects for a period of time, rotating with teachers in other subjects.

These alternatives do not contradict existing laws and are physically possible. However, for a broadcasting school some materials must be imported since Turkey does not have sufficiently advanced technology to produce them in large quantities at present and importing these goods is difficult because of the scarcity of foreign exchange. Because of this economic restriction to broadcasting schools and different modeling considerations, for mobile schools, neither are included in this study.

Developing a Simulation Model

The purpose of this section is to develop and present a model to describe the Turkish rural education system as a collection of interacting sectors or components (student, personnel, physical facilities, and control), each of which describes the operation or function of some aspect of rural education (Figure 4). The model represents the system through the values of parameters and program variables which are descriptive of the real situation at discrete points in time. A set of equations is developed for each sector to describe the relationships among the services produced and resources required, then a second set of equations is formed to describe required expenditures for these rural education services. Thus it is a mathematical description of the resources required (generally speaking they are personnel, space, supplies, and equipment) to produce middle school graduates in rural schools.

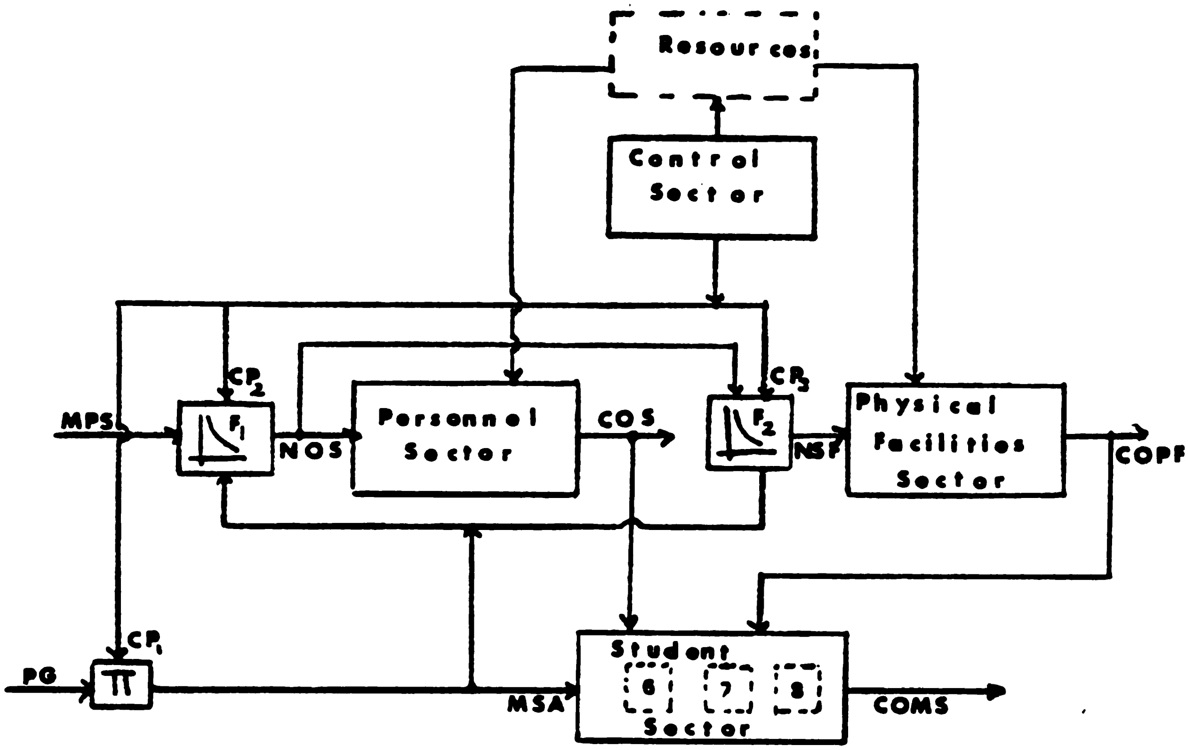

FIGURE 4. Basic Structure of Rural Education

Symbols for the Figure

COMS	Cost of middle school education
COPF	Cost of physical facilities
COS	Cost of staff
CP	Control policy parameter for admission
CP	Control parameter for staff hiring
CP	Control parameter for allocation of facilities
F	Function to calculate required staff
F	Function to calculate required facilities
MPS	Manpower stock
MSA	Middle school admission
NOS	Number of staff
NSF	Number and size of facilities
PG	Primary garduates

No attempt is made to define the academic goals of education nor to establish operational measures of "quality"; these are accepted as givens. Rather, the objective is to provide a definitive description of the mechanism by which the resources are transformed into the resulting products. The model must be regarded only as an aid to decision-makers (control) in designing and operating a rural education system.

The major objective of this study is to determine costs of resources to achieve enrollment levels of 75 percent of the primary school graduates in rural middle schools by 2000 A.D.

In order to keep the model within workable limits certain variables are assumed to remain constant, or to be controlled independently; only variables to which the system response is most sensitive are included. Among the variables identified in previous sections, but omitted from the model in Figure 5 are legislative, cultural, political and taxing considerations.

In order to implement the model, a computer program was developed, using the FORTRAN IV programming language.

Description of Model Sectors

The control sector represents policy decisions and is implemented to reflect regulations, decrees, administrative authority, admission policies etc., which are established by the provincial authorities or the Ministry of Education.

The student sector generates a direct demand for physical facilities and personnel effort (teachers, administrators, and staff). Equations of the student sector represent this demand by the numerical values of student enrollment, admission policy, and student distribution in different grade levels. The student sector creates indirect demand for additional facilities through the personnel sector. The rural education system must utilize classrooms, office space and other facilities (instructional materials, bus, lodging, etc.) In order to maintain the student, personnel, and training functions.

The equations in the physical sector indicate the size and amount of facilities demanded by the personnel and student sectors.

To produce personnel effort the system must also utilize teachers, administrators, and staff (secretaries, custodians, bus drivers, persons to operate boarding facilities, etc.). The equations of the personnel sector indicate the quantities of effort required to meet the student sector demand.

Outputs

The computer program gives a variety of descriptive output for each new and existing school when facilities are expanded in a subprovince, and it can also give totals for each subprovince and province. From the output of a single model run many questions can be answered for a given situation and set of input parameters. Such information includes:

1. Available middle-school-aged population for a selected school site, distributed to show (a) local residents, (b) those within busing distance, and (c) those in remote settlements (remaining parts of a subprovince).

2. The year in which a school should be built.

3. The center in which to build a school.

4. The kind of school to build (local, busing, boarding).

5. The required resources (personnel, facilities).

6. Expenses by various categories.

7. Cost differences if buses, land, building construction, boarding, or any combination of these were provided by the local people.

Representation of Regions

The model that is constructed here describes the education system within a geographic boundary corresponding to a subprovince, but subtotals are produced in such a way that they can be aggregated to represent a province.

The model is sufficiently generalized so that by changing input parameters, a wide variety of situations for different subprovinces, given subprovince, opening of an individual school, or expansion of facilities in an existing school, can be simulated. Some input parameters, for instance (1) dropout rate, (2) repeat rate, (3) migration rate, and classroom size can be changed to generate hypothetical situations and enable better understanding of the system's performance (see Appendix B for the description of how to use the model).

Each subprovince has the same political structure, but there are some differences among them such as population (large, small), geographical structure (hilly, plains, coastal), climate (temperature never below freezing, heavy rain or snow region), size (square kilometers), and development stage (agriculture is dominant, some industry exists, some industrial investment will be provided soon). These characteristics are reflected in school site selection.

Possible school sites, potential students that can attend a given school site center, and potential boarding students have to be defined for each subprovince by the control component to make the given information functional in the model. In the following paragraphs a six-step procedural algorithm is explained for selecting school sites and identifying potential student population.

Algorithm Defining School Sites

A subprovince is a political division of a province and has inhabitants in a center city and in scattered rural settlements. The center city is omitted from the model unless it is a rural town, since it is not considered part of the rural system as defined in this study. If the city's peripheral settlements have daily access to the city, they may also be left out of the study. Consider a rural settlement which has a middle school. It may serve students within a few miles as local students. It may handle additional students by providing bus service (to students who live less than one hour traveling time distance) or it may provide boarding facilities within the subprovince or province for students who are outside the busing distance.

A new school cannot be constructed just anywhere. The threshold population (identified in the student sector section) is the minimum total population deemed sufficient to establish a school with the minimum acceptable capacity in terms of student spaces or potential enrollment. A center settlement is a possible school site for a new school if the threshold population exists within busing distance.

Other desirable characteristics for a possible school site are the existence of infrastructure (sufficient running water, roads, electricity), public institutions (primary schools, lycee, health center, agricultural extension office, community development center), a base population of five hundred or more people, location (less than one hour travel time to settlements), commerce (trade) center in neighboring settlements (see Figure 5).

Some characteristics of a center	Group Classifications I	II	III
Infrastructure (electricity, roads, etc.)	adequate	some	none
Institutions (schools, etc.)	many	some	none
Trade types	sell/buy commodities	closed economy	none
Employment	agriculture small industry	agriculture or small industry	self employment
Population (p)	p>1000	1000>p>500	500>p
Migration	in	slight or none	out
Traveling time t (minutes)	60>t to some settlements	60>t to some settlements	60>t to no settlement
Future investment	employment	no investment	unemploym.

FIGURE 5. Characteristics of a School Site

Each subprovince would have an administrative unit to search for school sites by using a provincial map, local demographic data, and a procedure such as:

1. Omit peripheral settlements of the subprovince center, if the center is an urban area.

2. Identify rural settlements with an existing middle school where expansion of school facilities to an average or maximum size school is possible by providing busing or boarding facilities.

3. Identify possible center settlements to be school sites by dividing settlements without existing schools into three groups according to the characteristics in Figure 5. Group I and group II settlements are possible school sites.

4. Identify settlements (peripheral settlements) within busing distance to a school site by dividing remaining settlements into three groups according to their characteristics in Figure 6. Group I and group II settlements are possible peripheral settlements. Excessive distance between home and school is sometimes the key factor in reducing access and increasing absenteeism, therefore traveling time (from peripheral settlement to school should not be more than one hour). Tranportation facilities (on foot, bike, horse,carriage, automobile), road conditions (all weather or gravel roads), and climate (heavy rain or snow may cause transportation delay for hours or days) determine which ones are to be chosen as peripheral settlements.

Some characteristics of the center and its peripheral settlements	Group Classifications I	II	III
Traveling time t (minutes)	60>t	60>t	t>60
Transportation facilities	all means	auto only	none
Road condition	all weather roads	roads with drainage	roads without drainage
Climate	no effect on roads	no effect on auto	closing roads for snow/rain

FIGURE 6. Characteristics of Busing Distance

5. The remaining settlements are identified as remote settlements whose students can be accommodated only in boarding schools.

6. When a school site close to a subprovince border has some peripheral settlements in a neighboring subprovince the border is not a restriction, and those settlements may be included in whichever subprovince is most appropriate.

Figure 7 shows an application of the above algorithm to Bunyan subprovince. This algorithm enables the model implementer to arrange necessary demographic data (center, peripheral and remote settlement populations) to be used in sector equations.

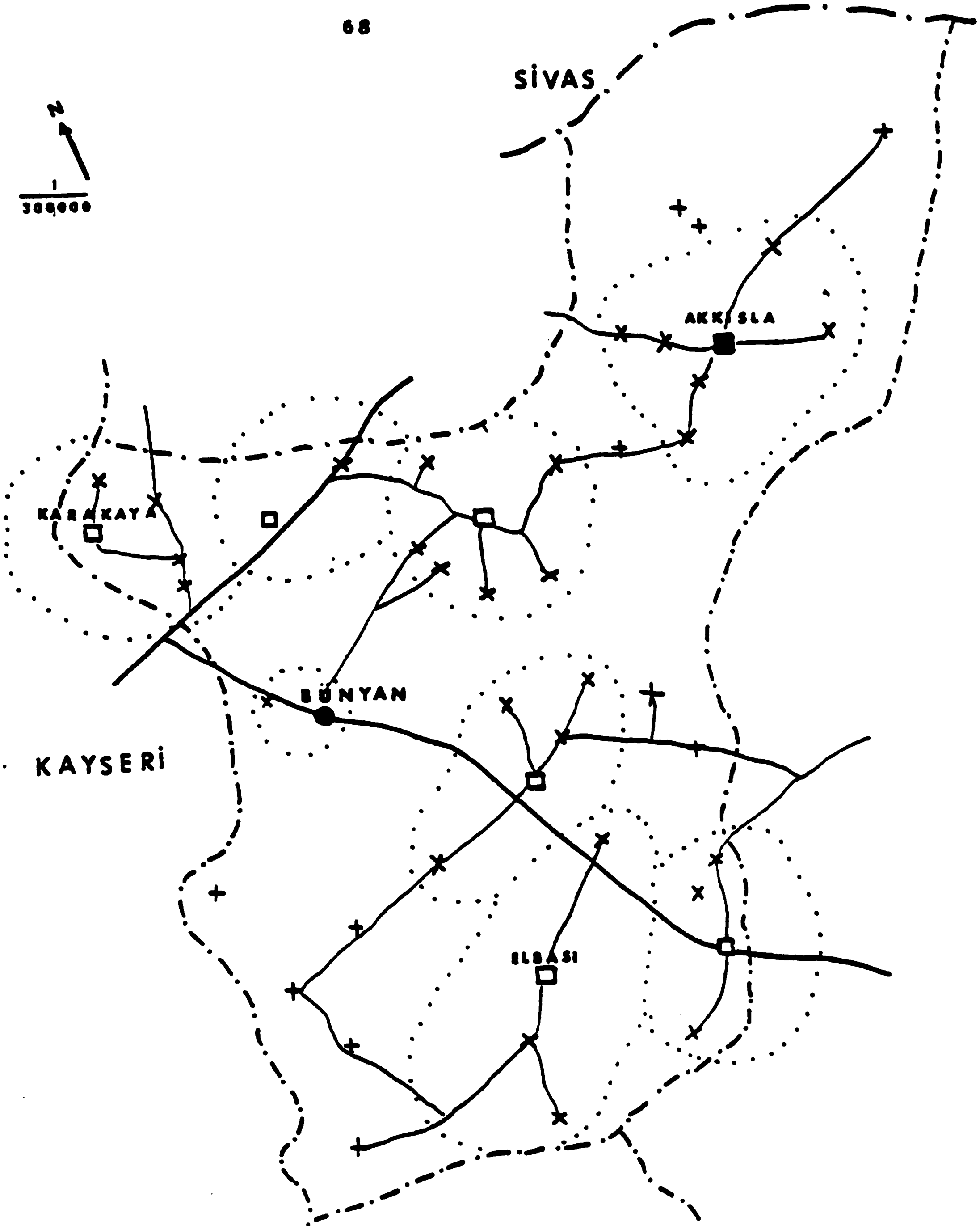

FIGURE 7. Application of Algorithm to Bunyan Subprovince

Symbols for the Figure

—·—	Subprovince border line.
....	Busing distance range to given settlement.
●	Subprovince center city.
■	Settlement with an existing middle school.
□	Possible center for school site.
×	Peripheral settlement of a center settlement.
+	Remote settlement whose students can be accommodated only in boarding school.

The Mathematical Model

In coming paragraphs the equations of the sectors of the model are stated in mathematical form to describe the relationships among the services and resources required, and their costs.

Student Sector

Assumption 1: In rural areas everyone gets primary education.

Assumption 2: Every primary graduate wants to attend middle school, or the government has some means to enforce the attendance.

Assumption 3: Transfer students (who are not busing or boarding students but temporary residents of a center settlement) are omitted from the calculations, because in the long run their number will be minimized when the model is implemented.

The computer program computes the available population of selected centers, peripheral settlements, and the rest of the settlements in a given subprovince by the next equation:

```
pop(k,n) = pop(k,n-1) * (1+br-dr-oum+j*inm-l*invm)
           + m * (art(1,n)*inm+art(2,n))
```

where,

pop(k,n) : n th year population of: center (k=3), peripheral settlements (k=2), remote settlements (k=1), all peripheral settlements (k=5),

br	:	birth rate,
dr	:	death rate,
oum	:	emigration rate,
j	:	1 when k=3 and pop(3,n)>2,000; else -1,
inm	:	immigration rate,
l	:	1/2 when k=2, else 0,
invm	:	migration due industrial investment,
m	:	+1 when k=3, otherwise 0,
art(1,n)	:	inm * (pop(1,n-1)+pop(5,n-1)); number of of people who immigrate to a center when center population is larger than 2,000.
art(2,n)	:	(pop(1,n-1)+pop(2,n-1))*invm/2; number of people who may immigrate to a center after an economic investment,
n	:	represents time (year) in all equations (for complete list of model parameters see Appendix C).

when the computer program shows pop(3,n) + pop(2,n) to be greater than or equal to the threshold population, then it is at year "n" that the construction of a school should be completed for a center and its peripheral settlements.

The model computes the required threshold population for a given set of input parameters by:

$$t = cs*nc / (rg *p) \tag{1}$$

where,

t	:	threshold population [16]
cs	:	classroom size
nc	:	number of classrooms in a middle school,
rg	:	age group as a percentage of total population
p	:	admission rate (policy)

For a threshold population of t, there are pop(3,n)*rag*p local students, pop(2,n)*rag*p busing students, and for a given subprovince pop(1,n)*rag*p students subject to boarding. The system can accommodate some boarding students when the threshold population is short. Entering class size for a combined school is;

$$gradl(1,n) = t*rag*p \tag{2}$$

where,

gradl (1,n)	:	number of students entering the system (the first grade of the middle school at the n th year),
t, p	:	as in equation (1), and
rag	:	relevant primary graduates as percentage of total population.

The student distribution by grades is :

$$gradl(1,n) = gradl(1,n) + gradl(1,n-1) * rp1 \tag{3}$$

$$gradl(2,n) = gradl(1,n-1) * (1-rp1-dor1)+gradl(2,n-1)*rp2$$

$$gradl(3,n) = gradl(2,n-1) * (1-rp2-dor2)$$

where,

gradl(k,n)	:	k th grade level students at the n th year
rp1	:	repeat rate for grade level 1
rp2	:	repeat rate for grade level 2
dor1	:	dropout rate from grade level 1
dor2	:	dropout rate from grade level 2
n-1	:	previous year students in corresponding grade level, if school is opened at the n th year gradl(k,n-1)-0 for k=1,2,3.

The output of this sector is the number of graduates for the n th year:

$$out(n) = gradl(3,n) * (1-dor3) \tag{4}$$

where,

out	:	output (graduates) of the system,
gradl	:	third grade students at the year n, and
dor3	:	dropout and failure rate from grade level 3.

The total number of students in the system in a given year is:

$$totstu(n) = \sum_{k=1}^{3} gradl(k,n) \tag{5}$$

where,

totstu : total students in the system, and
gradl : grade k student at the year n.

This total number of students, which may include busing and/or boarding students, demands sufficient and particular physical facilities and personnel effort.

Personnel Sector

Assumption 1: An adequate stock of manpower exists for staff employment, and the Ministry of Education will train teachers and administrators in required numbers and time.

