המרכז למחקר בכלכלה חקלאית
Hebrew University
THE CENTER FOR AGRICULTURAL ECONOMIC RESEARCH

Working Paper No. 8210

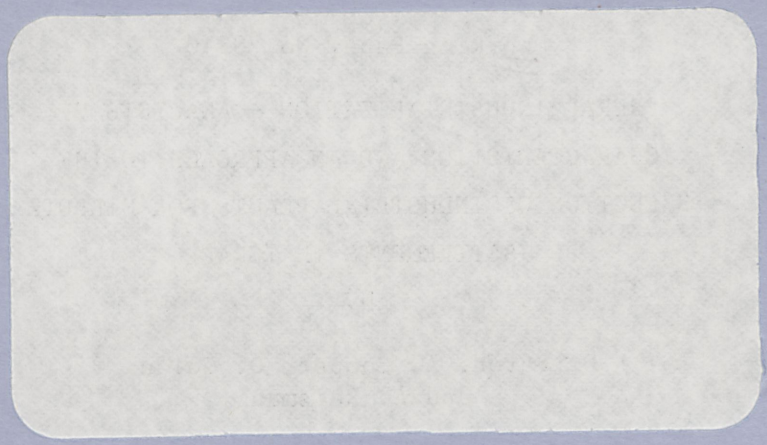
RURAL INDUSTRIALIZATION - ANALYSIS OF CHARACTERISTICS AND AN APPROACH TO THE SELECTION OF INDUSTRIAL PLANTS FOR KIBBUTZ SETTLEMENTS IN ISRAEL

by

D. Yaron, A. Cooper, D. Golan
and A. Reisman

Rehovoth, Israel, P.O.B. 12

רחובות, ת.ד. 12



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D. YARON(1, A. COOPER(2, D. GOLAN(3

and A. REISMAN(4

(1 The Hebrew University of Jerusalem

(2 The Hebrew University and Kibbutz NIR OZ

(3 The Hebrew University and Kibbutz GEVIM

(4 Case Western Reserve University, Cleveland, Ohio

ABSTRACT

A major problem related to rural industrialization is the selection of the types of industrial plants suitable for rural communities and their matching with resource potential and preferences of specific communities. This paper presents a methodology developed to cope with this problem and its empirical application to collective rural settlements in Israel.

1. INTRODUCTION

The decline of the relative share of agriculture in the national product and in employment is typical of developing economies. The process has been traditionally accompanied by outmigration of population from the rural areas to the urban centers. The state of Israel is no exception. Although literature of rural industrialization is rich and varied [2,3,6,14,16,17,19,23,29,30, & 31], this paper discusses the first known study to apply management science methods to the selection of industrial plants by rural communities.

Over and above the factors typical to any developing economy, the problem of non-agricultural employment in rural areas is exacerbated in Israel by the national policy aimed at the dispersion of the population throughout the country and the prevention of excessive growth of urban centers.

The kibbutz settlements[1] have been in the vanguard of rural industrialization in Israel. This has been due to limited natural resources (land and water) and market restrictions on the expansion of agricultural production. There are some specific factors in favor of industrial development in kibbutzim: (a) The interest of the young generation in advanced technology. This interest can be satisfied by jobs in industrial plants of appropriate types. (b) The interest of the young generation in higher education. Industrialization develops employment opportunities for engineers, technicians, economists, marketing

(1) The kibbutz is essentially a commune the members of which share equally in the ownership and the return of all its enterprises.

specialists, and other professionals. (c) Specifically designed plants or departments within plants providing employment opportunities for the aged and the infirm. Last but not least, (d) the community ownership and management of the kibbutz farms promotes flexibility in the utilization of the kibbutz resources, and especially internal mobility of labor from one occupation to another.

Two major difficulties inhibit the industrialization of kibbutzim. The first is the small scale of operations necessitated by the tendency to avoid hiring outside labor; therefore, the industrial plants in the kibbutzim are bound to be small.(2) In 1979, the average number of workers per plant was approximately 58. Only 10 percent of the kibbutzim plants employed more than 100 workers, and in most cases this was achieved by hiring labor from outside the kibbutz. The limited scale of the plants has an effect on: (a) prior elimination of industries with typical "economies of scale" such as chemical or metal heavy industries; (b) the difficulty of developing specialized departments in charge of marketing, research and development.

The second major difficulty is related to the lack of monetary reward as an incentive to undertake hard or inconvenient jobs. This difficulty which is due to the social system of the kibbutzim, leads them to assign a considerable weight to job satisfaction.(3)

Despite the above difficulties, the industrialization of the kibbutz settlements has made considerable progress. The number of industrial plants rose from 90 in 1960 to 306 in 1979. The total employment of the plants increased by 50 percent in the years 1970-1979.

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(2) The reader is referred to Section 3 for a detailed discussion of the preferences of kibbutz communities with respect to industrial plants, including the avoidance of hiring outside labor.

(3) Note that the problem of job satisfaction is not restricted to the social system of the kibbutzim. It has been widely recognized as an important factor in the industrial sectors of all western free enterprise.

The industrialization process has been in effect too, in the "Moshav Shitufi" settlements. These are settlements in which the farm and the industrial plant, if any, are managed and operated on a communal basis, the income is equally distributed, but the consumption is organized on an individual family basis. The case of industrialization in moshavim shitufim is similar to that of kibbutzim.

The other major type of agricultural settlements in Israel are the "Moshavim". These are cooperative villages with privately owned and operated farms, and cooperative service facilities for production and marketing, village operated credit system and municipal services.

A debate is currently in progress as to whether it is desirable to develop industrial plants in moshavim. The promoters of the idea are primarily sons of the founder generation who want to stay and live in the villages, despite the limited farming opportunities.(4) The opponents are primarily from the ranks of the leaders of the Moshav Organization who claim that the establishing of industrial plants employing non-farming moshav members may lead to a conflict of interest between farming and non-farming members of the cooperative and endanger the stability and integrity of the moshav as an integrated cooperative village.

It is against this background that the need for a formal planning approach to the selection of industrial plants for rural communities has been recognized. This paper presents an approach developed, tested and implemented towards this goal.

While the kibbutz setting provided the background for designing and field testing of the approach discussed, the approach appears to be applicable to other types of rural communities in Israel. In fact, with some modifications, it could be applied to the selection of industrial plants for non-cooperative types of villages and small towns as well, both in Israel and other countries.

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(4) According to the law, only one son can inherit the farm so as to keep the farm intact.

2. THE FRAMEWORK OF THE STUDY

A Systems Analytic approach was used in the definition of the components of the problem and in the identification of the many interrelationships among them. Following is a summary of the system components thus identified.

