

付 属 資 料

- ① 現地調査報告
- ② 事前説明資料 (Explanatory Note, 英文)
- ③ 質問と回答集 (Questionnair & Answers, 英文)
- ④ 質問と回答集 (和文)

付属資料 ①

現地調査報告

1. 土地改良公社・テレオルマン県灌漑管区
同管区内オールド・カルマツイ灌漑地区
同管区内ビイソアラ灌漑地区

調査結果 (1995年6月20日)

(I) テレオルマン県灌漑管区(Teleorman Country Subsidiary Office)

テレオルマン県灌漑管区の総灌漑面積は23,100haで、これを13,000人の職員で運営している。うち200人は大卒技師(80%は経済と土壌等の農芸化学)である。

テレオルマン県灌漑管区は7つの灌漑地区に分かれており、管区事務所には併設のモーター・変圧器の修理工場と機械工場がある。機械工場ではポンプの回転軸の修理のような高級な加工はできない。モーターの修理工場では、コイルを交換していた。このほか無線機とトラックの修理工場もある。

テレオルマン県灌漑管区では、灌漑地区のポンプ、開水路、管水路、排水路の維持管理改修のほか、3,000ha(231,000haの内数)の土壌侵食対策事業地区、95,000ha(231,000haの内数)の排水改良事業地区、40kmのドナウ川沿いの堤防の維持を担当している。

灌漑施設の維持管理に要する費用のうち80%は国家が補助し、残り20%を農家(農家組合を含む)から徴収している。維持管理費は、年の初め(1月)に全農家に新聞で単位面積当たりの単価を公表し、管区の担当者が電算で金額を計算の上、契約により農民が支払う。

単価は、①地表灌漑の方式(スプリンクラーか畦間か)②作付形態③過去の水利用の実績により決められるが、天候により灌水量は増減するので(降雨が多ければ灌水量は減る)、天候により単価を改定し、農家の支払いは灌漑期の終わりに行われる(支払いは毎月末とする聞取り結果もある)。

農家が支払う水の単価は、平年で25,000レイ/ha(1,090円/ha=全体のコストの1/5)であるが、年によっては、この3~4倍になることもある。(管区全体の管理費は、平年で12億6千万円となる。)

◎問題点(管区長からの聞取り)

- ① 農地の私有化と農家の組織化が進んでいるが、現在、その過度期にあり、農家(農家組合を含む)の数さえ正確に分からない。

農家のカテゴリー

(1) Commercial State Company (半官半民の農協?)

51%以上が国の出資で49%以下が民間分だが、民間分は旧地主に土地を返還する代わりに株券を渡している(全体面積の20% = 全国ベース(以下同様))。

(2) Association (組合) 全体面積の35%

a. Association of Small farmers (小農組合)

b. Family association (家族組合)

数家族が組合となっているもの

(3) Private land owner (個別農家)

全体面積の45%を占めているが、この個別農家の組合化を奨励している。

農家は、農薬や農業機械の購入に資金が必要で、水価へ資金を回す余裕がない。このため管理費用の徴収が順調に行われていない。

水路からの漏水が80%にもものぼっており、この改善により維持管理費の軽減を図り、農家の負担を減らす必要がある。

また、水量を直接測定する機器がないため、使用水量の直接測定ができないことが問題である。水量は、ポンプの稼働時間から間接的に測定している。

② 革命により農地は共産化以前の所有者である農家に返還されたが、個々の小規模の農家がスプリンクラー等の小規模経営のための灌漑施設を持っていない。

このため灌漑利用可能地区のうち、50%で灌漑が行われていない。

◎情報化に対する要望(土地改良公社<RAIF>本部 クレアンガ氏、管区長)

各灌漑地区(Scheme)の水利・電気・作付状況のデータは、各担当者が集めており、重要なものは、取捨選択してブカレストの土地改良公社の本部へ送っている(詳細別紙)。

本社と41の地方管区(Subsidiary)のテレコミュニケーション・ネットワークを構築したい。英国のコンサルタントが調査し、このネットワーク化を提言している(資料入手済み)。また、地方管区と灌漑地区(Scheme)とのコンピュータ化されたリンクも提言されている。現在、雨量、資機材等についてはコンピュータを使ったデータベース化が行われている(ソフトはカナダのFOX.Pro)。

将来的にはフル・オートマチック化によるポンプ場の無人化、または最小限の人員による運転も検討したい。(ただし、RAIF内部にはコンピューターネットワーク化は膨大な資金を要することから、コストベネフィットから疑問視する向きもある(電算機担当部局担当者)。

(2) オールド・カルマツイ灌漑地区(Old-Calmatui Irrigation Scheme) (地区の詳細は別添)