Assumption 2: The Ministry of Education anticipates and makes up for losses of personnel due to resignation, death or sick leave.

Inputs to the personnel sector are manpower stock, total number of students in the system, number of classified (busing, boarding) students, and control policy parameters to define the required number of personnel units. In the system, the number of administrators (school princpals and their deputies) are identified according to student population and calculated by:

$$tadm = totstu * adm \tag{6}$$

where,

tadm : total number of administrators in a school,
totstu : total students as in equation (5),
adm : number of administrators per student.

There are three groups of teachers in the rural middle school and their numbers are determined by the number of classrooms in the system:

$$tteach = nclas * (g1 + g2 + g3) \tag{7}$$

where,

tteach : total number of teachers in a school,
nclas : number of classrooms in a school,
gk : number of group k teachers per classroom.

The number of faculty in the system is the total from equations (6) and (7):

$$tofac = tadm + tteach \tag{8}$$

where,

tofac : total faculty,
tadm : total administrators as in equation (6), and
tteach : total teachers as in equation (7).

In the system, secretaries, custodians, librarians and laboratory technicians are possible staff members whose numbers are calculated by:

$$daystf = nclas * nds \tag{9}$$

where,

daystf : number of staff working for a middle school,
nclas : number of classrooms in a school,
nds : required number of daily staff per classroom.

Cooks, custodians, staff for maintenance, nurses, and maids are required personnel for the operation of boarding facilities and their number is:

$$borstf = boards * nbos \tag{10}$$

where,

borstf : number of boarding staff
boards : boarding students, and
nbos : number of boarding staff per boarding student.

Drivers and service men are necessary to operate buses, and their number in the system is:

busstf = nobus * nbs (11)

where,

busstf : number of busing staff
nobus : number of buses
nbs : required number of busing staff per bus

The number of staff then is calculated by summing up equations (9) through (11):

tstaf = daystf + borstf + busstf (12)

where,

tstaf : total staff

The number of personnel in the system is the combination of equations (8) and (12):

toper = tofac + tstaf (13)

where,

toper : total person in the system

<u>Physical Facilities Sector</u>

<u>Assumption 1</u>: The Ministry of Education will supply instructional materials to every middle school with at least one set of items for each of the following subjects: physics, chemistry, biology, library, workroom,

and physical education.

<u>Assumption 2</u>: School buildings are constructed according to a proposed school size population, but the design is flexible enough that about 40 percent in addition to the regular population can be accommodated without any change in physical facilities.

Inputs to the physical facilities sector are the total number of local-busing-boarding students, the number of support personnel, and parameters to identify required units of facilities. Land is necessary for constructing buildings, outside school activities and recreation (school garden). The garden area proportional to the student population is determined by:

$$tgard = totstu * ag \tag{14}$$

where,

tgard : total required garden area (areas are given in square meters),
totstu : total students as in equation (5), and
ag : garden area per student

School buildings are composed of classrooms, restrooms, offices, library, warehouse, workroom, stairs, etc. In addition to school buildings, the system may have a garage area when there is busing, and dormitories, canteen, and showers when there are boarding facilities. First, the classroom area is calculated by:

$$tclar = nclas * cs * acl \tag{15}$$

where,

tclar : total classroom area,
nclas : number of classrooms in a school.
cs : number of students per classroom, and
acl : classroom area per student

And second, remainder of the required building area is calculated by:

ebuldl = totstu*aes+ boards*abo+ nobus*ab + toper*ap (16)

where,

ebuldl : extra building area,
aes : extra area per student
boards : number of boarding students
abo : area per boarding student
nobus : number of buses
ab : area per bus
toper : total persons as in equation (13)
ap : area per person

The then total building area is the sum of equations (15) and (16),

tbuild = tclar + ebuildl (17)

where,

tbuild : total building area,

And the total land area is:

tland = tgard + tbuild (18)

where,

tland : total land,

<u>Cash Expenditures</u>

<u>Assumption 1</u>: All faculty are trained by the Ministry of Education.

<u>Assumption 2</u>: Although personnel salary varies according to a person's educational background, type of profession, and years of experience, here, an average monthly salary is used for every person in the system.

<u>Assumption 3</u>: Overtime work is paid on an average daily basis.

This section computes the cost of the rural middle school education. In order to determine the unit cost of rural education, cash expenditures and prorated investment cost are computed. Cash expenditure is the money paid for services and for consumer goods. It includes salaries of personnel and the operational costs of "daily", boarding, and busing facilities. Expenditures for all personnel services includes salaries, overtime payments, and benefits (travel, medical care etc.). They are calculated by:

$$\text{casper}(n) = \text{toper}+\text{emi}(n)+\text{toper}*\text{nowd}*\text{eein}(n) +\text{toper}*\text{be}(n) \qquad (19)$$

where,

casper	:	cash expenditures for all personnel services costs are given in Turkish lira-TL),
toper	:	total personnel as in equation (13),
emi	:	montly income per person,
nowd	:	number of school days in a year,
eein	:	overtime payment per day, per person, and
be	:	benefits per person.

Cash expenditures for all electricity, water, mailing, miscellaneous items, minor repairs etc. Are necessary to keep schools in operation every day. There are additional cash expenditures for food, clothing, repairs, allowance for students in boarding facilities, and for gasoline and bus repair when there is busing service. The total operating cost for schools is calculated by:

```
operc(n) = totstu*daomc(n)+borads*bomc(n)
         +nobus*nowd*buomc(n)                    (20)
```

where,

operc	:	cash expenditures for total operation,
totstu	:	total students as in equation (5),
daomc	:	operation-maintenance cost per daily student
boards	:	number of boarding students,
bomc	:	operation-maintenance cost per boarding student
nobus	:	number of buses,
nowd	:	number of school days in a year,
buomc	:	operation-maintenance cost per bus

Prorated Cost

The prorated cost is the annual depreciation rate of capital investment over the life of the durable goods (land, buildings, materials). First the total investment cost is calculated, thèn the prorated cost. Investment in building, land, and buses is calculated by:

```
bulinvc(n) = tbuild * cc(n)                      (21)
```

where,

bulinvc	:	investment for building constructions,
tbuild	:	total building area as in equation (17),and
cc	:	construction cost at the n th year per sq. m.

```
laninvc(n) = tland *lc(n)                        (22)
```

where,

laninvc : investment on land,
tland : total land as in equation (18),and
lc : land cost per sq. m.

$$businvc(n) = nobus * buc(n) \tag{23}$$

where,

businvc : investment on bus,
nobus : number of buses, and
buc : bus cost per bus

Different durable goods are required by different types of operations. Beds, mattresses, canteen facilities and clothes are some of the materials which are needed for boarding facilities. Service-repair tools are needed for busing operations, and desks, chairs, typwriters, etc., are some of the materials needed for school facilities. Their costs are calculated below as investment in boarding, busing, and local/combined facilities:

$$borfic(n) = boards * bouc(n) + borstf * ucp(n) \tag{24}$$

where,

borfic : investment in boarding facilities,
boards : number of boarding students,
bouc : boarding utility cost per boarding student
borstf : number of boarding staff as in equation (10),
ucp : utility cost per person

$$busfic(n) = busstf * ucp(n) + brk \tag{25}$$

where,

busfic : investment in busing facilities,
busstf : number of busing staff as in equation (11),
ucp : utility cost per person
brk : cost of repair tools.

```
dayfic(n) = totstu * ucs(n) + (daystf+tofac) * ucp(n)

          + set                                        (26)
```

where,

```
    dayfic  :  investment in local school facilities,
    totstu  :  total students as in equation (5),
    ucs     :  local/combined utility cost per student
    daystf  :  local school staff as in equation (9),
    tofac   :  total faculty as in equation (8),
    ucp     :  utility cost per person
    set     :  cost of library, workroom, physics, biology,
               etc., materials.
```

```
tofacic(n) = borfic(n)+busfic(n)+dayfic(n)             (27)
```

where,

```
    tofacic :  investment in total facilities,
```

```
tofainv(n) = tofac(n) * tetc                           (28)
```

where,

```
    tofainv  :  total investment to produce teachers,
    tofac    :  total faculty (teachers and administrators),
    tetc     :  teacher training cost.
```

The prorated cost of investment is calculated:

```
procost(n) = bulinvc(n)*bd +businvc(n)*busd +tofacic(n)*fd

           + tofainv(n)/25 + tland/50                  (29)
```

where,

```
    procost  :  prorated cost of investments,
    bulinvc  :  investment for building constructions,
    bd       :  depreciation value of buildings,
    businvc  :  investment on bus,
    busd     :  depreciation value of buses,
    tofacic  :  investment on total facilities,
    fd       :  depreciation value of facilities,
    tofainv  :  total investment to produce teachers,
```

<u>Unit Cost</u>

To find the unit cost for rural education per student, the current cost of education is calculated including cash expenditures and prorated cost by:

$$cucoed(n) = casper(n) + operc(n) + procost(n) \qquad (30)$$

where,

cucoed : current cost of rural education.
casper : as in equation (19),
operc : operation cost as in equation (20),
procost : as in equation (29).

and unit cost of educational services per student is then:

$$ucpst\ (n) = cucoed(n) \ / \ totstu(n) \qquad (31)$$

where,

ucpst : unit cost (TL) of educational services per student.

Summary

The Law of Basic Education requires expansion of five year education into eight years and is supported by Turkish educators and the Turkish State Planning Organization.

The Turkish education system does not provide equal educational opportunities nor adequate development of rural people.

A model has been developed to represent an educational system for rural areas. It is applicable to an individual school, subprovince, and province for definitive descriptions of the resources required for expansion. The program reads its input data, then computes the required resources and outputs of its three sectors (student,physical facilities, personnel), and related investment and operation costs. It may be used to carry out experiments by changing some of the parameters (rp1, dor1, cs, pi, etc.,), and possible school sites for a given run, in order to understand the expansion problem better.

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[16] William T. S. Gould, Guidelines for School Location Planning- World Bank Staff Working Paper No. 308. Washington D.C.: the World Bank, 1978.

CHAPTER IV

APPLICATION OF THE MODEL

The model is useful for studying a variety of situations from the operation of an individual school, through planning for all schools in a settlement, subprovince, or at the national level, by summarizing results of the lower levels.

While the development was motivated by and designed for studying the expansion of education facilities for rural people, it can also be applied to an urban center by identifying corresponding demographic data as local, peripheral, and remote populations for that urban center.

A province, with its subprovinces and their settlements and individual schools, is the most general case for an experiment. There are many possibilities for experiments for a given situation. Some of the following variables: classroom size, school size preference, population, student distribution rates, cost related parameters, and distribution of possible school sites in a given subprovince etc., can be considered constant and others changed for each experiment.

Typically, one would select a province for study, use the six-step algorithm developed in Chapter III to identify existing and potential school sites and populations for the given situation, then design an experiment using the model to carry out the calculations.

A variety of information such as school size, required number of personnel, plus costs of operation, land, buildings, utilities and maintenance (see Table C in Appendix C), and similar information for busing and boarding services (see Tables B-1 and B-2 respectively in Appendix C) is used to determine the cost for each school in the experiment. The program then selects the opening dates for schools at each site. At the subprovince level the results from these individual schools are then aggregated from the year they commence operation (see Tables T and Y in Appendix C).

The expansion to a province is then a summary of one or more subprovinces, and by taking each province of Turkey into consideration the total picture for the country can be obtained.

Application to a Province

In this chapter, several cases are presented in the form of an experiment to illustrate the utilization of the model. This experiment uses Kayseri province and its subprovinces. Kayseri, one of the 67 provinces in Turkey, is located southeast of the Capitol, Ankara, almost in the middle of the country with high plateau terrain.

Major sources of income for the more than one half million people in Kayseri, are the textile, carpet, and food industries and the use of land for cereals, sugar beets, grapes, and livestock production. The industries are located mostly in and around the province center city (also called Kayseri).

In order to keep this illustration to a reasonable size, it is assumed that Kayseri has three subprovinces, Bunyan (with actual demographic data) and two hypothetical ones Subpr2 and Subpr3. Some information about Bunyan is given in the following sections. For the other two subprovinces the data is identical to Bunyan except school size preference and bus costs, which are changed in order to examine their effects on costs. Thus several subprovinces and centers are included to illustrate how individual school data can be aggregated to the province level, but similar centers are used to illustrate cost comparisons under different considerations.

Bunyan

Bunyan has about 36,000 rural people who need middle school facilities, a situation common to other subprovinces. Rural people of Bunyan, like many other Turkish rural people, are engaged mainly in agriculture, and there is also some rug making.

There are several possible school sites with a population of 2,000 or more (see Figure 7). Using the six-step algorithm to identify school sites and potential students, rural Bunyan is found to have three center settlements. Settlement Akkisla has an existing middle school, and two other settlements Elbasi and Karakaya, are assumed to have identical local and peripheral populations. In order to show how the model responds when there is a high population increase in a center, it is assumed that there will be some kind of economic investment, generating a population increase in Elbasi, but no investment for Karakaya, so as to understand the effects of such an investment.

Input for the Experiment

A computer description of the experiment is represented on several data cards by the experimenter (Appendix B), and is illustrated below with actual data from this experiment. Most of the necessary data have been gathered from governmental publications, and educated guesses are used for the rest. The first data card indicates the level (province, subprovince, etc.) of the study, the length of the simulation period (20 years here), and the province name. The second card identifies the physical design characteristics that have been specified for a school and their values are displayed in Appendix C. The third card is the subprovince head card and contains:

0.055	birth rate,
0.025	death rate,
0.040	immigration rate to rural centers,
0.060	emigration rate to urban or other rural centers,
0.094	primary graduates as ratio to total population,
1	build larger school first (size preference),
5	Bunyan has one settlement with middle school,
2	there are two possible school sites,
3	there are 3 rural centers,
15155	remote population,
12659	total peripheral population,
Bunyan	subprovince name.

The fourth card contains the yearly admission rate, and for this experiment it is 40 percent for the first five years, 60 percent for the next five years, and 75 percent for the rest of the simulation period. The fift hand sixth cards have cost characteristics (cost of land, building, utilities,etc.) plus student progression rates. The seventh card, for the settlement Akkisla contains:

Akkisla	name of the center(has a school),
2799	local population,
4129	peripheral settlement population,
0.04	immigration rate to center,
0.060	emigration rate to other centers,
0.000	immigration due to investment,
25	no investment (when it is more than 20),
108	students in first grade of existing school,
197	total student population in school,
0.85	ratio of local to total first grade students.

The eighth card is for the center of Elbasi and contains:

Elbasi	name of the center (possible school site),
2685	local population,

4265	peripheral settlement population,
0.040	immigration rate to center,
0.060	emigration rate to other centers,
0.05	immigration due to investment,
2	year in which investment will begin.

The last card for the subprovince Bunyan is the card for the center of Karakaya and contains:

Karakaya	name of the center (possible school site),
2685	local population,
4265	peripheral settlement population,
0.040	immigration rate to center,
0.060	emigration rate to other centers,
0.00	immigration due to investment,

Output

The computer report (see Appendix C) displays the data card information and a set of tables with costs and needs for each school center in the experiment (see Appendix C for the table headings and tables). The following sections summarize this experiment.

Table 3 contains the results for Akkisla showing the population of remote, peripheral, and center settlements, and their primary graduates (boarding, busing and local students, respectively) at annual intervals over the simulation period.

TABLE 3

Population and Number of Primary Graduates for Akkisla
(extracted from Table A-1 in Appendix C)

Population of	Simulation Years 1	2	3 ..	11	12	13 ..	17
remote	15,155	14,094	12,189	7,331	6,817	6,339	4,741
periph.	4,129	3,839	3,570	1,995	1,855	1,725	1,288
center	2,799	2,869	2,999	3,395	3,446	3,495	3,684
primary graduates subject to:							
boarding	569	529	492	516	480	446	334
busing	138	127	117	123	113	104	73
local	13	15	18	147	150	154	167

The threshold population of Akkisla is large enough to support an expansion of the existing school facilities (with an entering class of 108 students), to a medium size school (an entering class size of 280), giving 172 new places for the entering class.

The number of primary graduates reaches the threshold for expansion in year 11, so the expansion should be completed no later than the beginning of the 11th year for 73 busing and 147 local students (Tables B-1 and C). Busing services are provided for 73 students, corresponding to year 17 when the declining rural population has decreased to 1/3 of its original value.

Tables 4 and 5 display the expansion requirements and costs (Turkish liras, TL) for busing or boarding services for the corresponding years. To provide busing services for 73 pupils during the first year of operation, one bus and one person are needed (Table 4). About 2,000,000 TL must be spent to provide a bus, garage, and land, plus another 530,700 TL for operation during the first year of schooling. On the other hand, boarding facilities for the same number of pupils would cost 485,300 TL for investment and 1,256,400 TL for operation (Table 5).

TABLE 4

Busing Results for Akkisla
(extracted from Table B-1 in Appendix C)

Simulation Year	Bused Students	Investment Cost	Operation Cost	Busing Staff	Buses needed
11	73	2,081,700	530,700	1	1
12	132	6,248,100	1,592,100	3	3
13	182	9,232,800	2,122,800	4	4

TABLE 5

Boarding Results if Busing Students Are Boarded
(extracted from Table B-2 in Appendix C)

Simulation Year	Boarded Students	Investment Cost	operation Cost	Boarding Staff
11	73	485,300	1,256,400	2
12	132	875,700	2,222,100	3
13	182	1,213,100	3,133,500	5

the computer program compares busing and boarding costs for the same number of students. The computed cost per student (based on prorated investment costs over the lifetime of capital goods plus annual operation costs) for busing(17,027 TL) is less than the boarding cost (17,381 TL), therefore busing is chosen over boarding (see Appendix C for Akkisla). Besides the busing and/or boarding costs, all students need classrooms, teachers, etc. Table 6 displays the requirements for educating the 220 new students for the 11th year and afterwards in Akkisla (220 enrollments for 172 available places).

TABLE 6

Results of Expansion in Akkisla
(extracted from Table C in Appendix C)

Simulation Year	Total Students	Investment Cost	Operation Cost	Staff	Faculty	Class rooms
11	220	4,241,400	3,058,500	1	6	4
12	397	6,223,825	5,627,000	2	8	8
13	551	8,095,325	7,900,500	3	12	12

Some students were not accommodated even after the expansion of school facilities in Akkisla (see, Table 7). Since toward the end of the simulation period, there are not enough students (local and busing) to justify another school in Akkisla, the computer program adds those students into the boarding population after the opening year of the new school, and moves to the next settlement center, Elbasi.

TABLE 7

Unaccommodated Primary Graduates
(extracted from Table A-2 in Appendix C)

Students of	Simulation Years 1	2	3 ...	14	15	16	17
Boarding	569	529	492	415	386	359	334
Busing	138	127	117	23	15	7	0
Local	13	15	18	0	0	0	0

Because of the assumption of investments in Elbasi, the computer program gives a different center and peripheral population distribution for Elbasi than Karakaya. Table 8 compares this distribution in the two settlements for selected years.