1. Projection of the resources available for development of an industrial plant: This involves projection of the natural resources and other factors of production available in the community analysis of alternatives to agricultural development, and finally, the evaluation of the net resource potential for industrial development.

2. Analysis of "external" factors: This includes projections of the surrounding economy, availability of credit (volume and cost), and the evaluation of marketing potential including exports. The collection and review of ideas and alternatives for the development of industrial projects is also included in the analysis.

3. Analysis of profiles of industrial plants: Under this heading we include the listing and the analysis of characteristic attributes of industrial plants which are a priori considered feasible for rural communities.(From the point of view size, labor requirements, extent of risk involved and other factors).

4. Identification of community preferences with respect to industrialization: This involves the definition of the goals and the objectives of the community, listing of the criteria for the evaluation objectives of industrial plants, and the evaluation of the relative weights assigned to the criteria.

5. Evaluation of projects and their adaptability to particular communities: This step involves the specification in general terms of an ideal industrial plant which may suit the community's resources and preferences as well as the external factors. Further steps involve the elimination of inferior alternatives, a detailed evaluation of the surviving options and finally, the ultimate decision regarding the selection of the industrial plant.

This paper deals with elements 3, 4 and 5. Moreover, the study results are summarized and evaluated. Elements 1 and 2 above have been widely treated in numerous agricultural planning studies, and will not be discussed here.

3. ANALYSIS OF THE CHARACTERISTICS OF INDUSTRIAL PLANTS AND PLANTS' PROFILES

This section discusses variables and "factors" which characterize the profiles of industrial plants on Israel collective settlements. A sample of 24 industrial plants on collective settlements (22 on kibbutz and 2 on "moshav shitufi" settlements) provided the empirical background for the study. This sample represents eight percent out of the total of 306 plants associated with the Inter-Kibbutz Industrial Association.

3.1 Potential Variables for Characterizing Industrial Plants

The study views an industrial plant as one entity which integrates numerous, closely inter-related elements. A list of variables with the potential for characterizing industrial plants was prepared at the initial stage of the study and on the basis of literature (e.g. Woodward [32], Pugh et al [25 & 26], Kotler [20] and Herbert [15]). The following categories of variables were considered: (1) product and demand characteristics; (2) marketing system; (3) technology; (4) labor force and employment; (5) technology and "know-how"; (6) working conditions and impact on ecology; (7) raw materials; (8) capital (fixed and current). Data regarding sales, expenditures and other economic variables were collected from the 24 sampled plants.

On the basis of the above data various indices were computed such as capital investment per worker, percentage of skilled workers, ratio of value added to output value, etc.

The data comprised both quantitative and qualitative variables. The quantitative variables with a wide range of variation were transformed into a logarithmic scale. The specification of the qualitative variables (e.g. dominant demand factor - price, quality or "good will" and reputation; work quality - routine, partially routine or diversified) were referred to interchangeably following two alternative approaches:

(1) As Dummay variables with dichotomic 0-1 scores;

(2) As cardinally scaled variables with each qualitative variable being scaled with scores ranging between 1-3.

Factor Analysis was applied to the original sample observation with the aim of achieving the following results:

a. Substituting the relatively large number of the original variables by a compact structure of linear combinations of the basic variables - "factors", while conserving the essential information included in the original variables.

b. Characterizing the attributes of the plants by a limited number of "factors", instead of the original variables.

c. Generating <u>factor scores</u> for the sample plants for the sake of further analysis.

The Principal Components with an orthogonal rotation approach [20] was applied according to the following formulation:

$$Z_{ji} = \sum_{p=1}^{m} a_{jp} F_{pi} \qquad (1)$$

$$r_{F_p F_s} = 0 \text{ if } p \neq s$$

where

Z_{ji} - standard variable j for observation i ($j = 1,2,\ldots,n$, $i=1,2,\ldots,N$)

F_{pi} - the value of factor p, observation i ($p = 1,2,\ldots,m$)

a_{jp} - loading coefficient relating variable j to factor p

$r_{F_p F_s}$ - correlation coefficient between factors p and s

Note that in the Principal Components model applied, with orthogonal factors, the loading coefficients a_{jp} constitute correlation coefficients between the variable and the factors.

3.2 Factor Analysis - Results

The computed abstract factors and the loading coefficients which represent the links (correlation coefficients) between them and the original variables are shown in Table 1. The results of Factor Analysis of qualitative inputs using the dichotomic approach, as well as several other variants of the Factor Analysis yielded similar results (see Yaron et al [33] for more details). The results of the analysis summarized in Table 1 and of other analyses which are not shown here, point to three significant factors:

1. Standardicity Factor

   The variables linked with this factor are:
   - numerous buyers;
   - low technological sophistication;
   - large production batches;
   - available technological know-how;
   - low share of overhead workers with respect to the total labor force;
   - low specialization requirements at the marketing stage.

2. Work Quality Factor

   Linked with the following variables:
   - diversified work;
   - workers' independence in the production process;
   - high percentage of production skilled workers;
   - absence of physical efforts;
   - absence of health hazards;
   - absence of other nuisances; e.g. noise, dirt etc.
   - low percentage of hired workers (negatively correlated with the factor).

It is of interest to note that the "Work Quality Factor" characterizes the positive attributes of work quality with the exception of the high and negatively correlated component concerned with hired workers (hired out of the community) as seen in Table 1.

The results thus support the hypothesis that in the Kibbutz framework the characteristics of work quality are one of the major factors for the promotion or the reduction of hired labor. The share of hired labor at the plant increases when: the share of routine work increases; the number of workers being attached to the production process increases; the skill requirements are lower; physical effort health hazards and other nuisances at job stations become extensive.

3. Automation Factor

The major variables which identify this factor are:

- small number of major buyers;
- product price - the dominant demand factor;
- technical proficiency required at the marketing phase;
- fully automated production;
- high investment in equipment per worker;
- technological sophistication;
- high share of skilled production workers;
- low percentage of hired workers;
- shifts.

In Table 1 (but not in other variants of the Factor Analysis) a fourth factor can be identified as a Simple Technology Factor linked with:

- multiplicity of product substitutes;
- large number of direct buyers;
- low skill requirements in marketing;
- undiversified work;
- availability of technological know-how.

3.3 Profiles of Industrial Plants

For each of the sample plants, factor scores were computed with respect to the three above mentioned factors. Table 3 presents the scores of the Work Quality Factor for five of the highest score plants and five lowest score plants. A high score regarding the Work Quality Factor characterizes plants with "positive" work characteristics. These are in the main plants with advanced technology, producing, by relatively sophisticated processes, industrial equipment and spare parts. The sample data indicate that these plants tend to employ a high percentage of skilled workers. An exception to the rule is a plant involved in the production of apparel consumer products, which scored highly in Work Quality as a result of the special organization of the production process. The work organization in this plant is aimed at facilitating working conditions for the elderly and infirm members of the kibbutz.