1974年製のポンプにより、46,600haを灌漑している。このうち97%は45,232haがスプリンクラーで、残りの3%・1,428haが畦間灌漑である。ドナウ河からの取水量は、最大32m³/sで、これはロス無しの場合で5.9mm/dayに相当する。

ドナウ河から取水ポンプ場(水位変化対応型のフローティング・ポンプ)で取水された用水は開水路で川沿いの低地を横断した後、第1段ポンプ場(1st Repumping Station H=41m)、第2段ポンプ場(H=40m)、第3段ポンプ場(H=47m)でドナウ河から157mの河岸段丘上に揚水される。

揚水された用水は、コンクリート3面張りの開水路(全長124km)で河岸段丘上の平地に配水され、開水路に沿って立地する34の加圧ポンプ場(Pressure Pumping Station)により圃場下に埋設された管水路に圧力水を供給する。加圧ポンプ場では、管水路(平均延長3500m)の最末端でも3.0km/cmlの圧力を確保できるように加圧している。

管水路はクシ型(または樹枝型)に配置され、1本の管水路の平均支配面積は153ha(間隔612m×奥行2500m)で、約400mおきにスプリンクラーに接続する立ち上がりバルブがある。可搬式のスプリンクラーは1本の灌水半径24m・間隔18m(重複部分6m)で配置される。

オールド・カルマツイ地区は第1段ポンプ場のコントロールルームでドナウ川からの取水ポンプ場、第1~3段ポンプ場、加圧ポンプ場(34カ所)、分水ゲート(31カ所)を有線で監視・操作している。このようなテレコントロール、テレメーターシステムは他にはないとのことであった。監視する情報は、ポンプの吸水側・吐水側の水位、水圧(パイプラインの場合)、分水工の上・下流側水位(フロート式)、分水工のゲート開度である。これらの情報は地中ケーブルでコントロールルームに27秒ごとに自動的に送られてきて、コントロールルーム内のコンピューターの計算により水量に換算されるという。操作は、コントロールルームの操作員により、各ポンプの起動・停止、分水工ゲートの開閉が地中ケーブルを通じて指示される。各ポンプ場には監視要員がいる。分水工は監視要員もおらず完全に無人化している。

灌漑地区事務所では、毎週金曜日に農家との会合を持ち、次週の灌漑供給量を決定するほか、降雨があった場合には、その量により供給量を削減している。

(3) ビイソアラ灌漑地区(Viisoara Irrigation Scheme)

ドナウ河の水を第1段ポンプ場で78m揚水して100,000haを灌漑している。取水量は最大57.5m³/s(ロスなしで4.97mm/dayに相当)でポンプ等の機材はすべてルーマニア製とのことである。

調査した加圧ポンプ場は $0.06\text{m}^3/\text{sec} \times 6$ 台で $H=68\text{m}$ 、受益面積は 900ha （ロスなしで $3.46\text{mm}/\text{day}$ に相当）。

運転記録は電気関係のみで、水量は事前に計測してあるので、ON-OFFだけで水量は決定される（水圧はcheckしていない）。

加圧ポンプ場と灌漑地区事務所との通話は無線である。

電気機器・ポンプ機器は、すべてルーマニア製で1980年から使用している。機器の状況は良好のように見受けられた。

2. 農業工学研究所

土地改良公社ジュルジュ県灌漑管区

調査結果 (1995年6月21日)

(1) 農業工学研究所(Research and Engineering Institute for Irrigation and Drainage (ICITID))

この研究所は以前の事前調査等でも調査したことがあり、今回明らかになったことを中心に記す。

研究所は、ドナウ河沿いの河岸段丘下の低平地に2,300ha、河岸段丘上の平地に1,067haの計3,367haの農地を持ち、段丘上に4階建ての研究所本館のほか、実験棟、研修棟を持つ。

今年2月に当研究所所長として着任したニツ氏は、以前は科学技術省農業アカデミーでSoil-Science担当Secretary氏であり、専門は土壌である。このニツ所長の着任により、それまでの所長クルツ氏は次長に格下げになった。

ニツ氏からは、以下の点につき要望があった。(一部6/22RAIF本部での要望を含む。)

①灌漑、特に用水の搬送効率が悪く改善が必要である。

②水文気象のデータを利用した灌漑計画の改善

現在、ルーマニア各地の計器蒸発量の測定値により蒸発散量を計算し、さらに灌漑水量を決定している。また、気象データからThornthwaite式により蒸発散位を計算し、灌漑開発に利用している。

(Thornthwaite式は、1943年に発表された気温・日射時間・修正係数を用いる蒸発散量推定式で、給水が良好な場合に適応される。これは、現在、FAOが奨励し、世界の主流となっているペンマン式とは考え方が大きく異なる=調査員注)