In the experiment this population difference is reflected in the size of required schools and their busing and local population. For Bunyan, the school size preference was to build the larger one first, so the computer program searches threshold population according to the desired school size. There is a threshold population of almost 10,000 for Elbasi around the 15th year, compared with about 5,000 threshold population for Karakaya. At the 11th year a maximum size combined school with busing facilities for 62 pupils in Elbasi and one medium size combined school with 93 busing students in Karakaya are necessary. The larger boarding population reported for Karakaya for years 15 and 16 is due to the unaccommodated population from Elbasi.

TABLE 8

Population Comparison Between Elbasi and Karakaya
(extracted from Table A-1 for Elbasi and Karakaya)

	Simulation Years					
	11	12	13	11	12	13
Population of		Elbasi			Karakaya	
Peripheral	1,596	1,446	1,310	2,060	1,915	1,780
Center	6,813	7,109	7,390	3,269	3,318	3,366
Boarding	516	520	477	616	559	507
Busing	112	101	92	145	135	125
Local	480	501	520	230	233	237

When there are large numbers of unaccommodated remote settlement students, the computer program reports additional boarding results. First, it displays the number of unaccommodated primary graduates who are subject to boarding in the subprovinces of Kayseri. Second, it displays the information for constructing a maximum size boarding school (see Appendix C) to accommodate those students.

Table 9, extracted from (Table T of Bunyan, shows the total subprovince enrollment and costs for selected years. For the first simulation year, the entering class facilities of a combined school are provided for 13,030,175 TL investment and 18,788,800 TL operating costs. At the 11th year three more schools with busing facilities and personnel are provided for Bunyan with corresponding costs. No more schools are opened during the balance of the experiment term.

Two maximum and one medium size schools (one with boarding, two with bus facilities), and one expansion of an existing school (with busing services), are required in order to admit 75 percent of the eligible students into middle schools in rural Bunyan, during the simulation period for this experiment. Types and number of places provided in Bunyan are displayed in Figure 8, and their unit costs per year in Figure 11.

TABLE 9

Yearly Totals for Subprovince Bunyan

Sim Yr	Bus Stu	Board Stu	All Stu	Total Cost of Investmt	Total Cost of Operation	No of Sch	No of Stf
1	0	525	525	13,030,175	18,778,800	1	34
2	0	949	949	21,913,475	34,079,100	1	63
3	0	1.320	1.320	29,626,630	47,532,300	1	89
6	0	1,320	1,320	0	47,532,300	1	89
11	228	1,320	2,297	28,102,375	67,563,900	4	127
12	410	1,320	3,086	49,677,850	84,827,700	4	161
13	567	1,320	3,773	68,639,575	99,404,400	4	192

For Subpr2 to admit 75 percent of the primary graduates during the experiment term, an expansion of old school facilities is necessary at the 11th year as in Bunyan, plus ten minimum size new schools in different years, six with busing and four with boarding services.

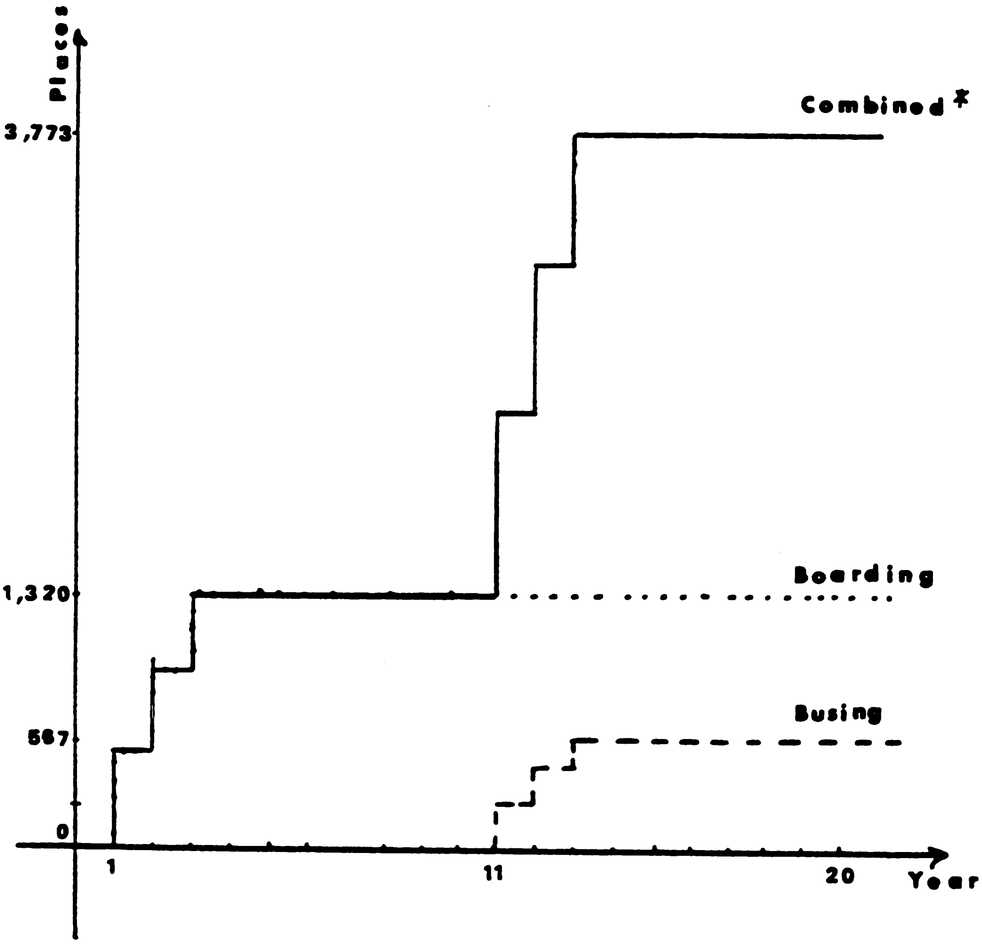

FIGURE 8. Number of Places Provided in Bunyan

* Combined : Boarding+Busing+Local

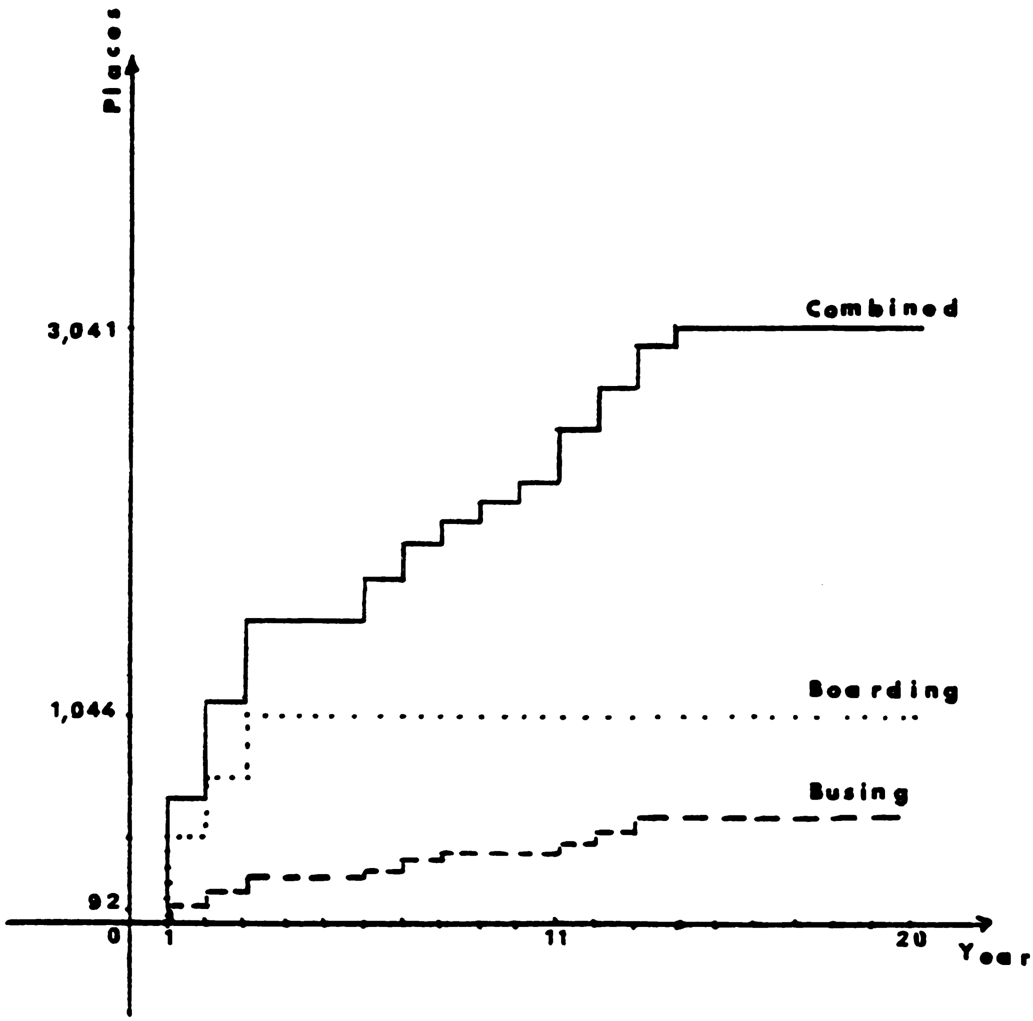

FIGURE 9. Number of Places Provided in Subpr2

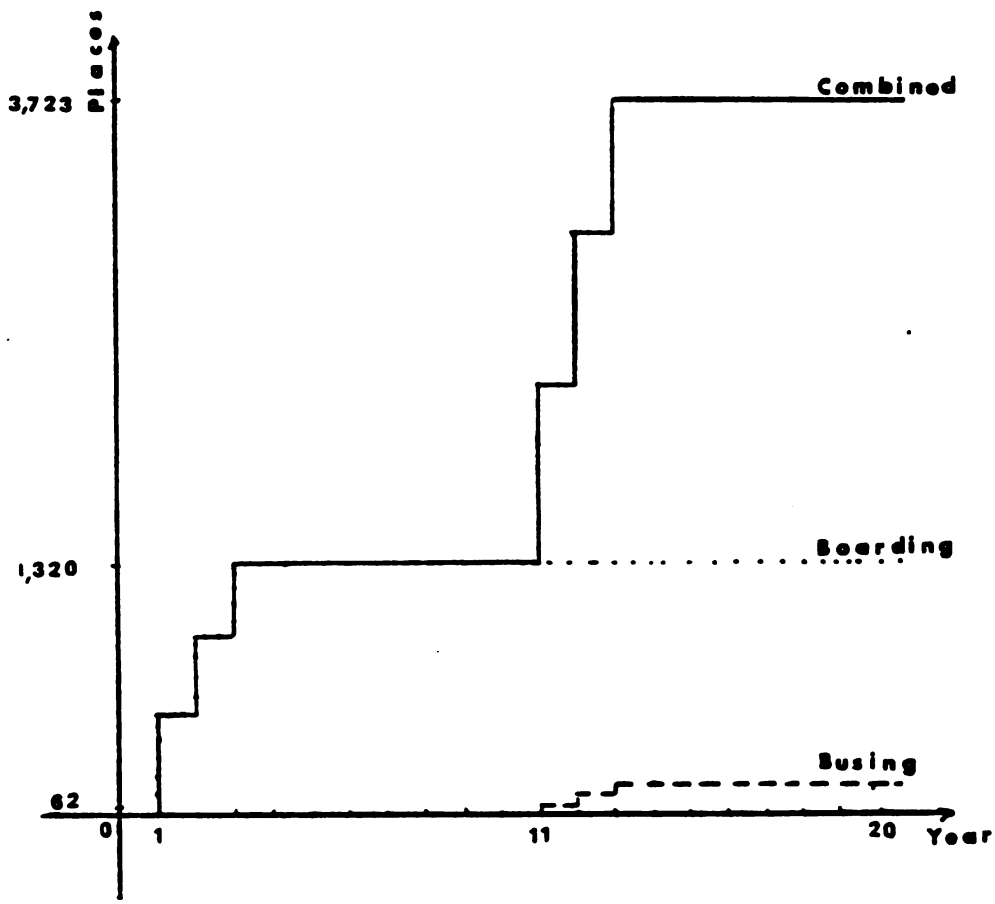

FIGURE 10. Number of Places Provided in Subpr3

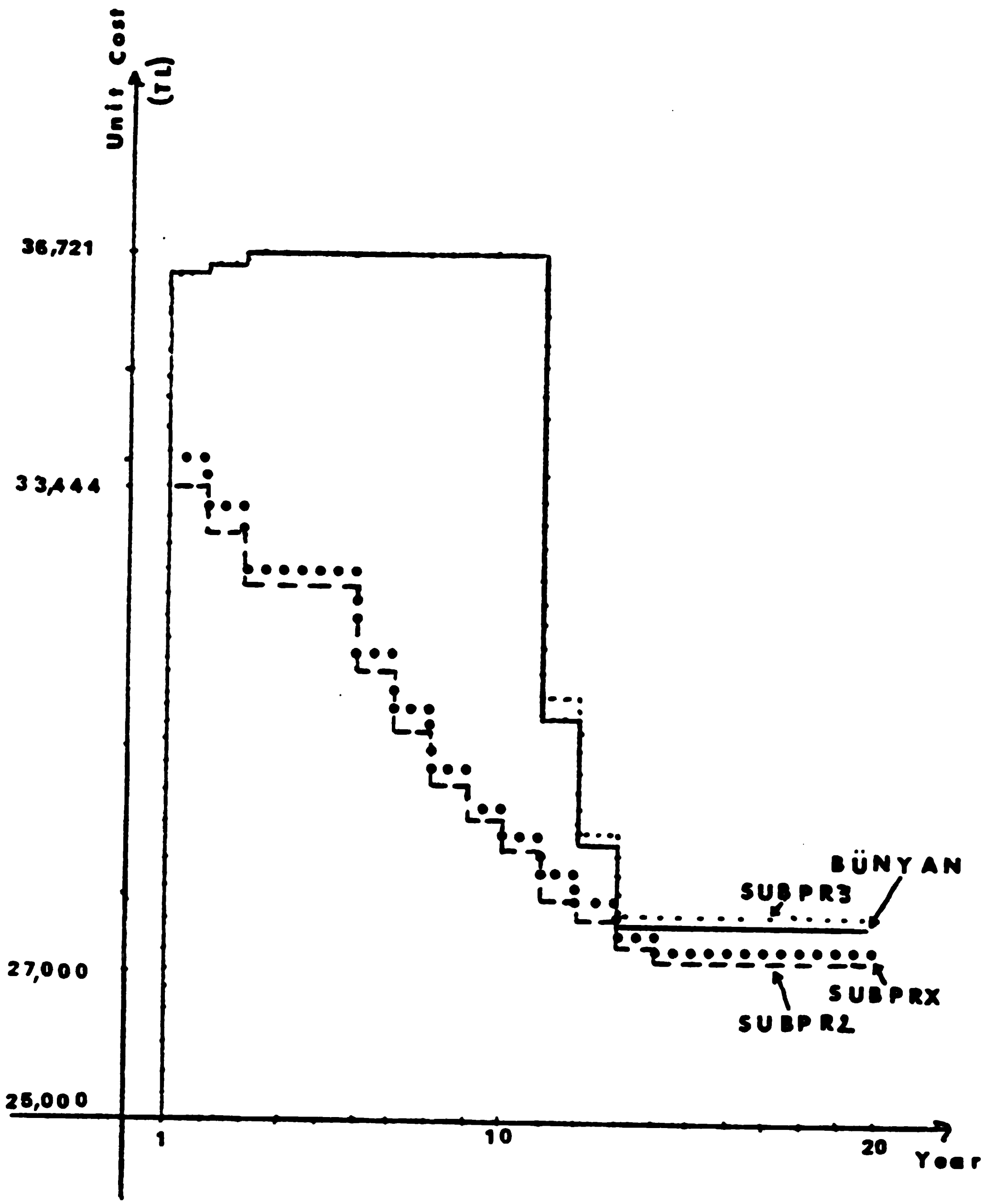

FIGURE 11. Unit Cost of Education

Table 10, extracted from Table T of Subpr2, displays information similar to Table 9. Differences are due to the preference of building smaller size schools in Subpr2. Consequently, more schools are needed and openings occur in earlier years of the simulation. For Subpr2 ten minimum size schools can do what two maximum and one medium size schools can for Bunyan, and with less cost (see Figures 8 and 9).

TABLE 10

Yearly Total for Subprovince Subpr2

Sim Yr	Bus Stu	Board Stu	All Stu	Total Cost of Investment	operation	No of Sc	stf
1	92	420	630	28,064,850	20,076,600	6	38
2	166	756	1,134	41,008,850	35,532,000	6	60
3	228	1,044	1,566	50,891,650	48,126,000	6	80
6	275	1,044	1,776	9,116,050	52,572,300	8	99
11	417	1,044	2,521	15,956,775	66,818,400	10	112
12	476	1,044	2,765	23,989,100	72,401,100	11	123
13	526	1,044	2,969	29,936,000	76,661,700	11	131

Table 11 extracted from the Table T of Subpr3, displays another set of information similar to Table 9. Differences occur due to higher bus costs in Subpr3, resulting in the selection of boarding over busing services. Here at the 11th year, 3 combined schools are required, but instead of having bus services for three of them as in Bunyan, just one will have busing service, and the other two will have boarding facilities (see Figures 8 and 10).

TABLE 11

Yearly Totals for Subprovince Subpr3

Year	Bused Stu.	Boarded Student	Combined Student	Total Investment	Cost of operation	Number of Sch	Staff
1	0	525	525	13,030,175	18,778,800	1	34
2	0	949	949	21,913,475	34,079,100	1	63
3	0	1,320	1,320	29,626,630	47,532,300	1	89
6	0	1,320	1,320	0	47,532,300	1	89
11	62	1,486	2,297	23,453,875	68,822,100	4	128
12	111	1,619	3,086	38,088,250	86,318,400	4	162
13	154	1,733	3,773	52,342,875	101,823,300	4	194

After the subprovince totals, the computer program provides final tables displaying available student places and their unit costs for every simulation year. Figure 11 displays these unit costs per place for the three subprovinces of Kayseri.

Finally, after the subprovince reports, the computer program gives province results for Kayseri in the same format as the subprovinces.

Evaluation of the Model

According to the results of Tables 9-11 and Figures 8-10 for this experiment, 10 minimum size schools can accommodate as many students as two maximum and one medium size schools. There would be several advantages in building smaller schools; (1) more facilities are provided and in earlier years (Figure 9), (2) school construction is spread more evenly throughout the experiment term, (3) operation costs are lower (because operation cost computation is proportional to the school size), (Figure 11 for Subpr2), and (4) instead of building one large boarding school in one location, four boarding schools in four different locations are constructed which should serve rural people better.

Cost differences for middle school facilities depend on the size of the schools and the types of services provided. In general, investment costs are lower than operating costs. A comparision between busing and boarding shows that investment costs are lower for boarding than for busing; on the other hand, the operating cost of busing is less than boarding (Tables 9-11).

In order to see cost versus type-of-service relations, another experiment was carried out. This time it was assumed that minimum size school construction is preferred in Subpr3 too. Unit cost results of this experiment are displayed in Figure 11 under Subprx. It shows that even with higher bus costs, providing a smaller school is still less expensive than the larger size schools in Bunyan.