A low Work Quality score occurs mainly in labor intensive plants with "negative" work characteristics; in these plants a high percentage of hired labor is employed. The Standardicity and the Automation plant characteristic Factors were evaluated similarly (Yaron et al [33]). Scrutiny of Table 3 suggests that classification of plants according to their conventional classification by industrial and/or by product type does not truly represent the characteristics of the plants. Additional information is needed regarding the technology, plant design, and the characteristics of the production process, and especially so with respect to industrial plants which employ Work Quality-oriented workers (as in the case of the Israeli collective settlements on the one hand, or in privately owned plants in Scandinavian countries on the other).

The concept of: "the profile of an industrial plants" , is illustrated by Table 3, in which profiles of three typical plants are presented. The first plant is characterized by a high negative work quality score and a negative automation score. This is a labor intensive plant with a high percentage of hired workers, with the other characteristics being presented in the table. Plant number two in the table, with a high automation score, can be characterized as capital intensive with a positive work quality score. The standardicity score for this plant (-1.0) appears to be out of range and is difficult to justify. Perhaps it is a reflection of "newness" of the plant and the search for standard products typical to the initial development phase of plants. The third plant was assigned a high work quality score and negative scores regarding standardicity and automation. It can be generally characterized as an advanced technology plant.

3.4 Summary of the Plant Characteristics Analysis

This study emphasized the view of an industrial plant as a system with strong inter-relationships among its various elements. The results of the empirical analysis presented here with reference to 24 industrial plants on collective settlements, support this approach and validate the hypothesis that there exists an internal consistency within the plant structure and a logical

interdependence among the variables characterizing the plants. The empirical analysis points to a limited number of "major variables" which are linked with three factors: Standardicity, Work Quality and Automation. The "major variables" and the three factors are sufficient for the description of the characteristics of the plants. Moreover, factor scores computed with reference to these three factors can be used as quantitative indices representing the major characteristics of industrial plants.

Table 1 Factor Loading Coefficients Matrix with Qualitative Variables Represented by a Scaling Procedure

Factor Identification	(1) Standardicity	(2) Work Quality	(3) Automation	(4) Simple Technology	h^2 (1
Variance accounted for by Factor, %	24.6	15.8	14.3	9.3	
Cumulative Variance accounted for, %	24.6	40.4	57.7	64.1	
Variable					
Product stability (stable) (2	.36				.28
Substitutes availability(low)				-.48	
Number of major buyers (many)	.81			.40	.83
Dominating demand factor(price) (3			.44		.27
Marketing skill requirements (general knowledge) (4				.73	.64
Automation level (high)			.90		.84
Technology sophistication(high)	-.63				.59
Work diversification(diversified)		.71		-.42	.80
Workers independence in production process (independent)	-.38	.78			.78
Batch size (flow process)			.73		.62
Shifts (3)	-.36		.70		.64
Capital equipment/production worker			.71		.65
% of overhead workers	-.73		.33		.68
% of skilled production workers		.51	.43		.50
% of hired workers		-.76			.50
Absence of physical effort		.88			.78
Absence of health hazards	.41	.78			.78
Stage of technological development (available) (5				.68	.55
Availability of technological know-how (low cost)				.78	.62
Stadardicity of product	.83		.37		.84
Standardicity of buyers	.88				.83

(1 h^2 (Communality) = % of total variance of the variable accounted for by the factors.

(2 The phrase in the parenthesis indicates the characteristics scored with the highest score. The range of the scores was between 1 to 3.

(3 The other qualitative variables being quality(2) and "good will" and reputation(1).

(4 The other qualitative variable being "technical proficiency".

(5 The other qualitative variables being, "at the stage of development" and "embryonic".

Table 2 Selected Plants with the Highest and Lowest Work Quality Factor Scores

Plant Ranking	Score(1	Group of Products	Branch of Industry	% of Hired Workers
1	1.524	Industrial Equipment	Electronics	0
2	1.465	Spare Parts	Metals	0
3	1.214	Consumer Goods	Textiles: Apparel	0
4	.937	Industrial Equipment	Metals	0
5	.851	Supplementary Materials	Metals	0
20	-.645	Supplementary Materials	Plastics	28
21	-1.058	Consumer Goods	Food	72
22	-1.214	Consumer Goods	Metals	48
23	-1.501	Consumer Goods	Food	91
24	-2.366	Supplementary Materials	Metals	71

(1 According to Factor computation presented in Table 1.

Table 3 Profiles of Three Typical Plants

Profile Variable	Plant Number 1	2	3
Product and Market Characteristics			
Product category	Consumer Goods	Raw Materials	Machinery & Materials
Industry branch	Food	Plastics	Electronics
Number of major buyers	Few	Many	Few
Skill requirements in marketing	General Knowledge	Technical Proficiency	Technical Proficiency
Actual marketing in Israel	Self/Agents	Self	Self
Dominant Demand Factor	Price/Quality	Quality	Quality
Technology			
General characteristics	Small Batches	Flow Process	Jobbing
Level of automation	Manual/Machine	Full Automation	Manual
Technological sophistication	Low	High	High
Work diversification	Routine	Partial-Routine	Diversified
Workers independence in production process	Partly Independent	Independent	Independent
Shifts	1	2-3	1
Technological Know-How			
Stage of Technological Development	Available, Partly at Developing Stage	Available	Available, Partly at Developing Stage
Production Factors			
Number of Total Workers	123	26	52
% of overhead workers	24	38	35
% of skilled production workers	20	56	79
% of hired workers	91	0	12
% of total hired workers	89	0	15
Capital Investment/Worker IL/1000 (1	370	1,870	673
General Characterization	Labor Intensive	Capital Intensive	Advanced Technology
Factor Scores (2			
Standardicity	.4	-1.0	-.9
Work Quality	-1.5	.6	1.5
Automation	-.8	1.5	-.9

(1 Spring 1979 price level; one IL(Israel pound) = 3 US cents.

(2 According to Factor computation in Table 1.

4. EVALUATION OF THE SOCIO-ECONOMIC PREFERENCES OF KIBBUTZ COMMUNITIES WITH RESPECT TO INDUSTRIAL PLANTS

4.1 The Approach

The literature of project or policy evaluation with multiple objectives is extensive. Distinction can be made between three classes of approaches;

(1) Approaches which generate an efficient set of solutions "efficiency frontier" as a background for articulating preferences and decision making e.g. Gass and Saaty [11], Marglin [21].

(2) Approaches which rely on prior specification of the utility function of the decision maker prior to the evaluation of the choice of alternatives e.g., Reisman and Dean [27], Keeney and Raiffa [18], and Einhorn and McCoach [9].

(3) Approaches which rely on progressive articulation of preferences e.g., Benayoun et al [1], Monarchi et al [4].

The second approach was used as a starting point in this study with the understanding that the evaluation of the utility function and the preferences of the decision maker ought to be validated or adjusted at a later stage in view of the analyses of the actual alternatives under consideration.

Before turning to specifics, the underlying philosophy of the approach used is that a rigorous analysis of the problem within a well defined model will enhance the quality of the decision. However, it is not our belief that a "model" should be viewed as an instrument into which various "inputs are fed" and from which decisions are automatically spewed. Rather we view the model as a means for a systematic way of thinking, recognizing the need for subjective inputs and several simplifying assumptions. The assumptions made will be specified later.

4.2 The Criteria

A hierarchical criteria structure for the selection of an industrial plant on a kibbutz was assumed. The first level criteria were (1) economic, and (2) social.

In considering the detailed specification of the criteria some preliminary questions have to be considered. The first question is whether the prospective industrial plant is intended for a special group within the labor force of the community or for the labor force in general. This question is of importance under situations in which the industrial plant is intended for the employment of the elderly and the infirm. The expectations from the industrial plants under the latter conditions would obviously be different from those of the former, and, accordingly, the list of the criteria will be different. A second question to be asked is whether the population of the settlement is relatively homogenous or split into various strata which may have conflicting interests. We used a relatively homogenous kibbutz community and directed the study to the general labor force. The detailed list of the criteria is presented in Table 5 and 6 along with the evaluation of their relative weights.

Most of the social criteria listed in Table 5 originate in the desire for a "high quality or working life" of kibbutz members. Some, such as work environment, skilled work, job satisfaction, are relevant to any industrial plant in developed countries such as in Scandinavia, the United Kingdom and others. The issue of quality of working conditions is emphasized on kibbutzim due to their social structure and the lack of monetary compensation for increased effort.

Some of the above criteria are unique to the kibbutz social structure and ideology. The most striking in this category is probably the resistance to hired labor. The kibbutzim, being small, homogenous, and egalitarian societies, generally object to the employment of hired labor on their farms on both ideological-egalitarian and practical-pragmatical grounds. Regarding the latter, it has been argued that excessive employment of hired workers introduces "social imbalances" into the kibbutz society, a discussion of which falls beyond the scope of this paper. Other criteria which are related to the structure of the kibbutz farms and societies are size of plant, labor mobility, and subordination to kibbutz management.

4.3 The Utility Function and the Dominance of The Major Economic Criteria

The concept of additive multiattribute linear utility was adopted following Fishburn [10], Reisman et al [27], and Einhorn and McCoach [9]:

$$U_k = \sum_{i=1}^{I} \frac{\partial U}{\partial X_i} X_{ik} \qquad (2)$$

where

U_k - utility derived from plant k ,

$\frac{\partial U}{\partial X_i}$ - marginal utility due to the i-th criterion.

The criteria are defined so that in the relevant range

$$\frac{\partial U}{\partial X_i} > 0 \text{ for all } i ,$$

X_{ik} - contribution of the k-th industrial plant to the i-th criterion (with a high value of X_{ik} indicating a high contribution).

The marginal utilities indicate the relative weights of the various criteria and their ratios $\frac{\partial U}{\partial X_i} / \frac{\partial U}{\partial X_j}$ $(i \neq j)$ represent the marginal rates of of substitution between them (see Appendix A). For a general specification of the utility function, $\frac{\partial U}{\partial X_i}$ should be considered as a function of the vector $\underline{X}$ i.e., $\frac{\partial U}{\partial X_i} = h(X_1, \ldots, X_i, \ldots, X_I)$, however for a <u>relatively narrow range of variation</u> in the components of $\underline{X}$ the marginal utility values $\frac{\partial U}{\partial X_i}$ can be considered as approximately constant. Assume that $\underline{X}_*$ represents the "status quo" in the criteria space and that only alternatives which induce a shift towards $\underline{X}$, $\underline{X} \geq \underline{X}_*$ are considered. It is further assumed that $\underline{X}$ is bounded from above i.e. $\underline{X}_* \leq \underline{X} \leq \underline{X}^*$ and that the range $(\underline{X}^* - \underline{X}_*)$ is "narrow". The last assumption complies with the realistic conditions in which the process of industrialization of a rural community is a gradual one. Under the above assumptions the concept of additive linear utility is considered as a good approximation to reality.

A similar justification of the linearity property of the utility function has been proposed by Einhorn and McCoach [9], who state that for "practical purposes"..."the plausible range of X will be considerably smaller than the possible range of X" and therefore a linear function can be considered as a good approximation. Regarding the additive combining rule, Einhorn and McCoach [9] state that "it has been shown to be a very good approximation to non-linear rules when the criteria are conditionally monotone with utility", with the latter being an acceptable assumption.

Other justifications of the additive linear utility function for certain well defined preferential structures of the decision maker are rigorously presented by Fishburn [10] and by Keeney and Raiffa [18].

The core of the evaluation of alternative projects as furmulated in (2) comprises two parts:

(a) Evaluation of the marginal utilities $\frac{\partial U}{\partial X_i}$, i.e. assigning relative weights to the criteria which express the socio-economic preferences of the rural society; and

(b) Identification of the attributes of the industrial projects and evaluation of their potential contributions in terms of the criteria space (X_{ik}).

As previously mentioned the relevant range of variation of the X_i -s is considerably smaller than the a priori plausible range. In empirical analyses, however, it is quite difficult to evaluate the boundaries of the relevant ranges for most of the X_i -s, before a detailed study of alternative projects is undertaken. The two major economic criteria - <u>alternative cost of labor</u> and <u>cost of capital</u> are an exception; these can be easily established by any kibbutz.

Moreover, during the course of our empirical work we were lead to the conclusion that most of the kibbutzim would rather refer to <u>return to labor</u> and <u>return to capital</u> as two <u>dominating criteria</u> with a priori determined critical threshold levels; - accordingly, industrial project alternatives which do not

meet the required threshold levels with a high probability should be eliminated from further consideration at the very beginning. The "other" economic criteria (listed in Table 6) could be used as auxiliary ones for the sake of supplementary evaluation of the plants from the economic point of view.