As in this last case, various experiments can be conducted to answer new questions or questions that arise from earlier experiments. In other cases, in order to carry out new experiments (for instance, to see the effect of changing bus costs for each different year of the experiment) the computer program has to be modified.

From the output of a single experiment, many questions can be answered for a given situation. Such information includes:

1. The population of the center, peripheral, and remote settlements and the number of primary graduates.

2. The year in which a school should be built.

3. Selection of the center settlement (where to build a school).

4. The kind of school to build (local, busing, boarding).

5. The required resources (personnel, facilities).

6. Expenses by various categories.

7. Cost differences when buses, land, building construction, or boarding are provided by the local people.

Utilizing a different set of experiments with a new set of parameters, the model can provide answers to additional questions. Some typical questions would be:

1. What happens if student progress rates are changed?

2. What happens if migration trends are different?

3. What if there is a new investment?

4. What if school size is different?

5. What if different peripheral settlements are chosen as school sites?

These kinds of questions could be used: (a) to understand the overall system and its components better, (b) to identify where critical decisions have to be made, and (c) to identify the kinds of data that are required.

To obtain reliable results calls for experiments with reliable data. School and cost characteristics may use nationwide averages, but for student distribution in different grades, demographic information, and rural migration characteristics, there should be specific data representing each subprovince. This requires a data collecting agency or additional research to gather the information.

Summary

The computer program reads given input data, then calculates a variety of descriptive outputs for each new and existing school within the geographic boundaries of a subprovince, and summary totals for each subprovince and province in the experiment.

The model has been applied to Kayseri province to show its utilization in a country like Turkey. Each experiment provides information about where to build schools, their types and year of opening, resource requirements of personnel, space, equipment, and cash flow in order to expand middle school facilities in rural parts of the country.

The model is a potential tool for decision makers in planning and studying the costs of providing additional school facilities in rural areas.

CHAPTER V

SUMMARY AND CONCLUSION OF THE STUDY

This Chapter is an overall summary of the preceding four chapters and is a general overview of a systems approach to identify, analyze, and search for solutions to the expansion of school facilities in rural Turkey.

Introduction to the Problem

The Turkish Constitution holds the state responsible for providing its citizens with educational facilities. The Ministry of Education carries out this responsibility by two main operations, the administration of its components and the production of materials and trained personnel (Figure 1).

Secular and coeducation in Turkish education is designed as a step on a ladder to further education, but the system is not able to meet the educational needs of rural people and provide equal opportunities in education.

The Law of Basic Education requires the expansion of five-year education into eight-year education, and the third five-year plan aims at expanding enrollment in middle schools from 40 to 75 percent in two decades.

Purpose of the Study

The main purpose of this study has been to develop a model with which to examine the costs of expanding the existing school system to one providing eight years of schooling for rural people. A systems approach technique has been utilized to generate a model which can be used to (1) investigate the cost of expanding school facilities and personnel in rural settings and (2) study some alternative solutions to these expansion problems.

Operational Working Procedures

In the process of developing the model, the following 5 operational working procedures were used: (1) needs analysis to provide a description of the required output, (2) system identification to form a link between the needs and solutions, (3) problem formulation to develop an explicit statement of what the system must provide, (4) generation of system alternatives to provide different ways of structuring the system, and (5) simulation to test alternatives utilizing the computer.

Review of Literature

A review of literature was carried out to present the systems approach as a methodology for solving educational problems. What may be drawn from the review of literature in Chapter II is summed up as follows.

Systems Approach Concept

The systems approach is a scientific procedure to describe, analyze, predict or at least obtain some knowledge of a system. It is an explicit description of procedures for representing objects as a system and of methods for their investigation.

The technique of a systems approach can be stated as comprising three elements: (1) analysis, (2) design, and (3) documentation. One of the advantages of the technique is attempting to model the real world.

Systems Approach in Education

The emphasis in educational literature on the use of the systems approach has been on instruction and administration, which includes the areas of school finance, personnel management, and school facilities.

A school is recognized as a system since it has the following six elements found in all systems: (1) sets of interrelated objects, (2) environment, (3) input, (4) process, (5) output/outcome, and (6) feedback.

A Systems Approach

In Chapter III, a systems technique is utilized to investigate the costs of providing facilities and personnel for eight year schooling in rural areas. This Chapter could be summarized as follows.

Needs Analysis

There are more than 40 million people in Turkey, most of them living in rural areas (Table 1). Rural people are illiterate and poor. There is a scarcity of resources, and the allocation of available resources to education is inadequate. There are a large number of primary graduates and a scarcity of middle school facilities in rural settings. The enrollment ratios drop from 90 percent of the primary age group to only 40 percent of the middle school age group (Table 2, Figure 2).

Eight years is presently accepted as the compulsory level of education for the Turkish people by Turkish educators and the State Planning Organization, and that is what is required by the Law of Basic Education.

Since the Turkish education system is now neither able to meet the educational and development needs of rural people, nor to provide educational opportunities, there is a major need to expand school facilities in rural areas.

System Identification

Interacting variables of the rural middle school system which form a link between the needs and a solution to some expansion problems have been identified. These interacting variables are categorized according to their role and effect in the system as system input variables, output variables, and design parameters (Figure 3).

Problem Formulation

To formulate the problem, interacting variables were studied in detail. In order to keep the model within workable limits certain variables are assumed to be constant or controlled independently, and are omitted from the model of Figure 3. Omitted variables include legislative, cultural, political, and taxing considerations. Variables which are included then are represented by actual data when available, and educated guesses for the remainder.

The problem statement then is: (1) expand middle school facilities for rural people in such a way that 75 percent of the rural primary school graduates can be accommodated by the year 2000 A.D., and (2) determine desirable school locations and types.

Generation of System Alternatives

Several types of schools proposed for rural education are: (1) local, (2) busing, (3) boarding, (4) combined, (5) broadcasting, and (6) mobile schools. However two of them, broadcasting schools and mobile schools, are omitted from consideration here, broadcasting schools because of economic restrictions for construction, and mobile schools because of some unique characteristics that require different model treatment.

Simulation Model

A model is developed to describe the rural education system as a collection of four components (sectors): student, personnel, physical facilities, and control (Figure 4). It is a mathematical model designed to describe the resources required to produce middle school graduates in rural settings.

A six-step procedural algorithm was developed to define possible school sites and potential students (boarding,busing, local) in a subprovince (Figure 5 and 6).

The model reads data that describes each school site, subprovince and province, then gives a variety of outputs for each school. Subtotals are then aggregated to the subprovince and province levels.

Application of the Model

The model developed for this study simulates the expansion of rural middle school education over a time period that can be of any selected length. Loaded into the computer, the model accepts parameters of school and cost characteristics and the demographic information produced by the application of a six-step algorithm. With these inputs the model computes and reports the resource requirements of staff, space, materials and money.

The model developed in Chapter III was applied to the province of Kayseri. For every experimental run, various tables were obtained for each school site in the experiment (Appendix C). Tables provided by the computer output give cost and needs information for each busing, boarding, and combined school. For primary graduates who are not accommodated by existing or planned schools, additional boarding results are reported for each subprovince in the experiment. Aggregate information is given for each subprovince and province.

The essential aim has been to develop a model and show how to use it. Data accuracy has been of secondary importance and the findings do not reflect the true situation in Kayseri province, but only that there are several ways to use it.

For each potential school site, and given the long-term population parameters and resource data, the model will directly determine whether additional facilities are needed and, if so, the year in which the school should commence and the type and size of the school which should be constructed.

For each school construction or expansion, the model calculates the comparative costs of busing versus boarding non-local students so as to fully utilize the new facilities and selects the school type which will have the lowest unit cost per student.

For each subprovince, the model reports a summary of resource requirements for boarding schools to accommodate those students who could not be placed in the local schools.

For each new facility, the model presents the investment and operating costs, personnel, land use, and other resource requirements, then reports the subtotals for all new facilities at the subprovince and province levels.

The model can be used to conduct a series of experiments by changing the values of some parameters and examining the output reports to determine trends, search for minimum and maximum costs, total enrollments, personnel requirements, etc., under selected conditions.

By just trying to use the model, it is possible to identify the type and accuracy of data that is required to answer questions about costs and resources. This can provide guidance to government agencies for developing a data base, or suggest special studies to develop reasonable assumptions where actual data is not available.

Even with the limited data available for Kayseri, it is apparent that different sizes and types of schools are required for different conditions of population, terrain, economic base etc.

Conclusion

It is hoped that this study may serve to encourage widespread applications of systems approaches to educational problems in Turkey. There is evidence in the literature that the systems approach has been successfully utilized in education problems in many areas from administration to instruction. Benefits of this technique are that it enables (1) looking at a problem from a broad point of view since the interacting components must be identified, (2) simulating the real world by way of modeling, (3) providing a methodology for problem solving and (4) allowing decision makers to see alternative ways of doing things.

In Turkey and developing countries, the systems approach may play an important role in the usage of limited resources by providing the best combination of capital, machine and energy. When there is a concern for a new organization or reorganization, or when there is a problem related to any component of an education system, at any level, this technique can be useful in searching for solutions.

The model can help decision makers at any level of administrative structure in Turkey, from subprovince to central government. By following the steps in Appendix B, governments of other countries, even individuals who want to consider opening a private school, can utilize this model. Provincial authorities at subprovince and province levels, can use this model for middle school expansion in their rural regions. The State Planning Organization and planning units in the Ministry of Education can use the model in their planning.

Any unit that utilizes the model should try various experiments in order to find better combinations of resources for supplying requirements. Such experiments may include different computer runs with different source data and parameters to examine the output reports and determine trends, costs, total enrollments, personnel requirements, etc., under selected conditions.

The accuracy of simulation results is dependent upon the input data. There must be reliable data for demographic, migration, population, geographic characteristics and infrastructure of a region for each subprovince. This requires the existence and emphasizes the importance of data collecting agencies. The Ministry of Education, the State Planning Organizatio and the State Institute of Statistics are the major data collecting agencies in Turkey. They use projections and sampling techniques to obtain information about the population and migration characteristics of the country.

All educational data should be gathered by the Ministry of Education and the remainder by the State Institute of Statistics but the data collection should be coordinated to provide fast and accurate information, retain consistency and avoid duplication.

In a case of missing data, a number of experiments can be conducted applying minimum and maximum values to understand its effect and estimate it better.

Immigration, emigration and student distributions (dropouts and repeat rates) are some of the parameters where data collection may not provide direct values. In such cases further research is recommended to identify these trends for rural people regionally.

For a better utilization of the model, further experiments are suggested to identify data items that; (1) are not gathered accurately (2) require additional research and (3) should be collected at the various levels (subprovince, province, and nation).

The model developed here is a deterministic and descriptive simulation model. It is a potential tool for the expansion of education facilities in rural areas, and can help decision makers from the subprovince level to province and central government levels. The State Planning Organization, any planning unit in the Ministry of Education, any other country, or even any individual who considers opening a private school can benefit from the model. In order to apply the model to any situation, it is only necessary to follow the procedures in Appendix B.

APPENDIX A

DEFINITION OF TERMS

To understand the most frequently used terms in the model, and especially those whose meanings may differ in the Turkish culture, the following terms are defined.

Basic Education: Eight years of education which is defined by the Law of Basic Education. It includes primary and middle school education.

Busing Distance: Less than one hour traveling time between two settlements, corresponding to peripheral settlements.

Components: The parts which comprise a system and which are selected to represent specific elements of the real world.

Constraints: Actions or conditions external to the system which restrict other actions or variables.

Control: To bring a system into a desired state or keep it in a desired state.

Design: The act of planning a system so that it achieves the desired output, when the desired input is at hand.

Discrete-time: Specific instants of time.

Dynamic Model: "the time-dependent structure of a model; i.e. The rules for moving from one system state to another" [1].

Environment: The surrounding situtation or circumstances in which a system operates, from which it receives its purpose and resources, and to which it is responsible for the use of the resources and for the adequacy of its output [2].

Feedback: One of the inputs to an operation within the system that is a sampled portion of the output of the system.

General Directorate: The highest operational administrative unit in the Turkish government structure.

Input: The items, of whatever form (labor, goods, capital), that is accepted by a system.

Lycee: A high school which provides ninth through eleventh grade schooling in Turkey.

Middle School: A Turkish school analogous to "junior high school."

Model: The representation of a system.

The Ministry of Education: A state organization which deals with all educational activities for the state. The Minister of Education is the head of this office, and is a member of the Cabinet.

Open System: A system that operates under controls which are independent of its own output.

Output: Product or results of a system.

Parameter: A variable whose assigned value is changed to reflect different conditions of the system, for different experiments, but which remains constant throughout any one trial.

Peripheral Settlements: Settlements which are within busing distance of a center settlement.

Province: Administratively Turkey is divided into provinces, with a governor as head administrator of each province. He also acts as the representative of the Ministry of Education, assisted by the provincial Director of Education in educational issues, although he is appointed by the Ministry of Interior.

Provincial Authorities: At the province level, the governor and Director of education. In a subprovince, the subgovernor and education officer.

Remote Settlements: Settlements which are not within busing distance to any center settlement, and whose primary graduates are subject to boarding.

Rural Settlement: A community with fewer than ten thousand inhabitants.

> A rural community is an aggregate of farm and village people inhabiting in an area limited by ease of transportation which makes frequent contacts possible, and unified by such bonds as common beliefs, common language, similarty of purposes, traditions, manners and customs,common interests, face-to-face relationships, effective leadership and experience in achieving goals [3].

In Turkey, according to the first article of the Village Law of 1924, population centers with less than two thousand inhabitants are considered rural. As in most developing countries, Turkey has some settlements which have more than two-thousand population but retain rural characteristics. The law of 1924 has not been changed, but in daily communication and in recent governmental official usage a population of ten thousand is now considered the upper limit for a community to be classified as rural [4].

Simulation: The process of manipulating the variables of a model and noting the resulting condition of the system as described by the model.

State Planning Organization: a planning office which is responsible to the Prime Minister for preparing advisory five-year plans for social and economic development as a guide to public and private investors.

State of a System: the description of a system at a selected instant of time during the simulation process.

Static Model: "the time-independent structure of a model; i.e., the framework within which system states are defined" [5].

Subprovince: Each province is further divided into subprovinces governed by subgovernors who are assisted by education officers in educational issues. Districts and villages are subdivisions of subprovinces. District officer and sub- governors are appointed by the Ministry of Interior while the village headmen are elected by eligible village voters [6].

Subsystem: a particular portion of a larger system.

System: A set of identifiable functional relationships among specified elements used to describe an orderly whole.

Systems Analysis: A technique for mathematically identifying, representing, and studying the interrelationships of the parts which comprise a system.

Systems Approach: A strategy that considers all elements, functional relationships and external influences of a system in order to define an operational system.

Threshold Population: "the threshold population is the minimum total population sufficient to establish a school with minimum acceptable capacity in terms of student spaces or potential enrollment" [7].

Turkish Lira: the basic Turkish monetary unit (TL). In January 1980, 48 TL equaled one American dollar.

Village: In this study, it is a settlement which has an elected headman and at least one hundred-fifty inhabitants.

FOOT NOTES

[1] A. Alan B. Pritsker, and Philip J. Kiviat, Simulation With Gasp II. Englewood Cliffs, N. J.: Prentice-Hall, Inc., 1969, p. 291.

[2] Bela H. Banathy, Instructional Systems. Palo Alto, Calif.: Fearon Publishers, 1968, p. 88.

[3] Clifford P. Archier, Elementary Education in Rural Areas. New York: the Ronald Press Company, 1958), p. 27.

[4] State Planning Organization, Republic of Turkey, Third Five Year Development Plan 1973-1977. Ankara: 1973.

Cavit Orhan Tutengil, "Turkiyenin Sosyo-economik Ve Kulturel Gelismesi Acisindan -Kucuk Koy-ve- Buyuk Koy- Sorunu," Turkiyenin Iktisadi Gelisme Meseleleri (Problems of Turkish Economic Development). Istanbul: Sermet Matbaasi, 1971.

[5] Pritsker, op. cit., p. 294.

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[7] William T. S. Gould, Guidelines for School Location Planning- World Bank Staff Working Paper No. 308. Washington D.C.: the World Bank, 1978.

APPENDIX B

SYMBOLS AND UTILIZATION OF THE MODEL

The symbols used for the input parameters of the program model are given below in the order in which they appear on data cards, together with corresponding values, definitions, and a step by step explanation of the model usage for experiments. Costs are given in Turkish lira and areas in square meters.

An experiment would be one execution of the model program which produces enrollment and cost information for each of any number of school sites that have been selected, together with summary information for each subprovince, and a province grand total. To conduct an experiment follow the seven steps cited below (formats are shown in parentheses):

<u>Step 1</u>. Select a province to study and supply card 1 according to the kind of experiment.

Card 1 (1X,2I2,I3,2A10) contains;

proflag	experiments for a province (=4), subprovince (=1), a new individual school (=2), or an old school (=3),
nofsprv	number of subprovinces (=1 when proflag is 1, 2 or 3),
year	length of simulation run,
provnam	province name.

<u>Step 2</u>. Supply card 2 with constant parameters, primarily the physical design characteristics of a school as determined by the control unit.

Card 2 (3I2,2I3,9I2,4F3.1,3F4.2,5F5.3) contains;

mincl	minimum number of classrooms for first grade,
avncl	average number of classrooms for first grade,
mancl	maximum number of classrooms for first grade,
area	total area for; physical education,library, canteen, warehouse, etc.,
nowd	number of working days in a school year,
minbord	least number of students for a boarding service,
minbus	least number of students for busing service,
ae	eating area/student
abo	boarding area/student
ab	bus area/bus
acl	classroom area/student
usp	utility supply/staff member
usbo	utility supply/boarding student
nbs	number of busing staff/bus
ag	garden area/student
aes	extra area/student
uss	utility supply/student
ar	area/staff member
ash	shower area/person
nds	number of staff/student
nbos	number of boarding staff/boarding student
adm	number of administrators/student
g1	number of group 1 teachers (Turkish literature, mathematics, social science, general science)/classroom,
g2	number of group 2 teachers (physical education, music, vocational arts and jobs)/ classroom,
g3	number of group 3 teachers (two subjects)/ classroom,
pi	inflation rate

Step 3. Supply card 3, the subprovince head card, with population characteristics of each subprovince utilizing the algorithm in Chapter III to identify;

A) center city of the subprovince and its peripheral settlements, and omit this city,

B) each rural settlement which has a middle school and its peripheral settlements,

C) each potential school site center settlement, and its peripheral settlements, and

D) remote settlements.

Card 3 (5F6.3,4I2,2I6,2A10) contains;

br	birth rate
dr	death rate
inm	immigration to rural settlements
oum	emigration to urban centers
rag	primary school graduates as percent of total population
spr	school size preference
nss	number of settlements in a subprovince with (nss=0 when proflag=2, nss=1 when proflag=3),
nls	number of settlements in a subprovince for possible school site (nls=1 when proflag=2, nls=0 when proflag=3),
noc	number of centers in subprovince,
pobo	number of students subject to boarding in a subprovince,
pobu	total peripheral population in subprovince,
suprna	subprovince name (school name if proflag= 2 or 3),

Step 4. Supply card 4 with annual admission rate as a percentage of the primary school graduates for each subprovince, in each year of the study.

card 4 (20F4.2) contains;

.pp p(n) admission to the first grade in the year n,

Step 5. Supply card 5 and 6 with facilities and operation costs plus student progression rate parameters, which may be different for each subprovince.

Card 5 (2I7,2I6,3I5,4F6.3) contains;

buc	bus cost/bus
brk	bus repair kit set cost/busing school,
tetc	teacher training cost/teacher.
setc	various teaching aid costs (physics, biology, chemistry,workroom tools, and library set),
be	staff benefits/staff,
emi	average employee income/month
eein	average extra work income/day
busd	depreciation rate of bus,

bd	depreciation rate of buildings,
fd	depreciation rate of other durable goods,
tak	a classroom can accommodate tak percent more or less,

card 6 (8I5,I2,9F4.2) contains;

cc	construction cost/m sq.
lc	land purchase cost/m sq.
bouc	boarding utility cost/student
ucp	personnel utility cost/person
ucs	utility supply cost/student
buomc	bus operation-maintenance cost/bus,
boomc	boarding oper.-maint. cost/boarding student,
daomc	school operation-maintenance cost/student,
cs	classroom size- number of students in a classroom,
rp1	repeat rate of grade 1
rp2	repeat rate of grade 2
sr	sex ratio (male/total students)
dor1	dropout rate from grade 1
dor2	dropout rate from grade 2
qit	personnel quitting/year
trs(j)	transfer students to grade j, j=1-3.

Step 6. Supply card 7 with demographic information for each settlement which has a middle school (identified in step 3-B).

Card 7 (1X,A10,2I6,3F5.3,I2,2I4,1X,F4.2) contains;

setnam	name of the center settlement,
spo	population of the center settlement,
bup	population of peripheral settlements,
inm	immigration rate to rural settlements,
oum	emigration rate to urban centers,
invm	immigration to the center settlement due to an investment,
inyear	year that investment will begin,
schp1	students in the first grade,
tschp	total students in school,
z	local students ratio in the first grade.

Step 7. Supply card 8 for each center settlement which is a school site (step 3-C). When 'nss' is zero 'card 8' replaces 'card 7'. When there is more than one subprovince in an experiment, the information on card 4

through card 8 is supplied (nosprv times) for each subprovince.

Card 8 (1X,A10,2I6,3F6.3,I2) contains;

setnam	name of the center settlement,
spo	population of the center settlement,
bup	population of peripheral settlements,
inm	immigration rate to rural settlements,
oum	emigration rate to urban centers,
invm	immigration to the center settlement due to an investment,
inyear	year that investment will begin,

For a typical usage of the model, the experimentor would run several experiments determined by what he wants to know, then examine the output, modify the control data to reflect changes or additional cases and repeat this until a collection of experiments have been completed which provide the desired answer.

APPENDIX C

TABLES SELECTED FROM COMPUTER OUTPUT

Some Tables are selected from the computer output to represent the results of the experiment. Headings are explained next, before displaying the Tables.

<u>Side headings for Table A-1</u>:

pop.- year	population vs year of simulation,
remote	population of remote settlements,
peripheral	population of peripheral settlements,
center	population of center settlement,
boarding	p(n) percent of the primary graduates from remote settlements,
local	p(n) percent of the local primary graduates,
busing	p(n) percent of the peripheral primary graduates,
in old sch.	first grade students in an existing school (omitted if there is no school).

<u>Side Headings for Table A-2</u>:

year	year of simulation,
boarding	remote's p(n) percent primary graduates who are unaccommodated yet,
busing	peripheral's p(n) percent graduates who are unaccommodated yet,
local	center's p(n) percent primary graduates who are unaccommodated yet.

<u>Side Headings for Table A-3</u>:

year	years of simulation,
boarding	p(n) percent of a subprovince's primary graduates who are not schooled yet.

<u>Column Headings for Table B-1</u>:

yr	year that school is in operation,
bused students	students who benefit from bus services,
investment cost	total cash (TL) required to provide bus services (i.e. bus, land, etc.,)
operation cost	total cash (TL) required to operate bus services,

busing stf	number of personnel required to operate bus services,
needed buses	number of required buses,
bus cost	total cash (TL) to buy buses,
bus area	total needed area for busing (garage..),
land cost	total cash (TL) to buy required land,
building cost	total cash (TL) to construct building for busing operation,
utility cost	total cash (TL) to provide utilities for busing,
ope/maint cost	total yearly cash (TL) to operate and maintain busing,
salary	total yearly cash (TL) paid for busing staff.

Column Headings for Table B-2:

yr	year of simulation,
boarded students	students who use boarding facilities,
investment cost	total cash (TL) to provide boarding,
operation cost	total cash (TL) to operate boarding services,
boarding stf	number of personnel for boarding,
utility cost	total cash (TL) to provide utilities for boarding,
board area	required land for boarding,
land cost	total cash (TL) to buy required land,
building cost	total cash (TL) to construct buildings for boarding,
ope/maint cost	total yearly cash (TL) to operate and maintain boarding services,
salary	total yearly cash (TL) paid for personnel in boarding service.

Column Headings for Table C:

yr	year that school is in operation,
combined students	total students in a school (it could be local+busing+boarding),
investment cost	total cash (TL) to provide schooling,
operation cost	total cash (TL) to operate a school,
school adm	number of administrators,
school stf	personnel in a school who are neither teacher nor administrator,
group- teach	number of teachers for related groups,
class rooms	number of classrooms in a school,
school area	total required area for schooling,
land cost	total cash (TL) to buy required land,
building cost	total cash (TL) to construct building,
faculty cost	total cash (TL) spent to train faculty,

utility cost	total cash (TL) to provide necessary utilities for schooling,
ope/maint cost	total yearly cash (TL) to operate and maintain schooling services,
salary	total yearly cash (TL) paid for personnel in a school.

Column Headings for Table T:

y	year of simulation,
bused stu	total bused students for a given year,
investm cost	total required investment for busing,
operation cost	total busing operation cost,
number-of stf	total busing staff,
number-of bus	total buses,
number-of sc	total number of busing schools,
board stu	total boarded students in a given year,
investm cost	total required investment for boarding,
operation cost	total boarding operation cost,
board stf	total boarding staff,
board sc	total boarding school in operation,
combin stu	all the students in the system,
investm cost	total cost for combined school,
operation cost	total cost for schooling operation,
number-of stf	total staff for schooling,
numberof tch	total teachers required for schooling,
number-of sc	total number of school,
stf	total number of staff in services,
prorated inv. cost	prorated investment cost,
operation cost	total cost of operation of all services.

Side Headings for Table Y:

year	simulation years,
in old sch.	available student places in old schools,
busing	available student places for busing,
boarding	available student places for boarding,
combined	available student places in schools,
uncopestu	unit cost per student place.

REPORT FOR   PROVINCE : KAYSERI   SUBPROVINCE : BUNYAN   SETTLEMENT : AKKISLA

TABLE A-1 POPULATIONS AND PRIMARY GRADUATES

YEAR	:	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
ALPOTE	:	15155	14094	13107	12189	11335	10541	9803	9116	8477	7883	7331	6817	6339	5895	5482	5098	4741	4752	4763	4774
PERIPHERAL	:	4129	3839	3570	3320	3087	2870	2669	2482	2308	2146	1995	1855	1725	1604	1491	1386	1288	1291	1294	1297
CENTER	:	2799	2869	2935	2999	3061	3122	3180	3236	3290	3343	3395	3446	3495	3544	3592	3639	3684	3693	3702	3711
BOARDING	:	569	529	492	458	426	594	552	514	478	444	516	480	446	415	386	359	334	335	335	336
BUSING	:	138	127	117	107	99	144	133	122	113	104	123	113	104	96	88	80	73	74	74	74
LOCAL	:	13	15	18	20	23	84	87	90	93	96	147	150	154	157	161	164	167	168	168	169
IN OLD SCH.	:	108	108	108	108	108	108	108	108	108	108	108	108	108	108	108	108	108	108	108	108

RESULTS OF EXPANSION OF EXISTING FACILITIES FOR 172 MORE PUPILS

TABLE B-1 BUSING RESULT BEGINNING IN YEAR 11 FOR : AKKISLA

YR	BUSED STUDENTS	INVESTMENT COST	OPERATION COST	BUSING STF	BUSES NEEDED	BUS COST	BUS AREA	LAND COST	BUILDING COST	UTILITY COST	OPE/MAINT COST	SALARY
1	73	2081700	530700	1	1	2000000	27	27000	54000	700	450000	80700
2	132	6248100	1592100	3	3	6000000	82	82000	164000	2100	1350000	242100
3	182	9232800	2122800	4	4	8000000	110	110000	220000	902800	1800000	322800

PRORATED INVESTMENT COST IN BUSING   976120 TL
OPERATION COST IN BUSING   2122800 TL

TABLE B-2 BOARDING RESULT IF STUDENTS IN TABLE B-1 ARE BOARDED IN AKKISLA

YR	BOARDED STUDENTS	INVESTMENT COST	OPERATION COST	BOARDING STF	UTILITY COST	BOARD AREA	LAND COST	BUILDING COST	OPE/MAINT COST	SALARY
1	73	485300	1256400	2	23300	154	154000	308000	1095000	161400
2	132	875700	2222100	3	41700	278	278000	556000	1980000	242100
3	182	1213100	3133500	5	58100	385	385000	770000	2730000	403500

PRORATED INVESTMENT COST IN BOARDING   29855 TL
OPERATION COST IN BOARDING   3133500 TL
SINCE BUSING COST PER STUDENT OF 17027 TL IS CHEAPER THAN BOARDING COST OF 17381 TL.
*** BUSING *** IS CHOSEN AND THE RESULTS ARE INCLUDED IN TABLES Y AND Y.

TABLE C RESULTS OF EXPANDING EXISTING SCHOOL FACILITIES BEGINNING IN YEAR 11 FOR : AKKISLA
THESE RESULTS DO NOT INCLUDE BUSING/BOARDING RESULTS
INVESTMENT IS FOR 172 311 431 PUPILS IN THE GRADES

YR	COMBINED STUDENTS	INVESTMENT COST	OPERATION COST	SCHOOL ADM	STF	GROUP1 TEACH	GROUP2 TEACH	GROUP3 TEACH	CLASS ROOMS	SCHOOL AREA	LAND COST	BUILDING COST	FACULTY COST	UTILITY COST	OPE/MAINT COST	SALARY
1	220	4241400	3058500	1	1	2.28	.86	.86	4	1741	1741000	2276000	120000	102400	2655000	40
2	397	6223825	5622000	1	2	4.57	1.71	1.71	8	2658	2658000	3140000	240000	185825	4815000	807000
3	551	8095325	7900500	1	3	6.85	2.57	2.57	12	3491	3491000	3566000	360000	258325	6650000	1210500

TABLE A-2 PRIMARY GRADUATES YET TO BE SCHOOLED

YEAR	:	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
BOARDING	:	569	529	492	458	426	594	552	514	478	444	516	480	446	415	386	359	334	335	335	336
BUSING	:	138	127	117	107	99	144	133	122	113	104	50	40	31	23	15	7	0	1	1	1
LOCAL	:	13	15	18	20	23	84	87	90	93	96	0	0	0	0	0	0	0	1	1	2

THERE IS NO NEED FOR ANOTHER SCHOOL HERE.

REPORT FOR PROVINCE : KAYSERI SUBPROVINCE : BUNYAN SETTLEMENT : ELBASI

TABLE A-1 POPULATIONS AND PRIMARY GRADUATES

YEAR	:	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
REMOTE	:	15155	14094	13107	12189	11335	10541	9803	9116	8477	7883	7331	6817	6339	5895	5482	5098	4741	4752	4763	4774
PERIPHERAL	:	4265	3866	3505	3177	2880	2611	2367	2145	1944	1761	1596	1446	1310	1187	1075	974	882	884	886	888
CENTER	:	2685	3272	3726	4199	4643	5068	5452	5821	6170	6499	6813	7109	7390	7657	7912	8155	8387	8407	8428	8449
BOARDING	:	569	529	492	458	426	594	552	514	478	444	566	520	477	438	401	366	334	337	337	339
BUSING	:	160	145	131	119	108	147	133	120	109	99	112	101	92	83	75	68	62	62	62	62
LOCAL	:	100	121	140	157	174	285	307	328	347	366	480	501	520	539	557	574	591	592	594	595

TABLE B-1 BUSING RESULT BEGINNING IN YEAR 11 FOR : ELBASI

YR	BUSED STUDENTS	INVESTMENT COST	OPERATION COST	BUSING STF	BUSES NEEDED	BUS COST	BUS AREA	LAND COST	BUILDING COST	UTILITY COST	OPE/MAINT COST	SALARY
1	62	2081700	530700	1	1	2000000	27	27000	54000	700	450000	80700
2	111	4166400	1061400	2	2	4000000	55	55000	110000	1400	900000	161400
3	154	7148100	1592100	3	3	6000000	82	82000	164000	902100	1350000	242100

PRORATED INVESTMENT COST IN BUSING 765655 TL
OPERATION COST IN BUSING 1592100 TL

TABLE B-2 BOARDING RESULT IF STUDENTS IN TABLE B-1 ARE BOARDED IN ELBASI

YR	BOARDED STUDENTS	INVESTMENT COST	OPERATION COST	BOARDING STF	UTILITY COST	BOARD AREA	LAND COST	BUILDING COST	OPE/MAINT COST	SALARY
1	62	406300	1010700	1	19300	129	129000	258000	930000	80700
2	111	740450	1907100	3	35400	235	235000	470000	1665000	242100
3	154	1024000	2632800	4	49000	325	325000	650000	2310000	322800

PRORATED INVESTMENT COST IN BOARDING 25200 TL
OPERATION COST IN BOARDING : 2632800 TL
SINCE BUSING COST PER STUDENT OF 15310 TL IS CHEAPER THAN BOARDING COST OF 17259 TL.
*** BUSING *** IS CHOSEN AND THE RESULTS ARE INCLUDED IN TABLES T AND Y.

TABLE C RESULTS OF THE COMBINED SCHOOL BEGINNING IN YEAR 11 FOR : ELBASI
THESE RESULTS DO NOT INCLUDE BUSING/BOARDING RESULTS
INVESTMENT IS FOR 525 949 1320 PUPILS IN THE GRADES

YR	COMBINED STUDENTS	INVESTMENT COST	OPERATION COST	SCHOOL ADM	STF	GROUP1 TEACH	GROUP2 TEACH	GROUP3 TEACH	CLASS ROOMS	SCHOOL AREA	LAND COST	BUILDING COST	FACULTY COST	UTILITY COST	OPE/MAINT COST	SALARY
1	542	9523175	9693300	2	3	8.57	3.21	3.21	15	4134	4134000	4594000	480000	315175	8160000	1533300
2	980	15564175	17564500	3	6	15.42	5.78	5.78	27	6922	6922000	7202000	870000	570175	14760000	2824500
3	1362	20794000	24585000	5	9	21.13	7.92	7.92	37	9330	9330000	9420000	1230000	794000	20550000	4035000

TABLE A-2 PRIMARY GRADUATES YET TO BE SCHOOLED

YEAR	:	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
BOARDING	:	569	529	492	458	426	594	552	514	478	444	566	520	477	438	401	366	334	337	337	339
BUSING	:	160	145	131	119	108	147	133	120	109	99	50	39	30	21	13	6	0	0	0	0
LOCAL	:	100	121	140	157	174	285	307	328	347	366	0	0	0	0	0	0	0	0	0	0

THERE IS NO NEED FOR ANOTHER SCHOOL HERE.

REPORT FOR PROVINCE : KAYSERI SUBPROVINCE : BUNYAN SETTLEMENT : KARAKAYA

TABLE A-1 POPULATIONS AND PRIMARY GRADUATES

YEAR :	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
REMOTE :	15155	14094	13107	12189	11335	10541	9803	9116	8477	7883	7331	6817	6339	5895	5482	5098	4741	4752	4763	4774
PERIPHERAL :	4265	3966	3688	3429	3188	2964	2756	2563	2383	2216	2060	1915	1780	1655	1539	1431	1330	1333	1336	1339
CENTER :	2685	2753	2819	2882	2943	3002	3058	3113	3166	3218	3269	3318	3366	3414	3461	3507	3551	3559	3567	3575
BOARDING :	569	529	492	458	426	594	552	514	478	444	616	559	507	459	414	372	334	337	337	339
BUSING :	160	149	136	128	119	167	155	144	134	124	145	135	125	116	108	100	93	93	94	94
LOCAL :	100	103	105	108	110	169	172	175	178	181	230	233	237	240	244	247	250	250	251	252

TABLE B-1 BUSING RESULT BEGINNING IN YEAR 11 FOR : KARAKAYA

YR	BUSED STUDENTS	INVESTMENT COST	OPERATION COST	BUSING STF	BUSES NEEDED	BUS COST	BUS AREA	LAND COST	BUILDING COST	UTILITY COST	OPE/MAINT COST	SALARY
1	93	4166400	1061400	2	2	4000000	55	55000	110000	1400	900000	161400
2	167	8332800	2122800	4	4	8000000	110	110000	220000	2800	1800000	322800
3	231	11314500	2653500	5	5	10000000	137	137000	274000	903500	2250000	403500

PRORATED INVESTMENT COST IN BUSING 1186215 TL
OPERATION COST IN BUSING 2653500 TL

TABLE B-2 BOARDING RESULT IF STUDENTS IN TABLE B-1 ARE BOARDED IN KARAKAYA

YR	BOARDED STUDENTS	INVESTMENT COST	OPERATION COST	BOARDING STF	UTILITY COST	BOARD AREA	LAND COST	BUILDING COST	OPE/MAINT COST	SALARY
1	93	614300	1556400	2	29300	195	195000	390000	1395000	161400
2	167	1115600	2908500	5	53600	354	354000	708000	2505000	403500
3	231	1537500	3949200	6	73500	488	488000	976000	3465000	484200

PRORATED INVESTMENT COST IN BOARDING 37835 TL
OPERATION COST IN BOARDING 3949200 TL
SINCE BUSING COST PER STUDENT OF 16622 TL IS CHEAPER THAN BOARDING COST OF 17259 TL.
*** BUSING *** IS CHOSEN AND THE RESULTS ARE INCLUDED IN TABLES T AND Y.