4.4 Empirical Evaluation of the Socio-Economic Criteria

An extensive empirical work regarding the evaluation of the social criteria was carried out first at kibbutz Nir Oz in the Negev. The same procedures were later followed at five "young" kibbutzim and seven "old" kibbutzim.(5) At Nir Oz two independent panels of judges were selected, each consisting of 16 kibbutz members. These panels were representative of all strata of the Nir Oz membership according to sex, age, employment, and formal and informal involvement in the society and the economy of the kibbutz. Kibbutz Nir Oz is relatively homogenous socially and no far-reaching differences of opinion or conflicts of interest were expected among the members of the panels. This assumption was later validated by the results.

Two methods for scoring the criteria - ranking and rating - were applied in parallel by the two panels. These methods were selected on the basis of the study by Eckenrode [7], who compared several scoring methods and found that the results of the scoring by the different approaches were highly correlated and at the same time, the ranking and the rating methods were more efficient in terms of the time required.

The actual technique for the evaluation of the criteria followed Reisman and Dean [27] and was based on the application of the Delphi method as a medium for scoring by the two panels. For a detailed discussion of the Delphi method, the reader is referred to Gordon and Helmer [13], and for a critical assessment, to Sackman [28]. Here it will suffice to briefly describe its method of application and evaluate its major features.

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(5) Established before and after 1950, respectively.

Each panel of judges maintained three sessions of approximately three hours each, with a senior member of the research team as a coordinator of each session. Questionnaires were distributed to the panelists who submitted their scores anonymously, in writing, along with a 2-3 sentences' explanation of each score.

At the end of a scoring round, the essential score statistics (mean, median, frequency distribution of the scores) and the panelists' explanations for scoring, were presented to the panels who were asked to re-evaluate their scores in view of the feedback information presented. Each panel maintained three scoring rounds. Criteria with respect to which "small" score variance or "consensus" was achieved, were eliminated from consecutive rounds.(6)

The Delphi technique has two major advantages: (a) anonymity; and (b) controlled feedback. Anonymity has the effect of minimizing the influence of dominant individuals in the panel and "side considerations" by the panelists. The controlled feedback is a device used to reduce the variance, in response to the anonymous arguments and counter-arguments offered by the individual panelists. Further details regarding the Delphi sessions technique, as applied in this study, can be found in Cooper [5, in Hebrew].

The results of the Delphi sessions at Kibbutz Nir Oz have shown high correlations between the weights assigned to the social criteria by (i) the two independent panels and (ii) the two scoring methods (rating and ranking).

The relative weights of the economic criteria could not be evaluated by the members of Nir Oz themselves due to the fact that only a limited number of the kibbutz members were sufficiently knowledgeable to pass an educated judgement; thus, experts from outside had to be invited.

Following the detailed work at Nir Oz, similar Delphi sessions were held at five "young" kibbutzim with a relatively homogenous membership. The

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(6) A "small" variance or a "consensus" was defined as a situation in which 75% of the votes for a given criterion fell within the range of two consecutive scores out of five. Note that for the two Nir Oz panels, "consensus" was achieved with respect to 68% and 59% of the criteria at the end of the first round, and 94% and 85% at the end of the third round.

criteria weights assisgned by them were highly correlated with those of Nir Oz. Additional empirical work on the subject has been carried out on seven "old" kibbutzim with the results that these evaluations being similar to the previous ones. The correlation coefficients between the evaluations of the panels of Nir Oz and the other kibbutzim are shown in Table 4. Note that they are all high, with the lowest being .76 and .25 out of 36 coefficients being higher than .85 . Most of these 12 kibbutzim have had industrial plants. More details on the subject can be found in Cooper in Hebrew [5].

The results of the above described extensive field work led us to formulate the hypothesis that there exists a "universal preference structure" of the kibbutzim with respect to the social-group and social-personal criteria. In view of the above hypothesis a task was undertaken with the aim of evaluating the relative weights of the criteria as scored by 40 kibbutz industrial experts. Due to the difficulties in organizing Delphi session meetings within this group, a method, based on the distribution of questionnaires and summing up of the results after one round only, was followed.

The kibbutz industrial experts were asked to provide evaluations of the social as well as of the economic criteria. The results of their evaluations with respect to the social criteria are presented in Table 5. Regarding the social-group and social-personal criteria, the highest weight was assigned to

- Hired labor;
- Ecology;
- Health hazards;
- Work environment (heat, smell, etc.).

A lower level of importance (median score - 3) was assigned to

- Democratic management;
- Subordination to kibbutz management.

Regarding the social-personal criteria, second level priority (median score - 3) was assigned to:

- Physical efforts;
- Skilled work;
- Job satisfaction;
- Shifts.

Regarding the economic criteria other than return to labor and return to capital, (referred to as the dominating ones in the sense discussed above), a relatively high score (median score - 4) was assigned to

- Size of plant;
- Sophistication in production and marketing;
- Risk of liquidity problems;
- Price fluctuations;
- Low chance for export;
- High probability for obsolescence of technology;
- High probability for difficulties and instability in supply of raw materials.

5. PERFORMANCE OF THE PLANTS: INTERRELATIONSHIP WITH PROFILE VARIABLES AND PROJECT EVALUATION

This section describes our approach to the evaluation of industrial projects for development within the collective villages of Israel.

5.1 Project Evaluation from the Point of View of Social-Group and Social-Personal Criteria

The basic conception of our study was the existence of a systematic interrelationship between the plant structural variables called "profile variables" and the success of the plant from the point of view of social and personal criteria. For example: types of plants which require strong coordination among the various parts of the production process imply formal rather than informal management organization (See Woodward [32]).

However, formal types of management do not fit well into the preference system of the kibbutz society. Even though it is possible by special attention and consideration given to social and personal problems (workers meetings, frequent reports by management, smooth flow of information within the plant, etc.) to diminish the severity of the social problems likely to emerge when the plant

structure requires formal management, the consideration of the profile variables and of the effect they are likely to exert on the emergence of social and personal problems, should be encouraged at the planning stage of industrial plants.

A positive statistical analysis of the performance of the plants and their success from the social point of view could not be performed since the efforts required by such an analysis fell beyond the limits of feasibility of our study. Accordingly, an objective analysis was substituted by subjective export evaluation. Out of a few kibbutz industry experts approached, two felt that they were well acquainted with the sample plants. Their judgement in the evaluation of the performance of the plants from the point of view of the social criteria was used as a bench mark for testing the approach to project evaluation applied by this investigation.

The experts were presented with a list of six social-group criteria and eight social-personal criteria (detailed in Table 5) and were asked to rate each of the plants on a cardinal scale, with scores ranging from 1 to 5. A score of 5 meant that the project was very positive with respect to the criteria, 4 - the plant was positive, etc. The experts' scores are shown in Tables 7 and 8, columns 2 and 3 (social-group and social-personal criteria, respectively).

As shown by the tables the scores of the two experts were quite similar (both evaluated 21 out of the 24 plants in the sample). Regarding the social-group criteria 13 plants were granted the same scores exactly. With respect to the others, the differences between the scores varied by one score point only. With respect to the social-personal criteria, again 13 plants were scored equally by the experts, and, regarding the others only two projects were granted scores differing by two score points.

The evaluation of the 24 plants by the research group with respect to the social-group criteria followed the steps enumerated below:

1. Reference was made to the six social-group criteria listed in Table 5.

2. Each member of the research team scored each of the plants with respect to each of the six criteria (with X_{ikj}, $1 \leq X_{ikj} \leq 5$, being the score granted by a team member j to plant k with respect to the i-th's criterion).

3. An average score over the J research team members was computed for every plant k and every criterion $i (X_{ik\cdot} = \frac{1}{J} \sum_j X_{ikj})$.

4. An overall weighted score for each plant was computed with the weights being $\frac{\partial U}{\partial X_i}$ (= the marginal utility derived from the i-th attribute):

$$U_k = \sum_{i=1}^{6} \frac{\partial U}{\partial X_i} X_{ik}$$

5. A simple average score U_k^* was computed for each plant according to:

$$U_k^* = \frac{1}{6} \sum_{i=1}^{6} X_{ik}$$

The plant scores U_k and U_k^* (weighted and simple average scores respectively) are presented in columns 4 and 5 of Table 7. Column 6 of this table presents a simple average rounded to the nearest integer.

Scrutiny of Table 7 reveals a striking similarity between the scores granted by the research team and those by the experts. A striking similarity exists as well between the scores granted to the plants by the research team applying the weighted average and the simple average computation over the individual criteria scores. This result is consistent with the argument by Einhorn and Hogarth [8] based on theoretical considerations, which assigns limited importance to weighting.

A similar approach was applied by the research team to the evaluation of the plants according to the social-personal criteria (second part of Table 7). The scores are presented in Table 8, columns 4 to 6. Here too, the similarity between the experts' scores and those granted by the research team, using both the weighted average and the simple average approach is evident. Note that the experts granted a few extreme scores (one 5, one 1 and one 2) which do not appear in the research

team scores. The difference is due to the fact that the research team scores are averages (generally of five votes) which obscure the extreme scores.

It is important to emphasize that the evaluation of the sample plants by the research team, from the point of view of the social-group and social-personal criteria, took place at an early stage of the research work, when the experience of the members of the research team and their knowledge of the sample plants were still limited. The good correspondence bewteen the plants' evaluation by the experts and that by the research team, points to the possibility of achieving "good evaluation results" with limited experience. This can be achieved, as in our case, by reference to a detailed list of criteria which is helpful in the plant evaluation considerations and compensates for the lack of experience.

Plant evaluation is subjective, as it is based on subjective comparisons among plants. A recommended approach for the structuring of a comparative scale is to start with three or four plants which may serve as bench-mark points on the scale to be constructed. The inexperienced judges will find it helpful to ask themselves whether a given plant meets criterion i similar to a given bench-mark plant, better or worse.

5.2 Analysis of the Economic Performance of the Plants

In order to estimate the productivity of the production factors of the sample plants and to examine the effect of the factors on productivity, plants' factor scores were incorporated into the estimate of the production function of the sample plants. The following specification was applied:

$$VA = b_0 X_1^{b_1} X_2^{b_2} X_3^{b_3} \prod_{k=1}^{4} 10^{c_k F_k} \qquad (3)$$

With all the monetary values being expressed in Spring 1979 prices (IL).[7] The variables are:

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[7] One IL (Israel Lira) = $.03 U.S. dollars during Spring 1979.

VA - plants' value added (= sales less current expenses);

X_1 - fixed capital (replacement value);

X_2 - current capital (average stock value);

X_3 - total number of work days, members and hired workers;

F_k - score of Factor k; (8)

b_1 - production elasticities i = 1,2,3;

c_k - factor coefficients.

In an alternative formulation of the production function, X_2 was omitted. The estimates of (3) are presented in Table 9.

As shown by the table, the coefficient of the Work Quality Factor is negative in all the regressions and significant in most of them, reflecting a tendency for reduced productivity in plants with positive work characteristics (see Table 1 for the variables correlated with this factor).

The coefficient of the Simple Technology Factor (F_4) is positive and significant in those regressions in which it was included, while the coefficient of the Automation Factor (F_3) is positive but not significant.

The coefficient of the Standardicity Factor (F_1) obtained in the estimates of the production function is negative.

An analysis of the effect of the factors on the profitability of the plants applying an approach based on definition of about 15 indices of economic performance (e.g. $\frac{\text{value added}}{\text{labor}}$ ratio, $\frac{\text{current expenses}}{\text{sales}}$ ratio) and correlating them with the above Factors indicated a negative relationhsip between profitability and the Work Quality Factor and a positive relationship with Automation, thus supporting the previous results obtained through production function analysis. However, the relationship between profitability and the Standardicity Factor was found to be

(8 The factor scores were computed according to Factor definition in Table 1.

positive contrary to the production function analysis. Another question mark regarding the effect of the Standardicity Factor arises in view of the positive effect of the Simple Technology Factor in the production function analysis. Further elaboration on this issue is needed.

The consistently similar results regarding the Work Quality Factor (F_2) indicate the tendency towards increased productivity in terms of return to labor and capital in plants with a low Work Quality Factor score. A low Work Quality score was obtained in labor intensive plants with a high share of hired workers in which negative work characteristics prevailed, such as routine work, low skill requirements, lack of workers' independence at the production process, high probability of physical efforts and other nuisances. On the other hand a high Work Quality score was obtained for plants with advanced technology producing mainly raw materials and industrial equipment.

Since low scores on the Work Quality Factor are related to high probability of hired labor, it seemed likely that the positive correlation between profitability and the Work Quality Factor could be attributed to the difference between the cost of labor of kibbutz members and hired workers. In order to examine this assumption the labor costs of the hired workers were adjusted and equated to those of kibbutz members. It was found that the adjustments made along this line were insignificant and the change in the profitability of the plants resulting from this adjustment was negligible. With respect to some plants the profitability even increases as a result of the adjustment. We assume that the above mentioned results with respect to the Work Quality Factor can be attributed to the following:

1. High and positive scores on this factor characterize plants with advanced technology. These types of plants, which were included in the sample, still face marketing problems, and their profitability is diminished accordingly.

2. Many of the capital intensive and advanced technology plants, with a high share of member employees, have been established relatively recently and have not yet reached their full productive capacity.