TABLE C RESULTS OF THE COMBINED SCHOOL BEGINNING IN YEAR 11 FOR : KARAKAYA
THESE RESULTS DO NOT INCLUDE BUSING/BOARDING RESULTS
INVESTMENT IS FOR 280 506 702 PUPILS IN THE GRADES

YR	COMBINED STUDENTS	INVESTMENT COST	OPERATION COST	SCHOOL ADM	STF	GROUP1 TEACH	GROUP2 TEACH	GROUP3 TEACH	CLASS ROOMS	SCHOOL AREA	LAND COST	BUILDING COST	FACULTY COST	UTILITY COST	OPE/MAINT COST	SALARY
1	323	6600000	5157000	1	2	4.57	1.71	1.71	8	2520	2520000	3080000	240000	168000	4350000	807000
2	584	9142550	9312600	2	3	7.99	3.00	3.00	14	3977	3977000	4412000	450000	303550	7460000	1452600
3	812	12054850	13018200	2	5	11.42	4.28	4.28	20	5299	5299000	5664000	630000	421850	10920000	2098200

TABLE A-2 PRIMARY GRADUATES YET TO BE SCHOOLED

YEAR :	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
BOARDING :	569	529	492	458	426	594	552	514	478	444	616	559	507	459	414	372	334	337	337	339
BUSING :	160	149	136	128	119	167	155	144	134	124	52	42	32	23	15	7	0	0	1	1
LOCAL :	100	103	105	108	110	169	172	175	178	161	0	0	0	0	0	0	0	0	0	0

REPORT FOR ADDITIONAL BOARDING FOR REMOTE BUNYAN

TABLE A-3 PRIMARY GRADUATES YET TO BE BOARDED

YEAR :	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
BOARDING:	569	529	492	458	426	594	552	514	478	444	668	601	539	482	429	379	334	337	338	340

TABLE B-2 BOARDING RESULT BEGINNING IN YEAR 1 FOR 1 BUNYAN

YR	BOARDED STUDENTS	INVESTMENT COST	OPERATION COST	BOARDING STF	UTILITY COST	BOARD AREA	LAND COST	BUILDING COST	OPE/MAINT COST	SALARY
1	525	3507000	9065500	15	168000	1113	1113000	2226000	7875000	1210500
2	949	6349300	16494600	28	304300	2015	2015000	4030000	14235000	2259600
3	1320	8832300	22947300	39	423300	2803	2803000	5606000	19800000	3147300

TABLE C THIS IS THE COMBINED PART RESULTS OF THE 1ST BOARDING SCHOOL BEGINNING IN YEAR 1 IN THIS SUBPROVINCE
THESE RESULTS DO NOT INCLUDE BUSING/BOARDING RESULTS
INVESTMENT IS FOR 525 949 1320 PUPILS IN THE GRADES

YR	COMBINED STUDENTS	INVESTMENT COST	OPERATION COST	SCHOOL ADM	STF	GROUP1 TEACH	GROUP2 TEACH	GROUP3 TEACH	CLASS ROOMS	SCHOOL AREA	LAND COST	BUILDING COST	FACULTY COST	UTILITY COST	OPE/MAINT COST	SALARY
1	525	9523175	9693300	2	3	8.57	3.21	3.21	15	4134	4134000	4594000	480000	315175	8160000	1533300
2	949	15564175	17584500	3	6	15.42	5.78	5.78	27	6922	6922000	7202000	870000	570175	14760000	2824500
3	1320	20794000	24585000	5	9	21.13	7.92	7.92	37	9330	9330000	9420000	1230000	794000	20550000	4035000

TABLE A-3 PRIMARY GRADUATES YET TO BE BOARDED

YEAR :	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
BOARDING:	44	4	0	0	0	69	27	0	0	0	143	76	14	0	0	0	0	0	0	0

THERE IS NO NEED FOR ANOTHER BOARDING SCHOOL.

TABLE T YEARLY TOTALS FOR SUBPROVINCE : BUNYAN
IT IS ASSUMED THAT COMMODITY PRICES WILL INCREASE 0.00 YEARLY

	TOTALS FOR BUSING						BOARDING TOTALS						TOTALS FOR COMBINED SCHOOLS							OVERALL SUMMARY	
Y	BUSED STU	INVESTM COST	OPERATION COST	NUMBER-OF STF	BUS	SC	BOARD STU	INVESTM COST	OPERATION COST	BOARD STF	SC	COMBIN STU	INVESTM COST	OPERATION COST	NUMBER-OF STF	TCH	SC	STF	PRORATED INV. COST	OPERATION COST
1	0	0	0	0	0	0	525	3507000	9085500	15	1	525	9523175	9693300	3	16	1	18	318798	18778800
2	0	0	0	0	0	0	949	6349300	16494600	28	1	949	15564175	17584500	6	29	1	34	538063	34079100
3	0	0	0	0	0	0	1320	8832300	22947300	39	1	1320	20794000	24585000	9	41	1	48	728375	47532300
4	0	0	0	0	0	0	1320	0	22947300	39	1	1320	0	24585000	9	41	1	48	728375	47532300
5	0	0	0	0	0	0	1320	0	22947300	39	1	1320	0	24585000	9	41	1	48	728375	47532300
6	0	0	0	0	0	0	1320	0	22947300	39	1	1320	0	24585000	9	41	1	48	728375	47532300
7	0	0	0	0	0	0	1320	0	22947300	39	1	1320	0	24585000	9	41	1	48	728375	47532300
8	0	0	0	0	0	0	1320	0	22947300	39	1	1320	0	24585000	9	41	1	48	728375	47532300
9	0	0	0	0	0	0	1320	0	22947300	39	1	1320	0	24585000	9	41	1	48	728375	47532300
10	0	0	0	0	0	0	1320	0	22947300	39	1	1320	0	24585000	9	41	1	48	728375	47532300
11	228	8329800	2122800	4	4	3	1320	0	22947300	39	1	2297	19772575	42493806	15	69	4	58	2648703	67563900
12	410	18747300	4776300	9	9	3	1320	0	22947300	39	1	3086	30930550	57104100	20	93	4	68	3376076	84627700
13	567	27695400	6368400	12	12	3	1320	0	22947300	39	1	3773	40944175	70088700	26	115	4	77	4658023	99404400
14	567	0	6368400	12	12	3	1320	0	22947300	39	1	3773	0	70088700	26	115	4	77	4658023	99404400
15	567	0	6368400	12	12	3	1320	0	22947300	39	1	3773	0	70088700	26	115	4	77	4658023	99404400
16	567	0	6368400	12	12	3	1320	0	22947300	39	1	3773	0	70088700	26	115	4	77	4658023	99404400
17	567	0	6368400	12	12	3	1320	0	22947300	39	1	3773	0	70088700	26	115	4	77	4658023	99404400
18	567	0	6368400	12	12	3	1320	0	22947300	39	1	3773	0	70088700	26	115	4	77	4658023	99404400
19	567	0	6368400	12	12	3	1320	0	22947300	39	1	3773	0	70088700	26	115	4	77	4658023	99404400
20	567	0	6368400	12	12	3	1320	0	22947300	39	1	3773	0	70088700	26	115	4	77	4658023	99404400

TABLE Y AVAILABLE PLACES FOR MIDDLE SCHOOL STUDENTS IN THIS SUBPROVINCE

YEAR :	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
IN OLD SCH. :	197	197	197	197	197	197	197	197	197	197	197	197	197	197	197	197	197	197	197	197
BUSING :	0	0	0	0	0	0	0	0	0	0	228	410	567	567	567	567	567	567	567	567
BOARDING :	525	949	1320	1320	1320	1320	1320	1320	1320	1320	1320	1320	1320	1320	1320	1320	1320	1320	1320	1320
COMBINED :	525	949	1320	1320	1320	1320	1320	1320	1320	1320	2297	3086	3773	3773	3773	3773	3773	3773	3773	3773
UNCOMPLSTU :	36376	36477	36561	36561	36561	36561	36561	36561	36561	36561	30305	28581	27580	27580	27580	27580	27580	27580	27580	27580

END OF SUBPROVINCE REPORT.

REPORT FOR PROVINCE : KAYSERI SUBPROVINCE : SUBPR2 SETTLEMENT : SETL2-1

• • • • • RESULTS ARE THE SAME AS FOR •••• AKKISLA •••• AND HAVE BEEN OMITTED • • • • •

REPORT FOR PROVINCE : KAYSERI SUBPROVINCE : SUBPR2 SETTLEMENT : SETL2-2

TABLE A-1 POPULATIONS AND PRIMARY GRADUATES

YEAR :	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
REMOTE :	15155	14094	13107	12189	11335	10541	9803	9116	8477	7883	7331	6817	6339	5895	5482	5098	4741	4752	4763	4774
PERIPHERAL :	4265	3866	3505	3177	2880	2611	2367	2145	1944	1761	1596	1446	1310	1187	1075	974	882	884	886	888
CENTER :	2685	3222	3726	4199	4643	5060	5452	5821	6170	6499	6813	7109	7390	7657	7912	8155	8387	8407	8428	8449
BOARDING :	569	529	492	458	426	594	552	514	478	444	566	520	477	438	401	366	334	337	337	339
BUSING :	160	145	131	119	108	147	133	120	109	99	112	101	92	83	75	68	62	62	62	62
LOCAL :	100	121	140	157	174	285	307	328	347	366	480	501	520	539	557	574	591	592	594	595

TABLE B-1 BUSING RESULT BEGINNING IN YEAR 1 FOR : SETL2-2

YR	BUSED STUDENTS	INVESTMENT COST	OPERATION COST	BUSING STF	BUSES NEEDED	BUS COST	BUS AREA	LAND COST	BUILDING COST	UTILITY COST	OPE/MAINT COST	SALARY
1	46	2081700	530700	1	1	2000000	27	27000	54000	700	450000	80700
2	83	4166400	1061400	2	2	4000000	55	55000	110000	1400	900000	161400
3	114	5066400	1061400	2	2	4000000	55	55000	110000	901400	900000	161400

PRORATED INVESTMENT COST IN BUSING 555560 TL
OPERATION COST IN BUSING 1061400 TL

TABLE B-2 BOARDING RESULT IF STUDENTS IN TABLE B-1 ARE BOARDED IN SETL2-2

YR	BOARDED STUDENTS	INVESTMENT COST	OPERATION COST	BOARDING STF	UTILITY COST	BOARD AREA	LAND COST	BUILDING COST	OPE/MAINT COST	SALARY
1	46	302500	770700	1	14500	96	96000	192000	690000	80700
2	53	551300	1406400	2	26300	175	175000	350000	1245000	161400
3	114	759300	1952100	3	36300	241	241000	462000	1710000	242100

PRORATED INVESTMENT COST IN BOARDING 18685 TL
OPERATION COST IN BOARDING 1952100 TL
SINCE BUSING COST PER STUDENT OF 14183 TL IS CHEAPER THAN BOARDING COST OF 17287 TL.
••• BUSING ••• IS CHOSEN AND THE RESULTS ARE INCLUDED IN TABLES T AND Y.

TABLE C RESULTS OF THE COMBINED SCHOOL BEGINNING IN YEAR 1 FOR : SETL2-2
THESE RESULTS DO NOT INCLUDE BUSING/BOARDING RESULTS
INVESTMENT IS FOR 105 189 261 PUPILS IN THE GRADES

YR	COMBINED STUDENTS	INVESTMENT COST	OPERATION COST	SCHOOL ADM	STF	GROUP1 TEACH	GROUP2 TEACH	GROUP3 TEACH	CLASS ROOMS	SCHOOL AREA	LAND COST	BUILDING COST	FACULTY COST	UTILITY COST	OPE/MAINT COST	SALARY
1	146	3517175	1957800	1	1	1.71	.64	.64	3	1366	1366000	1998000	90000	63175	1635000	322800
2	264	4607875	3409200	1	1	2.86	1.07	1.07	5	1889	1889000	2456000	150000	112875	2925000	484200
3	365	5633675	4680600	1	1	4.00	1.50	1.50	7	2358	2358000	2690000	210000	155675	4035000	645600

TABLE A-2 PRIMARY GRADUATES YET TO BE SCHOOLED

YEAR :	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
BUSING :	114	99	85	73	62	101	87	74	63	53	66	55	46	37	29	22	16	16	16	16
LOCAL :	0	21	40	57	74	185	207	228	247	266	380	401	420	439	457	474	491	492	494	495

TABLE C RESULTS OF THE LOCAL SCHOOL BEGINNING IN YEAR 6 FOR : SETL2-2
INVESTMENT IS FOR 105 189 261 PUPILS IN THE GRADES

YR	LOCAL STUDENTS	INVESTMENT COST	OPERATION COST	SCHOOL ADM	STF	GROUP1 TEACH	GROUP2 TEACH	GROUP3 TEACH	CLASS ROOMS	SCHOOL AREA	LAND COST	BUILDING COST	FACULTY COST	UTILITY COST	OPE/MAINT COST	SALARY
1	146	3517175	1957800	1	1	1.71	.64	.64	3	1366	1366000	1998000	90000	63175	1635000	322800
2	264	4607875	3409200	1	1	2.86	1.07	1.07	5	1889	1889000	2456000	150000	112875	2925000	484200
3	365	5633675	4680600	1	1	4.00	1.50	1.50	7	2358	2358000	2890000	210000	155675	4035000	645600

TABLE A-2 PRIMARY GRADUATES YET TO BE SCHOOLED

YEAR	:	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
BOARDING	:	569	529	492	458	426	594	552	514	478	444	566	520	477	438	401	366	334	337	337	339
BUSING	:	114	99	85	73	62	101	87	74	63	53	66	55	46	37	29	22	16	16	16	16
LOCAL	:	0	21	40	57	74	39	61	82	101	120	234	255	274	293	311	328	345	346	348	349

TABLE C RESULTS OF THE LOCAL SCHOOL BEGINNING IN YEAR 9 FOR : SETL2-2
INVESTMENT IS FOR 105 189 261 PUPILS IN THE GRADES

YR	LOCAL STUDENTS	INVESTMENT COST	OPERATION COST	SCHOOL ADM	STF	GROUP1 TEACH	GROUP2 TEACH	GROUP3 TEACH	CLASS ROOMS	SCHOOL AREA	LAND COST	BUILDING COST	FACULTY COST	UTILITY COST	OPE/MAINT COST	SALARY
1	117	3517175	1957800	1	1	1.71	.64	.64	3	1366	1366000	1998000	90000	63175	1635000	322800
2	211	4607875	3409200	1	1	2.86	1.07	1.07	5	1889	1889000	2456000	150000	112875	2925000	484200
3	292	5633675	4680600	1	1	4.00	1.50	1.50	7	2358	2358000	2890000	210000	155675	4035000	645600

TABLE A-2 PRIMARY GRADUATES YET TO BE SCHOOLED

YEAR	:	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
BOARDING	:	569	529	492	458	426	594	552	514	478	444	566	520	477	438	401	366	334	337	337	339
BUSING	:	114	99	85	73	62	101	87	74	63	53	66	55	46	37	29	22	16	16	16	16
LOCAL	:	0	21	40	57	74	39	61	82	0	0	68	109	126	147	165	182	199	200	202	203

TABLE C RESULTS OF THE LOCAL SCHOOL BEGINNING IN YEAR 12 FOR : SETL2-2
INVESTMENT IS FOR 105 189 261 PUPILS IN THE GRADES

YR	LOCAL STUDENTS	INVESTMENT COST	OPERATION COST	SCHOOL ADM	STF	GROUP1 TEACH	GROUP2 TEACH	GROUP3 TEACH	CLASS ROOMS	SCHOOL AREA	LAND COST	BUILDING COST	FACULTY COST	UTILITY COST	OPE/MAINT COST	SALARY
1	125	3517175	1957800	1	1	1.71	.64	.64	3	1366	1366000	1998000	90000	63175	1635000	322800
2	225	4607875	3409200	1	1	2.86	1.07	1.07	5	1889	1889000	2456000	150000	112875	2925000	484200
3	313	5633675	4680600	1	1	4.00	1.50	1.50	7	2358	2358000	2890000	210000	155675	4035000	645600

TABLE A-2 PRIMARY GRADUATES YET TO BE SCHOOLED

YEAR	:	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
BOARDING	:	569	529	492	458	426	594	552	514	478	444	566	520	477	438	401	366	334	337	337	339
BUSING	:	114	99	85	73	62	101	87	74	63	53	66	55	46	37	29	22	16	16	16	16
LOCAL	:	0	21	40	57	74	39	61	82	0	0	88	0	0	1	19	36	53	54	56	57

THERE IS NO NEED FOR ANOTHER SCHOOL HERE.

REPORT FOR PROVINCE : KAYSERI SUBPROVINCE : SUBPR2 SETTLEMENT : SETL2-3
- RESULT DIFFERENCES FROM KARAKAYA SIMILAR TO ELBASI:SETL2• • • •2 AND HAVE BEEN OMITTED • • • • •

REPORT FOR ADDITIONAL BOARDING FOR REMOTE SUDPR2

TABLE A-3 PRIMARY GRADUATES YET TO BE BOARDED

YEAR :	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
BOARDING:	569	529	492	458	426	668	614	565	519	475	649	651	593	548	509	479	454	458	462	466

TABLE B-2 BOARDING RESULT BEGINNING IN YEAR 1 FOR : SUBPR2

YR	BOARDED STUDENTS	INVESTMENT COST	OPERATION COST	BOARDING STF	UTILITY COST	BOARD AREA	LAND COST	BUILDING COST	OPE/MAINT COST	SALARY
1	105	699600	1817100	3	33600	222	222000	444000	1575000	242100
2	189	1257200	3238500	5	60200	399	399000	798000	2835000	403500
3	261	1739200	4479900	7	83200	552	552000	1104000	3915000	564900

TABLE C THIS IS THE COMBINED PART RESULTS OF THE 1ST BOARDING SCHOOL BEGINNING IN YEAR 1 IN THIS SUBPROVINCE
THESE RESULTS DO NOT INCLUDE BUSING/BOARDING RESULTS
INVESTMENT IS FOR 105 189 261 PUPILS IN THE GRADES

YR	COMBINED STUDENTS	INVESTMENT COST	OPERATION COST	SCHOOL ADM	STF	GROUP1 TEACH	GROUP2 TEACH	GROUP3 TEACH	CLASS ROOMS	SCHOOL AREA	LAND COST	BUILDING COST	FACULTY COST	UTILITY COST	OPE/MAINT COST	SALARY
1	105	3517175	1957800	1	1	1.71	.64	.64	3	1366	1366000	1998000	90000	63175	1635000	322800
2	189	4607875	3409200	1	1	2.86	1.07	1.07	5	1889	1889000	2456000	150000	112875	2925000	484200
3	261	5633675	4680600	1	1	4.00	1.50	1.50	7	2358	2358000	2858000	210600	155675	4035000	645600

TABLE A-3 PRIMARY GRADUATES YET TO BE BOARDED

YEAR :	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
BOARDING:	464	424	387	353	321	563	509	460	414	378	544	546	488	435	404	374	349	353	357	36[illegible]

2ND BOARDING SCHOOL IS NEEDED WITH THE SAME ABOVE-MENTIONED SPECIFICATIONS.

TABLE A-3 PRIMARY GRADUATES YET TO BE BOARDED

YEAR :	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
BOARDING:	359	319	282	248	216	458	404	355	309	265	439	441	383	338	299	269	244	248	252	256

3RD BOARDING SCHOOL IS NEEDED WITH THE SAME ABOVE-MENTIONED SPECIFICATIONS.

TABLE A-3 PRIMARY GRADUATES YET TO BE BOARDED

YEAR :	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
BOARDING:	254	214	177	143	111	353	299	250	204	160	334	336	278	225	194	164	139	143	147	151

4TH BOARDING SCHOOL IS NEEDED WITH THE SAME ABOVE-MENTIONED SPECIFICATIONS.