3. Certain plants, which were included in the sample with low (i.e. negative) scores on the Work Quality Factor were apparently paid for jobs which involved physical efforts and extensive nuisances at job stations.

The above results provide a general background for the evaluation of industrial plants for collective settlements.

Alternative specifications of the production function were attempted. Specifically, additional variables, such as age of the plants, share of export in sales, were incorporated into the estimated equations. However, in all these attempts the variables were not found to be significant.

Evaluation of Plants with Respect to Economic Criteria

As previously mentioned during the course of our empirical work we were lead to the conclusion that return to labor and return to capital should be viewed as two dominating criteria with a predetermined critical threshold level, according to the alternative cost of labor and capital on the settlement under consideration. An industrial project unable to meet these threshold values with a high probability will be eliminated from further consideration at the very beginning.

In order to examine the validity of the "other" economic criteria (Table 6), the sample plants were subjected to a process of evaluation by the research team in a manner similar to that applied to the social criteria. At the evaluation process each plant was scored with respect to the "restrictions" and "risks" criteria, detailed in Section 3. Finally, each plant was given two overall scores relating to the two above groups of criteria. These scores were compared with indices of economic performance (e.g. deviations from the plants' production functions, various indices of profitability Golan [12, in Hebrew]. However, in all the analyses attempted no significant relationship could be established between the objective measures of economic performance of the plants and the

scores reflecting the "other" economic criteria. Accordingly, we suggest referring to these criteria as auxiliary ones in the process of project evaluation with the major economic criteria being return to labor and return to capital.

6. SUMMARY

An approach for the evaluation of industrial plants from the point of view of their adaptability has been developed. The contribution of the study was mainly along the following lines:

(a) The exposition and analysis of the problem of the selection of an industrial plant for a rural settlement within the comprehensive framework of a system and proper identification of its major elements and the links among them.

(b) Identification of a limited number of variables and Factors apt to characterize industrial plants and their profiles.

(c) Identification of the social criteria (group oriented and personal oriented) for the evaluation of industrial plants for kibbutz settlements, and establishing the relative weights of the criteria.

(d) The design and testing of an approach to the evaluation of industrial projects for rural communities.

During our empirical work attempts were made to assess an overall utility index integrating all economic and social criteria for each industrial plant. However, these attempts did not yield sound results. On the other hand, "good" results were achieved in the evaluation of industrial projects in terms of the social (group and personal) criteria. The procedure recommended is to evaluate prospective industrial projects by reference to four scores:

(1) The return to labor (with a probabilistic dimension);
(2) The return to capital (with a probabilistic dimension);
(3) The social-group oriented criteria score;
(4) The social-personal oriented criteria score.

In addition to these scores a supplementary evaluation of the projects on the basis of the "other" auxiliary economic criteria is recommended.

(e) The design of a rigorous logical framework for the evaluation of industrial plants from the point of view of their adaptability to collective settlements. The authors do not believe in the existence of "models" apt to solve complex problems mechanically, but an orderly way of thinking, supplemented by general information and empirical findings, can be of assistance to the decision makers in settlements and to rural planners facing the problem of the selection and development of industrial plants in rural communities.

The empirical background for the study was provided by collective settlements in Israel, primarily kibbutzim. It is likely, however, that the approach developed, with certain modifications, could be applied to other types of rural settlements and small towns in Israel and other countries.

Table 4 Correlation Coefficients Between the Relative Weights Assigned to the Social Criteria by Two Panels of Kibbutz Nir Oz, Five "Young" and Two "Old" Kibbutzim

Panel	Nir Oz I	Nir Oz II	Kibbutz A	B	C	D	E	F
Nir Oz II	.83							
A (Young)	.88	.79						
B (Young)	.83	.76	.91					
C (Young)	.88	.81	.91	.95				
D (Young)	.91	.81	.91	.87	.87			
E (Young)	.91	.86	.90	.91	.94	.93		
F (Old)	.91	.80	.90	.87	.92	.89	.91	
G (Old)	.92	.81	.92	.85	.91	.91	.95	.95

Table 5 Relative Weights of the Social Criteria as Assigned by Kibbutz Industry Specialists

Criteria	Criteria Description	Relative Weight (Score)[1]							Median	Mean
		1	2	3	4	5	N.R.[2]	Total		
(a) Social-Group Criteria										
1. Hired labor	i. High labor intensity implying probability of reliance upon hired labor.	2	0	8	30	60	0	100	5	4.5
	ii. High probability for "low quality" jobs.	0	0	13	60	25	2	100	4	4.1
2. Partnership with others	High probability that demand for inputs (labor and capital) will imply partnership.	12	23	38	18	7	2	100	3	2.9
3. Democratic management	Extensive requirements for specialization which may limit the possibility for rotation at the managerial level.	18	17	30	18	12	5	100	3	2.9
4. Subordination to kibbutz management	Extensive requirements for specialization which may cause antagonism to subordination to kibbutz management.	12	22	39	20	0	7	100	3	2.7
5. Ecology	High probability for plant-caused ecological nuisances.	0	6	10	27	63	0	100	5	4.5

(1 Score 5 means - "very critical to the plant's success", score 1 means - "not critical to the plant's success". The scores should be normalized at a later stage so as to achieve $\sum_{i=1}^{6} \beta_i = 1$.

(2 N.R. = no reply.

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Table 5 (Continued)

Criteria	Criteria Description	Relative Weight (Score)[1] 1	2	3	4	5	N.R.[2]	Total	Median	Mean
(b) Personal Oriented Criteria										
1. Health	i. High probability of work-related diseases.	2	5	0	15	78	0	100	5	4.6
	ii. High probability of work-related physical disability.	2	5	7	22	64	0	100	5	4.4
2. Work environment	i. Dissatisfactory physical work environment (heat, noise, smell, etc.).	0	2	12	56	30	0	100	4	4.1
	ii. Physical efforts.	0	7	46	37	10	0	100	3	3.5
3. Skill requirements	High probability for jobs requiring low-qualifications.	17	24	34	17	3	5	100	3	2.6
4. Education	High probability for jobs which do not require advanced education.	15	41	22	20	0	2	100	2	2.5
5. Job Satisfaction	High probability for extensive routine work.	17	22	27	32	2	0	100	3	2.8
6. Shifts	High probability of capital intensive technology implying shift work.	2	15	37	34	7	5	100	3	3.3

(1 See footnote 1 above.

(2 See footnote 2 above.