TABLE A-3 PRIMARY GRADUATES YET TO BE BOARDED

YEAR :	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
BOARDING:	149	109	72	38	6	248	194	145	99	55	229	231	173	120	89	59	34	38	42	46

THERE IS NO NEED FOR ANOTHER BOARDING SCHOOL.

TABLE T YEARLY TOTALS FOR SUBPROVINCE : SUBPR2
IT IS ASSUMED THAT COMMODITY PRICES WILL INCREASE 0.00 YEARLY

	TOTALS FOR BUSING						DOARDING TOTALS					TOTALS FOR COMBINED SCHOOLS							OVERALL SUMMARY	
Y	BUSED STU	INVESTM COST	OPERATION COST	NUMBER-OF STF	BUS	SC	BOARD STU	INVESTM COST	OPERATION COST	BOARD STF	SC	COMBIN STU	INVESTM COST	OPERATION COST	NUMBER-OF STF	TCH	SC	STF	PRORATED INV. COST	OPERATION COST
1	92	4163400	1061400	2	2	2	420	2798400	7268400	12	4	630	21103050	11746800	6	18	6	20	993238	20076600
2	166	8332800	2122800	4	4	2	756	5028800	12954000	20	4	1134	27647250	20455200	6	30	6	30	1629818	35532000
3	228	10132800	2122800	4	4	2	1044	6956800	17919600	28	4	1566	33802050	28083600	6	42	6	38	2095876	48126000
4	228	0	2122800	4	4	2	1044	0	17919600	28	4	1566	0	29083600	6	42	6	38	2095876	48126000
5	228	0	2122800	4	4	2	1044	0	17919600	28	4	1566	0	28083600	6	42	6	38	2095876	48126000
6	275	2081700	2653500	5	5	3	1044	0	17919600	28	4	1776	7034350	31999200	8	48	8	41	2474029	52572300
7	312	4166400	3184200	6	6	3	1044	0	17919600	28	4	1944	9215750	34902000	8	52	8	42	2738084	56005800
8	344	5066400	3184200	6	6	3	1044	0	17919600	28	4	2088	11267350	37444800	8	56	8	42	2922624	56548600
9	344	0	3184200	6	6	3	1044	0	17919600	28	4	2193	3517175	39402600	9	59	9	43	3006652	60506400
10	344	0	3184200	6	6	3	1044	0	17919600	28	4	2277	4607875	40854000	9	61	9	43	3033447	61957800
11	417	6081700	3714900	7	7	4	1044	0	17919600	28	4	2521	9875075	45183900	10	67	10	45	3370002	66818400
12	476	14248100	4776300	9	9	4	1044	0	17919600	28	4	2765	9741000	49705200	12	74	11	49	3923451	72401100
13	526	17232800	5307000	10	10	4	1044	0	17919600	28	4	2969	12703200	53435100	13	80	11	51	4341446	76661700
14	526	0	5307000	10	10	4	1044	0	17919600	28	4	3041	5633675	54706500	13	82	11	51	4366216	77933100
15	526	0	5307000	10	10	4	1044	0	17919600	28	4	3041	0	54706500	13	82	11	51	4366216	77933100
16	526	2000000	5307000	10	10	4	1044	0	17919600	28	4	3041	0	54706500	13	82	11	51	4366216	77933100
17	526	4000000	5307000	10	10	4	1044	0	17919600	28	4	3041	0	54706500	13	82	11	51	4366216	77933100
18	526	4000000	5307000	10	10	4	1044	0	17919600	28	4	3041	0	54706500	13	82	11	51	4366216	77933100
19	526	0	5307000	10	10	4	1044	0	17919600	28	4	3041	0	54706500	13	82	11	51	4366216	77933100
20	526	0	5307000	10	10	4	1044	0	17919600	28	4	3041	0	54706500	13	82	11	51	4366216	77933100

TABLE Y AVAILABLE PLACES FOR MIDDLE SCHOOL STUDENTS IN THIS SUBPROVINCE

YEAR :	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
IN OLD SCH. :	197	197	197	197	197	197	197	197	197	197	197	197	197	197	197	197	197	197	197	197
BUSING :	92	166	228	228	228	275	312	344	344	344	417	476	526	526	526	526	526	526	526	526
BOARDING :	420	756	1044	1044	1044	1044	1044	1044	1044	1044	1044	1044	1044	1044	1044	1044	1044	1044	1044	1044
COMBINED :	630	1134	1566	1566	1566	1776	1944	2088	2193	2277	2521	2765	2969	3041	3041	3041	3041	3041	3041	3041
UNCOPESTU :	33444	32770	32070	32070	32070	30994	30218	29440	28961	28542	27841	27603	27282	27063	27063	27063	27063	27063	27063	27063

END OF SUBPROVINCE REPORT.

REPORT FOR PROVINCE : KAYSERI SUBPROVINCE : SUBPR3 SETTLEMENT : SETL3-1

TABLE A-1 POPULATIONS AND PRIMARY GRADUATES

YEAR :	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
REMOTE :	15155	14094	13107	12189	11335	10541	5803	9116	8477	7883	7331	6817	6339	5895	5482	5098	4741	4752	4763	4774
PERIPHERAL :	4129	3839	3570	3320	3087	2870	2669	2482	2308	2146	1995	1855	1725	1604	1491	1386	1288	1291	1294	1297
CENTER :	2799	2859	2935	2999	3061	3122	3180	3236	3290	3343	3395	3446	3495	3544	3592	3639	3684	3693	3702	3711
BOARDING :	569	529	492	458	426	594	552	514	478	444	516	480	446	415	386	359	334	335	335	336
BUSING :	138	127	117	107	99	144	133	122	113	104	123	113	104	96	88	80	73	74	74	74
LOCAL :	13	15	18	20	23	84	87	90	93	96	147	150	154	157	161	164	167	168	168	169
IN OLD SCH. :	108	108	108	108	108	108	108	108	108	108	108	108	108	108	108	108	108	108	108	108

RESULTS OF EXPANSION OF EXISTING FACILITIES FOR 172 MORE PUPILS

TABLE B-1 BUSING RESULT BEGINNING IN YEAR 11 FOR : SETL3-1

YR	BUSED STUDENTS	INVESTMENT COST	OPERATION COST	BUSING STF	BUSES NEEDED	BUS COST	BUS AREA	LAND COST	BUILDING COST	UTILITY COST	OPE/MAINT COST	SALARY
1	73	2581700	568200	1	1	2530000	27	27000	54000	700	487500	80700
2	132	7748100	1704600	3	3	7500000	82	82000	164000	2100	1462500	242100
3	182	11232800	2272800	4	4	10000000	110	110000	220000	902800	1950000	322800

PRORATED INVESTMENT COST IN BUSING 1176120 TL
OPERATION COST IN BUSING 2272800 TL

TABLE B-2 BOARDING RESULT IF STUDENTS IN TABLE B-1 ARE BOARDED IN SETL3-1

YR	BOARDED STUDENTS	INVESTMENT COST	OPERATION COST	BOARDING STF	UTILITY COST	BOARD AREA	LAND COST	BUILDING COST	OPE/MAINT COST	SALARY
1	73	485300	1256400	2	23300	154	154000	308000	1095000	161400
2	132	875700	2222100	3	41700	278	278000	556000	1980000	242100
3	182	1213100	3133500	5	58100	385	385000	770000	2730000	403500

PRORATED INVESTMENT COST IN BOARDING 29855 TL
OPERATION COST IN BOARDING 3133500 TL
SINCE BOARDINE COST PER STUDENT OF 17381 TL IS CHEAPER THAN BUSING COST OF 18950 TL.
*** BOARDING *** IS CHOSEN AND THE RESULTS ARE INCLUDED IN TABLES T AND Y.

TABLE C RESULTS OF EXPANDING EXISTING SCHOOL FACILITIES BEGINNING IN YEAR 11 FOR : SETL3-1
THESE RESULTS DO NOT INCLUDE BUSING/BOARDING RESULTS
INVESTMENT IS FOR 172 311 431 PUPILS IN THE GRADES

YR	COMBINED STUDENTS	INVESTMENT COST	OPERATION COST	SCHOOL ADM	STF	GROUP1 TEACH	GROUP2 TEACH	GROUP3 TEACH	CLASS ROOMS	SCHOOL AREA	LAND COST	BUILDING COST	FACULTY COST	UTILITY COST	OPE/MAINT COST	SALARY
1	220	4241400	3056500	1	1	2.28	.86	.86	4	1741	1741000	2278000	120000	102400	2655000	403500
2	397	6223825	5622000	1	2	4.57	1.71	1.71	8	2658	2658000	3140000	240000	185825	4815000	807000
3	551	8095325	7900500	1	3	6.85	2.57	2.57	12	3491	3491000	3966000	360000	258325	6690000	1210500

TABLE A-2 PRIMARY GRADUATES YET TO BE SCHOOLED

YEAR :	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
BOARDING :	569	529	492	458	426	594	552	514	478	444	516	480	446	415	386	359	334	335	335	336
BUSING :	138	127	117	107	99	144	133	122	113	104	50	40	31	23	15	7	0	1	1	1
LOCAL :	13	15	18	20	23	84	87	90	93	96	0	0	0	0	0	0	0	1	1	2

THERE IS NO NEED FOR ANOTHER SCHOOL HERE.

REPORT FOR PROVINCE : KAYSERI SUBPROVINCE : SUBPR3 SETTLEMENT : SETL3-2
• • • • • OMITTED • • • • •

REPORT FOR PROVINCE : KAYSERI SUBPROVINCE : SUBPR3 SETTLEMENT : SETL3-3
• • • • • OMITTED • • • • •

REPORT FOR ADDITIONAL BOARDING FOR REMOTE SUBPR3
- RESULTS SAME AS FOR •••BUNYAN••• AND HAVE BEEN OMITTED -

TABLE T YEARLY TOTALS FOR SUBPROVINCE : SUBPR3
IT IS ASSUMED THAT COMMODITY PRICES WILL INCREASE 0.00 YEARLY

	•••••••• TOTALS FOR BUSING •••••••••						••••••• BOARDING TOTALS ••••••••					••••• TOTALS FOR COMBINED SCHOOLS •••••						••• OVERALL SUMMARY ••••	
Y	BUSED STU	INVESTM COST	OPERATION COST	NUMBER-OF STF	BUS	SC	BOARD STU	INVESTM COST	OPERATION COST	BOARD STF	SC	COMBIN STU	INVESTM COST	OPERATION COST	NUMBER-OF STF	TCH	SC	STF	PRORATED INV. COST	OPERATION COST
1	0	0	0	0	0	0	525	3507000	9085500	15	1	525	9523175	9693300	3	16	1	18	318790	18778800
2	0	0	0	0	0	0	949	6349300	16494600	28	1	949	15564175	17584500	6	29	1	34	538063	34079100
3	0	0	0	0	0	0	1320	8832300	22947300	39	1	1320	20794000	24585000	9	41	1	48	728375	47532300
4	0	0	0	0	0	0	1320	0	22947300	39	1	1320	0	24585000	9	41	1	48	728375	47532300
5	0	0	0	0	0	0	1320	0	22947300	39	1	1320	0	24585000	9	41	1	48	728375	47532300
6	0	0	0	0	0	0	1320	0	22947300	39	1	1320	0	24585000	9	41	1	48	728375	47532300
7	0	0	0	0	0	0	1320	0	22947300	39	1	1320	0	24585000	9	41	1	48	728375	47532300
8	0	0	0	0	0	0	1320	0	22947300	39	1	1320	0	24585000	9	41	1	48	728375	47532300
9	0	0	0	0	0	0	1320	0	22947300	39	1	1320	0	24585000	9	41	1	48	728375	47532300
10	0	0	0	0	0	0	1320	0	22947300	39	1	1320	0	24585000	9	41	1	48	728375	47532300
11	62	2581700	568200	1	1	1	1486	1099600	25760100	43	3	2297	19772575	42493800	15	69	4	59	1495108	68822100
12	111	5166400	1136400	2	2	1	1619	1991300	28077900	47	3	3086	30930550	57104100	20	93	4	69	2053306	86318400
13	154	8649100	1704600	3	3	1	1733	2750600	30030000	50	3	3773	40944175	70088700	26	115	4	79	2713378	101823300
14	154	0	1704600	3	3	1	1733	0	30030000	50	3	3773	0	70088700	26	115	4	79	2713378	101823300
15	154	0	1704600	3	3	1	1733	0	30030000	50	3	3773	0	70088700	26	115	4	79	2713378	101823300
16	154	0	1704600	3	3	1	1733	0	30030000	50	3	3773	0	70088700	26	115	4	79	2713378	101823300
17	154	0	1704600	3	3	1	1733	0	30030000	50	3	3773	0	70088700	26	115	4	79	2713378	101823300
18	154	0	1704600	3	3	1	1733	0	30030000	50	3	3773	0	70088700	26	115	4	79	2713378	101823300
19	154	0	1704600	3	3	1	1733	0	30030000	50	3	3773	0	70088700	26	115	4	79	2713378	101823300
20	154	0	1704600	3	3	1	1733	0	30030000	50	3	3773	0	70088700	26	115	4	79	2713378	101823300

TABLE Y AVAILABLE PLACES FOR MIDDLE SCHOOL STUDENTS IN THIS SUBPROVINCE

YEAR :	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
IN OLD SCH. :	197	197	197	197	197	197	197	197	197	197	197	197	197	197	197	197	197	197	197	197
BUSING :	0	0	0	0	0	0	0	0	0	0	62	111	154	154	154	154	154	154	154	154
BOARDING :	525	949	1320	1320	1320	1320	1320	1320	1320	1320	1486	1619	1733	1733	1733	1733	1733	1733	1733	1733
COMBINED :	525	949	1320	1320	1320	1320	1320	1320	1320	1320	2297	3086	3773	3773	3773	3773	3773	3773	3773	3773
UNCOMPLSTU :	36376	36477	36561	36561	36561	36561	36561	36561	36561	36561	30612	28636	27706	27706	27706	27706	27706	27706	27706	27706

END OF SUBPROVINCE REPORT.

TABLE T YEARLY TOTALS FOR PROVINCE : KAYSERI

IT IS ASSUMED THAT COMMODITY PRICES WILL INCREASE 0.00 YEARLY

	******** TOTALS FOR BUSING *********					******* BOARDING TOTALS ********					***** TOTALS FOR COMBINED SCHOOLS *****							*** OVERALL SUMMARY ****	
Y	BUSED STU	INVESTM COST	OPERATION COST	NUMBER-OF STF	BUS	SC	BOARD STU	INVESTM COST	OPERATION COST	BOARD STF	SC	COMBIN STU	INVESTM COST	OPERATION COST	NUMBER-OF STF	TCH	SC	STF	PRORATED INV. COST	OPERATION COST
1	42	4163400	1061400	2	2	2	1470	9812400	25439400	42	6	1680	40149400	31133400	12	50	8	56	1630834	57634200
2	166	8332800	2122800	4	4	2	2654	17727400	45943200	76	6	3032	58775600	55624200	18	88	8	98	2705944	103690200
3	228	10132800	2122800	4	4	2	3684	24621400	63814200	106	6	4206	75390050	77253600	24	124	8	134	3552628	143190600
4	228	0	2122800	4	4	2	3684	0	63814200	106	6	4206	0	77253600	24	124	8	134	3552628	143190600
5	228	0	2122800	4	4	2	3684	0	63814200	106	6	4206	0	77253600	24	124	8	134	3552628	143190600
6	275	2081700	2653500	5	5	3	3684	0	63814200	106	6	4416	7034350	81169200	26	130	10	137	3930779	147636900
7	312	4166400	3184200	6	6	3	3684	0	63814200	106	6	4584	9215750	84072000	26	134	10	138	4194834	151070400
8	344	5066400	3184200	6	6	3	3684	0	63814200	106	6	4728	11267350	86614600	26	138	10	138	4379374	153613200
9	344	0	3184200	6	6	3	3684	0	63814200	106	6	4833	3517175	88572600	27	141	11	139	4463402	155571000
10	344	0	3184200	6	6	3	3684	0	63814200	106	6	4917	4607875	90624000	27	143	11	139	4490197	157022400
11	787	16993200	6405900	12	12	8	3850	1099600	66627000	110	8	7115	49420225	130171500	40	205	18	162	6912813	203204400
12	997	38161800	10689000	20	20	8	3983	1991300	68944800	114	8	8937	71602100	163913400	52	260	19	186	9352833	243547200
13	1247	53576300	13380000	25	25	8	4097	2750600	70896900	117	8	10515	94591550	193612500	65	310	19	207	11712847	277889400
14	1247	0	13380000	25	25	8	4097	0	70896900	117	8	10587	5633675	194883900	65	312	19	207	11737617	279160800
15	1247	0	13380000	25	25	8	4097	0	70896900	117	8	10587	0	194883900	65	312	19	207	11737617	279160800
16	1247	2000000	13380000	25	25	8	4097	0	70896900	117	8	10587	0	194883900	65	312	19	207	11737617	279160800
17	1247	4000000	13380000	25	25	8	4097	0	70896900	117	8	10587	0	194883900	65	312	19	207	11737617	279160800
18	1247	4000000	13380000	25	25	8	4097	0	70896900	117	8	10587	0	194883900	65	312	19	207	11737617	279160800
19	1247	0	13380000	25	25	8	4097	0	70896900	117	8	10587	0	194883900	65	312	19	207	11737617	279160800
20	1247	0	13380000	25	25	8	4097	0	70896900	117	8	10587	0	194883900	65	312	19	207	11737617	279160800

TABLE Y AVAILABLE PLACES FOR MIDDLE SCHOOL STUDENTS IN THIS PROVINCE

YEAR :	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
IN OLD SCH. :	591	591	591	591	591	591	591	591	591	591	591	591	591	591	591	591	591	591	591	591
BUSING :	92	166	228	228	228	275	312	344	344	344	787	997	1247	1247	1247	1247	1247	1247	1247	1247
BOARDING :	1470	2654	3684	3684	3684	3684	3684	3684	3684	3684	3850	3983	4097	4097	4097	4097	4097	4097	4097	4097
COMBINED :	1680	3032	4206	4206	4206	4416	4584	4728	4833	4917	7115	8937	10515	10587	10587	10587	10587	10587	10587	10587
UNCOPESTU :	35276	35091	34889	34889	34889	34322	33871	33416	33112	32847	29531	28298	27541	27476	27476	27476	27476	27476	27476	27476

END OF PROVINCE REPORT.