Table 6 Relative Weights of the Economic Auxiliary Criteria as Assigned by Kibbutz Industry Specialists

Criteria		Criteria Description	Relative Weight (score)[1]							Median	Mean
			1	2	3	4	5	N.R.[2]	Total		
(a)	Restrictions										
1.	Finance and liquidity[3]	Risk of liquidity problems.	0	3	25	60	10	2	100	4	3.8
2.	Size of Plant	Inherent economies of scale which make a kibbutz-small plant a priori disadvantageous.	0	10	30	43	17	0	100	4	3.7
3.	Labor mobility between the plant and other kibbutz activities	i. Rigidities in production level and lack of flexibility in shifting workers from the plant to agriculture during high agricultural seasons [4]									
		ii. Lack of adaptability for the employment of part-time, elderly and/or inform workers at low alternative cost of labor. [4]									
4.	Complexity and sophistication	i. Production-technology sophistication implying difficulties in the assignment of a professional team from the kibbutz labor force.	25	33	40	2	0	0	100	2	2.2
		ii. Sophistication at the marketing stages implying difficulties in marketing through external channels and/or difficulties in the assignment of adequate marketing personnel from the kibbutz labor force.	10	25	38	20	10	0	100	3	3.0

[1] See footnote 1 - Table 5

[2] See footnote 2 - Table 5

[3] Due to excessive capital intensity, low value added in production, need for excessive inventories and the like.

[4] Not scored by the Kibbutz Industry Specialists.

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Table 6 (Continued)

Criteria		Criteria Description	Relative Weight (Score (1 1	2	3	4	5	N.R. (2	Total	Median	Mean
(b)	Risks										
1.	Life cycle of products	High probability for obsolescence of products.	25	30	28	13	2	2	100	2	2.4
2.	Extent of the line of products	High probability for a limited line of products.	20	23	32	20	5	0	100	3	2.7
3.	Flexibility of transition from one group of products to another	The transition is feasible at high cost only.	2	10	38	38	12	0	100	3-4	3.5
4.	Price Fluctuations	High probability for high prices fluctuations.	0	2	40	45	8	2	100	4	3.5
5.	Market potential	A low potential for exports (due to competitive products, high cost of transportation, etc..	0	5	17	35	43	0	100	4	4.2
6.	Life cycle of technology	High probability for obsolescence of technology.	5	20	28	37	20	0	100	4	3.5
7.	Technological sophistication risking quality of products	Technological risks related to quality of products.	5	12	45	23	10	5	100	3	3.2
8.	Raw materials availability	High probability for difficulties in supply and/or instability of raw materials at reasonable prices.	0	0	10	45	43	2	100	4	4.3

(1 See footnote 1 - Table 5.

(2 See footnote 2 - Table 5.

Table 7 Comparison of Plants' Scores with Respect to Social-Group Criteria Granted by (a) Experts and (b) Research Team

Plant No.	Scores by 2 experts		Scores by Research Team		
	Expert # 1	Expert # 2	Weighted Average(1	Simple Average Exact	Rounded
(1)	(2)	(3)	(4)	(5)	(6)
1	4	4	4.2	4.3	4
2	4	3	3.7	3.7	4
3	3	4	4.0	4.0	4
4	3	3	3.1	3.1	3
5	4	4	4.2	4.2	4
6	5	4	4.1	4.0	4
7	3	3	3.4	3.4	3
8	4	4	3.7	3.7	4
9	2	2	3.7	3.7	4
10	4	4	4.8	4.7	5
11	2	4	3.7	3.7	4
12	4	4	3.7	3.7	4
13	4	3	4.0	4.0	4
14	3	2	2.5	2.6	3
15	3	-	3.0	3.1	3
16	4	4	4.2	4.1	4
17	4	-	3.0	2.9	3
18	4	3	4.1	4.1	4
19	4	4	3.7	3.6	4
20	2	1	3.1	3.2	4
21	4	4	4.4	4.4	4
22	4	4	4.3	4.1	4
23	-	-	2.7	2.8	3
24	4	4	3.9	3.6	4

(1 See text for details.

Table 8 Comparison of Plants' Scores with Respect to Social-Personal Criteria Granted by (a) Experts and (b) Research Team

Plant No.	Scores by 2 Experts		Scores by Research Team		
	Expert # 1	Expert # 2	Weighted Average(1	Simple Average Exact	Rounded
(1)	(2)	(3)	(4)	(5)	(6)
1	4	4	3.9	3.7	4
2	4	4	3.6	3.2	3
3	3	3	4.2	4.2	4
4	2	2	3.2	3.1	3
5	3	4	3.6	3.4	4
6	3	4	3.5	3.5	3
7	2	3	3.0	2.9	3
8	3	4	3.7	3.7	4
9	2	2	3.6	3.5	4
10	3	4	4.6	4.5	4
11	2	4	3.4	3.4	3
12	4	4	4.2	3.9	4
13	3	3	4.1	4.1	4
14	2	2	3.5	3.3	3
15	2	-	2.8	2.8	3
16	4	4	4.4	4.2	4
17	2	-	2.9	3.1	2
18	3	3	3.9	3.8	4
19	4	4	4.0	4.1	4
20	2	1	2.7	2.7	3
21	4	4	4.1	3.8	4
22	4	4	3.7	3.6	4
23	-	-	2.8	2.7	4
24	3	5	4.8	4.7	5

(1 See text for details.

Table 9 Regression Coefficients in the Production Function of the Sample Plants[1]

Regression No.	Constant b_0	Fixed Capital x_1	Current Capital x_2	Labor x_3	Factors: Standardicity F_1	Work Quality F_2	Automation F_3	Simple Technology F_4	R^2
1	.017	.380		.599		-.058	.045		.85
		(3.68)[2]		(3.84)		(-1.74)	(.92)		
2	.007	.399		.693	-.058	-.042	.041	.071	.88
		(3.55)		(3.57)	(-1.44)	(-1.32)	(.82)	(1.97)	
3	.031	3.88		.507		-.059			.84
		(5.28)		(4.24)		(-1.80)			
4	.029	.294	.194	.527		-.058	.064		
		(3.06)	(2.62)	(3.97)		(-1.99)	(1.47)		
5	.009	.300	.185	.650	-0.62	-.043	.065	.061	
		2.94	(2.73)	(3.92)	(1.80)	(-1.59)	(1.49)	(1.99)	
6	.644	.388	.176	.407	(-1.80)	-0.06			.88
		(5.28)	(2.34)	(3.50)		(2.01)			
Geometric Mean[3]		29.300	7,970	9,641					
Units		IL Mil.	IL Mil.	Work Days					

Comments:

(1 Factor scores according to the scaling approach were used (Table 1). See text for the explanationofthe definition of the variables and the specification of the regression.

(2 The coefficients in parenthesis are (t) values with 24 observations.

(3 The geometric mean of the value added was 14.5 IL Mil. at Spring, 1979 price level (One IL = 3US cents).

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