SUBPROVINCE REPORT FOR   PROVINCE : KAYSERI   SUBPROVINCE : SUBPRX   SETTLEMENT : SETLX-1

TABLE A-1 POPULATIONS AND PRIMARY GRADUATES

YEAR	:	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
REMOTE	:	15155	14094	13107	12189	11335	10541	9803	9116	8477	7883	7331	6817	6339	5895	5482	5098	4741	4752	4763	4774
PERIPHERAL	:	4129	3839	3570	3320	3087	2870	2669	2482	2308	2146	1995	1855	1725	1604	1491	1386	1288	1291	1294	1297
CENTER	:	2799	2859	2935	2999	3061	3122	3180	3236	3290	3343	3395	3446	3495	3544	3592	3639	3684	3693	3702	3711
BOARDING	:	569	529	492	458	426	594	552	514	478	444	516	480	446	415	386	359	334	335	335	336
BUSING	:	138	127	117	107	99	144	133	122	113	104	123	113	104	96	88	80	73	74	74	74
LOCAL	:	13	15	18	20	23	84	87	90	93	96	147	150	154	157	161	164	167	168	168	169
IN OLD SCH.	:	108	108	108	108	108	108	108	108	108	108	109	108	108	108	108	108	108	108	108	108

RESULTS OF EXPANSION OF EXISTING FACILITIES FOR   172 MORE PUPILS

TABLE B-1 BUSINGRESULTS BEGINNING IN YEAR 11 FOR : SETLX-1

YR	BUSED STUDENTS	INVESTMENT COST	OPERATION COST	BUSING STF	NEEDED BUSES	BUS COST	BUS AREA	LAND COST	BUILDING COST	UTILITY COST	OPE/MAINT COST	SALARY
1	73	2581700	568200	1	1	2500000	27	27000	54000	700	487500	80700
2	132	7748100	1704600	3	3	7500000	82	82000	164000	2100	1462500	242100
3	182	11232800	2272800	4	4	10000000	110	110000	220000	2800	1950000	322800

PRORATED INVESTMENT COST IN BUSING   1176120 TL
OPERATION COST IN BUSING   2272800 TL

TABLE B-2 BOARDING RESULT IF STUDENTS IN TABLE B-1 ARE BOARDED IN SETLX-1

YR	BOARDED STUDENTS	INVESTMENT COST	OPERATION COST	BOARDING STF	UTILITY COST	BOARD AREA	LAND COST	BUILDING COST	OPE/MAINT COST	SALARY
1	73	485300	1256400	2	23300	154	154000	308000	1095000	161400
2	132	875700	2222100	3	41700	278	278000	556000	1980000	242100
3	182	1213100	3133500	5	58100	385	385000	770000	2730000	403500

PRORATED INVESTMENT COST IN BOARDING   29855 TL
OPERATION COST IN BOARDING   3133500 TL
SINCE BOARDING COST PER STUDENT   17381 TL IS CHEAPER THAN BUSING   COST OF   18950 TL.
*** BOARDING *** IS CHOSEN AND THE RESULTS ARE INCLUDED IN TABLES T AND Y.

TABLE C RESULTS OF EXPANDING EXISTING SCHOOL FACILITIES BEGINNING IN YEAR 11 FOR : SETL3-1
THESE RESULTS DO NOT INCLUDE BUSING/BOARDING RESULTS
INVESTMENT IS FOR   172 311 431 PUPILS IN THE GRADES

YR	COMBINED STUDENTS	INVESTMENT COST	OPERATION COST	SCHOOL ADM	STF	GROUP1 TEACH	GROUP2 TEACH	GROUP3 TEACH	CLASS ROOMS	SCHOOL AREA	LAND COST	BUILDING COST	FACULTY COST	UTILITY COST	OPE/MAINT COST	SALARY
1	220	4241400	3058500	1	1	2.28	.86	.86	4	1741	1741000	2278000	120000	102400	2655000	403500
2	397	6223825	5622000	1	2	4.57	1.71	1.71	8	2658	2658000	3140000	240000	185825	4815000	807000
3	551	8095325	7900500	1	3	6.85	2.57	2.57	12	3491	3491000	3966000	360000	258325	6690000	1210500

TABLE A-2 PRIMARY GRADUATES YET TO BE SCHOOLED

YEAR	:	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
BOARDING	:	569	529	492	458	426	594	552	514	478	444	516	480	446	415	386	359	334	335	335	336
BUSING	:	138	127	117	107	99	144	133	122	113	104	50	40	31	23	15	7	0	1	1	1
LOCAL	:	13	15	18	20	23	84	87	90	93	96	0	0	0	0	0	0	0	1	1	2

END OF EXPANSION REPORT.

SUBPROVINCE REPORT FOR PROVINCE : KAYSERI SUBPROVINCE : SUBPRX SETTLEMENT : SETLX-2

TABLE A-1 POPULATIONS AND PRIMARY GRADUATES

YEAR :	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
REMOTE :	15155	14094	13107	12189	11335	10541	9803	9116	8477	7883	7331	6817	6339	5895	5482	5098	4741	4752	4763	4774
PERIPHERAL :	4265	3866	3505	3177	2880	2611	2367	2145	1944	1761	1596	1446	1310	1187	1075	974	882	884	886	888
CENTER :	2685	3222	3726	4199	4643	5060	5452	5821	6170	6499	6813	7109	7390	7657	7912	8155	8387	8407	8428	8449
BOARDING :	569	529	492	458	426	594	552	514	478	444	566	520	477	438	401	366	334	337	337	339
BUSING :	160	145	131	119	108	147	133	120	109	99	112	101	92	83	75	68	62	62	62	62
LOCAL :	100	121	140	157	174	285	307	328	347	366	480	501	520	539	557	574	591	592	594	595

TABLE B-1 BUSINGRESULT BEGINNING IN YEAR 11 FOR : SETLX-2

YR	BUSED STUDENTS	INVESTMENT COST	OPERATION COST	BUSING STF	NEEDED BUSES	BUS COST	BUS AREA	LAND COST	BUILDING COST	UTILITY COST	OPE/MAINT COST	SALARY
1	62	2581700	568200	1	1	2500000	27	27000	54000	700	487500	80700
2	111	5166400	1136400	2	2	5000000	55	55000	110000	1400	975000	161400
3	154	8648100	1704600	3	3	7500000	82	82000	164000	902100	1462500	242100

PRORATED INVESTMENT COST IN BUSING 915655 TL
OPERATION COST IN BUSING 1704600 TL

TABLE B-2 BOARDING RESULT IF STUDENTS IN TABLE B-1 ARE BOARDED IN SETLX-2

YR	BOARDED STUDENTS	INVESTMENT COST	OPERATION COST	BOARDING STF	UTILITY COST	BOARD AREA	LAND COST	BUILDING COST	OPE/MAINT COST	SALARY
1	62	406300	1010700	1	19300	129	129000	258000	930000	80700
2	111	740400	1907100	3	35400	235	235000	470000	1665000	242100
3	154	1024000	2632800	4	49000	325	325000	650000	2310000	322800

PRORATED INVESTMENT COST IN BOARDING 25200 TL
OPERATION COST IN BOARDING 2632800 TL
SINCE BUSING COST PER STUDENT 17014 TL IS CHEAPER THAN BOARDING COST OF 17289 TL.
*** BUSING *** IS CHOSEN AND THE RESULTS ARE INCLUDED IN TABLES T AND Y.

TABLE C RESULTS OF THE COMBINED SCHOOL BEGINNING IN YEAR 11 FOR : SETLX-2
THESE RESULTS DO NOT INCLUDE BUSING/BOARDING RESULTS
INVESTMENT IS FOR 525 949 1320 PUPILS IN THE GRADES

YR	COMBINED STUDENTS	INVESTMENT COST	OPERATION COST	SCHOOL ADM	STF	GROUP1 TEACH	GROUP2 TEACH	GROUP3 TEACH	CLASS ROOMS	SCHOOL AREA	LAND COST	BUILDING COST	FACULTY COST	UTILITY COST	OPE/MAINT COST	SALARY
1	542	9523175	9693300	2	3	8.57	3.21	3.21	15	4134	4134000	4594000	480000	315175	8160000	1533300
2	980	15564175	17584500	3	6	15.42	5.78	5.78	27	6922	6922000	7202000	870000	570175	14760000	2824500
3	1362	20794000	24585000	5	9	21.13	7.92	7.92	37	9330	9330000	9420000	1230000	794000	20550000	4035000

TABLE A-2 PRIMARY GRADUATES YET TO BE SCHOOLED

YEAR :	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
BOARDING :	569	529	492	458	426	594	552	514	478	444	566	520	477	438	401	366	334	337	337	339
BUSING :	160	145	131	119	108	147	133	120	109	99	50	39	30	21	13	6	0	0	0	0
LOCAL :	100	121	140	157	174	285	307	328	347	366	0	0	0	0	0	0	0	0	0	0

THERE IS NO NEED FOR ANOTHER SCHOOL HERE.

SUBPROVINCE REPORT FOR PROVINCE : KAYSERI SUBPROVINCE : SUBPRX SETTLEMENT : SETLX-3

TABLE A-1 POPULATIONS AND PRIMARY GRADUATES

YEAR	:	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
REMOTE	:	15155	14094	13107	12189	11335	10541	9803	9116	8477	7883	7331	6817	6339	5895	5482	5098	4741	4752	4763	4774
PERIPHERAL	:	4265	3966	3688	3429	3188	2964	2756	2563	2383	2216	2060	1915	1780	1655	1539	1431	1330	1333	1336	1339
CENTER	:	2685	2753	2819	2882	2943	3002	3058	3113	3166	3218	3269	3318	3366	3414	3461	3507	3551	3559	3567	3575
BOARDING	:	569	529	492	458	426	594	552	514	478	444	616	559	507	459	414	372	334	337	337	339
BUSING	:	160	149	138	128	119	167	155	144	134	124	145	135	125	116	108	100	93	93	94	94
LOCAL	:	100	103	105	108	110	169	172	175	178	181	230	233	237	240	244	247	250	250	251	252

TABLE B-1 BUSINGRESULT BEGINNING IN YEAR 11 FOR : SETLX-3

YR	BUSED STUDENTS	INVESTMENT COST	OPERATION COST	BUSING STF	NEEDED BUSES	BUS COST.	BUS AREA	LAND COST	BUILDING COST	UTILITY COST	OPE/MAINT COST	SALARY
1	93	5166400	1136400	2	2	5000000	55	55000	110000	1400	975000	161400
2	167	10332800	2272800	4	4	10000000	110	110000	220000	2800	1950000	322800
3	231	13814500	2841000	5	5	12500000	137	137000	274000	963500	2437500	403500

PRORATED INVESTMENT COST IN BUSING 1436215 TL
OPERATION COST IN BUSING 2841000 TL

TABLE B-2 BOARDING RESULT IF STUDENTS IN TABLE B-1 ARE BOARDED IN SETLX-3

YR	BOARDED STUDENTS	INVESTMENT COST	OPERATION COST	BOARDING STF	UTILITY COST	BOARD AREA	LAND COST	BUILDING COST	OPE/MAINT COST	SALARY
1	93	614300	1556400	2	29300	195	195000	390000	1395000	161400
2	157	1115600	2908500	5	53600	354	354000	708000	2505000	403500
3	231	1537500	3949200	6	73500	488	488000	976000	3465000	484200

PRORATED INVESTMENT COST IN BOARDING 37835 TL
OPERATION COST IN BOARDING 3949200 TL
SINCE BOARDING COST PER STUDENT 17259 TL IS CHEAPER THAN BUSING COST OF 18616 TL.
*** BOARDING *** IS CHOSEN AND THE RESULTS ARE INCLUDED IN TABLES T AND Y.

TABLE C RESULTS OF THE COMBINED SCHOOL BEGINNING IN YEAR 11 FOR : SETLX-3
THESE RESULTS DO NOT INCLUDE BUSING/BOARDING RESULTS
INVESTMENT IS FOR 200 506 702 PUPILS IN THE GRADES

YR	COMBINED STUDENTS	INVESTMENT COST	OPERATION COST	SCHOOL ADM	STF	GROUP1 TEACH	GROUP2 TEACH	GROUP3 TEACH	CLASS ROOMS	SCHOOL AREA	LAND COST	BUILDING COST	FACULTY COST	UTILITY COST	OPE/MAINT COST	SALARY
1	323	6008000	5157090	1	2	4.57	1.71	1.71	8	2520	2520000	3080000	240000	168000	4350000	807000
2	569	9142550	9312660	2	3	7.99	3.00	3.00	14	3977	3977000	4412000	450000	303550	7860000	1452600
3	812	12054850	13018200	2	5	11.42	4.28	4.28	20	5299	5299000	5684000	630000	421850	10920000	2098200

TABLE A-2 PRIMARY GRADUATES YET TO BE SCHOOLED

YEAR	:	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
BOARDING	:	569	529	492	458	426	594	552	514	478	444	616	559	507	459	414	372	334	337	337	339
BUSING	:	160	149	138	128	119	167	155	144	134	124	52	42	32	23	15	7	0	0	1	1
LOCAL	:	100	103	105	108	110	169	172	175	178	181	0	0	0	0	0	0	0	0	0	0

THERE IS NO NEED FOR ANOTHER SCHOOL HERE.

REPORT FOR ADDITIONAL BOARDING FOR REMOTE SUBPRX

TABLE A-3 PRIMARY GRADUATES YET TO BE BOARDED

YEAR :	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
BOARDING:	569	529	492	458	426	594	552	514	478	444	668	601	539	482	429	379	334	337	338	340

TABLE B-2 BOARDING RESULT BEGINNING IN YEAR 1 FOR : SUBPRX

YR	BOARDED STUDENTS	INVESTMENT COST	OPERATION COST	BOARDING STF	UTILITY COST	BOARD AREA	LAND COST	BUILDING COST	OPE/MAINT COST	SALARY
1	525	3507000	9085500	15	168000	1113	1113000	2226000	7875000	1210500
2	949	6349300	16494600	28	304300	2015	2015000	4030000	14235000	2259600
3	1320	8832300	22947300	39	423300	2803	2803000	5606000	19800000	3147300

TABLE C THIS IS THE COMBINED PART RESULTS OF THE 1ST BOARDING SCHOOL BEGINNING IN YEAR 1 IN THIS SUBPROVINCE
THESE RESULTS DO NOT INCLUDE BUSING/BOARDING RESULTS
INVESTMENT IS FOR 525 949 1320 PUPILS IN THE GRADES

YR	COMBINED STUDENTS	INVESTMENT COST	OPERATION COST	SCHOOL ADM	STF	GROUP1 TEACH	GROUP2 TEACH	GROUP3 TEACH	CLASS ROOMS	SCHOOL AREA	LAND COST	BUILDING COST	FACULTY COST	UTILITY COST	OPE/MAINT COST	SALARY
1	525	9523175	9693300	2	3	8.57	3.21	3.21	15	4134	4134000	4594000	480000	315175	8160000	1533300
2	949	15564175	17584500	3	6	15.42	5.78	5.78	27	6922	6922000	7202000	870000	570175	14760000	2824500
3	1320	20794000	24585000	5	9	21.13	7.92	7.92	37	9330	9330000	9420000	1230000	794000	20550000	4035000

TABLE A-3 PRIMARY GRADUATES YET TO BE BOARDED

YEAR :	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
BOARDING:	44	4	0	0	0	69	27	0	0	0	143	76	14	0	0	0	0	0	0	0

THERE IS NO NEED FOR ANOTHER BOARDING SCHOOL.

TABLE T YEARLY TOTALS FOR SUBPROV. : SUBPRX
IT IS ASSUMED THAT COMMODITY PRICES WILL INCREASE 0.00 YEARLY

	******** TOTALS FOR BUSING			*********			******* BOARDING TOTALS			********			***** TOTALS FOR COMBINED SCHOOLS		*****				*** OVERALL SUMMARY ****	
Y	BUSED STU	INVESTM COST	OPERATION COST	NUMBER-OF STF	BUS	SC	BOARD STU	INVESTM COST	OPERATION COST	BOARD STF	SC	COMBIN STU	INVESTM COST	OPERATION COST	NUMBER-OF STF	TCH	SC	STF	PRORATED INV. COST	OPERATION COST
1	0	0	0	0	0	0	525	3507000	9085500	15	1	525	9523175	9693300	3	16	1	18	318798	18778800
2	0	0	0	0	0	0	949	6349300	16494600	28	1	949	15564175	17584500	6	29	1	34	538063	34079100
3	0	0	0	0	0	0	1320	8832300	22947300	39	1	1320	20794000	24585000	9	41	1	48	728375	47532300
4	0	0	0	0	0	0	1320	0	22947300	39	1	1320	0	24585000	9	41	1	48	728375	47532300
5	0	0	0	0	0	0	1320	0	22947300	39	1	1320	0	24585000	9	41	1	48	728375	47532300
6	0	0	0	0	0	0	1320	0	22947300	39	1	1320	0	24585000	9	41	1	48	728375	47532300
7	0	0	0	0	0	0	1320	0	22947300	39	1	1320	0	24585000	9	41	1	48	728375	47532300
8	0	0	0	0	0	0	1320	0	22947300	39	1	1320	0	24585000	9	41	1	48	728375	47532300
9	0	0	0	0	0	0	1320	0	22947300	39	1	1320	0	24585000	9	41	1	48	728375	47532300
10	0	0	0	0	0	0	1320	0	22947300	39	1	1320	0	24585000	9	41	1	48	728375	47532300
11	62	2581700	568200	1	1	1	1486	1099600	25760100	43	3	2297	19772575	42493800	15	69	4	59	1495108	68822100
12	111	5166400	1136400	2	2	1	1619	1991300	28077900	47	3	3086	30930550	57104100	20	93	4	69	2053306	86316400
13	154	8646100	1704600	3	3	1	1733	2750600	30030000	50	3	3773	40944175	70088700	26	115	4	79	2713378	101823300
14	154	0	1704600	3	3	1	1733	0	30030000	50	3	3773	0	70088700	26	115	4	79	2713378	101823300
15	154	0	1704600	3	3	1	1733	0	30030000	50	3	3773	0	70088700	26	115	4	79	2713378	101823300
16	154	0	1704600	3	3	1	1733	0	30030000	50	3	3773	0	70088700	26	115	4	79	2713378	101823300
17	154	0	1704600	3	3	1	1733	0	30030000	50	3	3773	0	70088700	26	115	4	79	2713378	101823300
18	154	0	1704600	3	3	1	1733	0	30030000	50	3	3773	0	70088700	26	115	4	79	2713378	101823300
19	154	0	1704600	3	3	1	1733	0	30030000	50	3	3773	0	70088700	26	115	4	79	2713378	101823300
20	154	0	1704600	3	3	1	1733	0	30030000	50	3	3773	0	70088700	26	115	4	79	2713378	101823300

TABLE Y AVAILABLE PLACES FOR MIDDLE SCHOOL STUDENTS IN THIS SUBPROV.

YEAR	:	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
IN OLD SCH.	:	197	197	197	197	197	197	197	197	197	197	197	197	197	197	197	197	197	197	197	197
BUSING	:	0	0	0	0	0	0	0	0	0	0	0	62	111	154	154	154	154	154	154	154
BOARDING	:	525	949	1320	1320	1320	1320	1320	1320	1320	1320	1486	1619	1733	1733	1733	1733	1733	1733	1733	1733
COMBINED	:	525	949	1320	1320	1320	1320	1320	1320	1320	1320	2297	3086	3773	3773	3773	3773	3773	3773	3773	3773
UNCOPESTU	:	36376	36477	36561	36561	36561	36561	36561	36561	36561	36561	30612	28636	27706	27706	27706	27706	27706	27706	27706	27706

END OF SUBPROVINCE REPORT.

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