③農地の私有化、小規模農家の増加といった新しい変化に対応した研究や問題の解決がなされていない。

④施設、機材が老朽化して研究に支障がある。

⑤水路等における流水量の測定、圃場における消費水量の測定を効率的に行う方法が開発されていない。(灌漑諸元の決定、テンシオメーター利用による消費水量測定等)

⑥新技術の導入、新しい灌漑機材(element)の実証ができていない。

⑦灌漑だけでなく排水についても対象としてほしい。

⑧灌漑が水文や土壌に与える影響についても検討してほしい。

⑨研修の実施

以上のうち⑦⑧については可能ならばということであり、その他についても、調査団

としては聞き置くのみにとどめ、コメントは述べなかった。

さらに、ニツ所長からは他の機関（土地改良設計公社〈ISPIF〉や土地改良公社〈RAIF〉）との共同研究は効果的であるとの発言もあった。

構内、特に畑地灌漑研究施設を調査した。

圃場では、点滴灌漑がブドウを対象に研究されていた。（方式は2重管式とオリフィス型エミッタ式のものであった。）

実験棟の中には、別のさし込みオリフィス型エミッタ式の点滴ホースが10mほど放置されていたが、実験室内での基礎研究には使われていないようであった。マイクロ灌漑の機材のエレメントのサンプルが本館ショーケースの中に展示されていたが、研究はされていないようであった。

大規模な灌漑機材としてはリール式レインガンが使用されているが、研究成果についての説明はなかった。

圃場では、6m×10m×3反復のプロットにて灌水量試験が行われていた。灌水はビニールパイプを敷設し、直接根元へ水を2日間ほど滴下して土を完全に飽和する方式で行っているとのことであった。

このほか、センターピボット（半径200m程度）が1基あったが、今は使用されていないようであった。さらに、ラテラルラインの残骸と使用されていない点滴灌漑用の液肥注入器が放置されていた。今回ICITIDからは以下の気象データのサンプルを入手したが、どれもよく整理されていた。データは全国41カ所のものがあることになっている。

- 1) 風向、風速、2) 日照時間、3) 相対湿度、4) 蒸発散量、5) 雨量（日、月）、6) 気温（測定時刻不詳）

このほか、計器蒸発量、地中温度についても測定はされている。

一部の研究室についても調査したが、雨量のデータベース化したものはあったが、コンピュータの利用度合は低いように思われた。

ごく少数（1～2台）の最新型の化学分析器があったが、精密天ピンさえもなく、遠心分離機はあったが使用されていない。研究者は手持ち無沙汰という雰囲気であった。

今回各研究室の研究テーマを入手した（別紙）が消費水量等畑地灌漑計画諸元や新機材の適用試験、水路の改修のための工法検討を行っている研究室があり、これらへの技術移転が可能である。

(2) 土地改良公社ジュルジュ県灌漑管区(Giurgiu Country Subsidiary Office)

ここも以前に何回か日本の調査団が訪問しており、今回の調査で明らかになった点を中心に述べる。（全面積167,000haうちスプリンクラー139,000ha）

ア) 水管理情報（管区長からの聞き取り内容）

ジュルジュ県灌漑管区からブカレストの土地改良公社(RAIF)本部へは、雨量等の重要なデータは毎日送られる。このほか、電力消費量、灌漑供給量、灌漑面積のデータは週1回ブカレストの本部へ送られる。

1989年12月の革命までは水価（電気等維持管理コスト）が安かったこともあり、地区全体で最大200M³/シーズン（120mm/シーズン相当、値は不正確か）あったが、今は大幅に減少している。

各ポンプ場は、各灌漑地区ごとのコントロールオフィスからの遠隔操作ではなく、各ポンプ場機側のパネルで操作されている。ポンプ場の操作の指示は、コントロールオフィスから無線で行うが緊急時（降雨時）等特別な一斉指示は難しい。ジュルジュ県の特殊事情として、無線がドナウの舟運の無線と同周波数のため雑音が入る。

水位整理表の例

○月○日

ポンプの名前	最低	最高	2時	4時	6時.....24時
第○段ポンプ場 No○加圧ポンプ場 ----- ----- -----					
第○段ポンプ場 No○加圧ポンプ場 ----- ----- -----					

ポンプの吐出側圧力が水頭(m)で記録される。

イ) 施設管理（管区長からの聞き取り内容）

本ジュルジュ県には一部上流の水源地から重力水を開水路で導水し、さらに加圧ポンプで加圧し、スプリンクラー灌漑している地域がある。（ベルドレンザ地区）

地区全体としてランニング水路（コンクリート3面張）の漏水が激しい。（目地はモルタル）

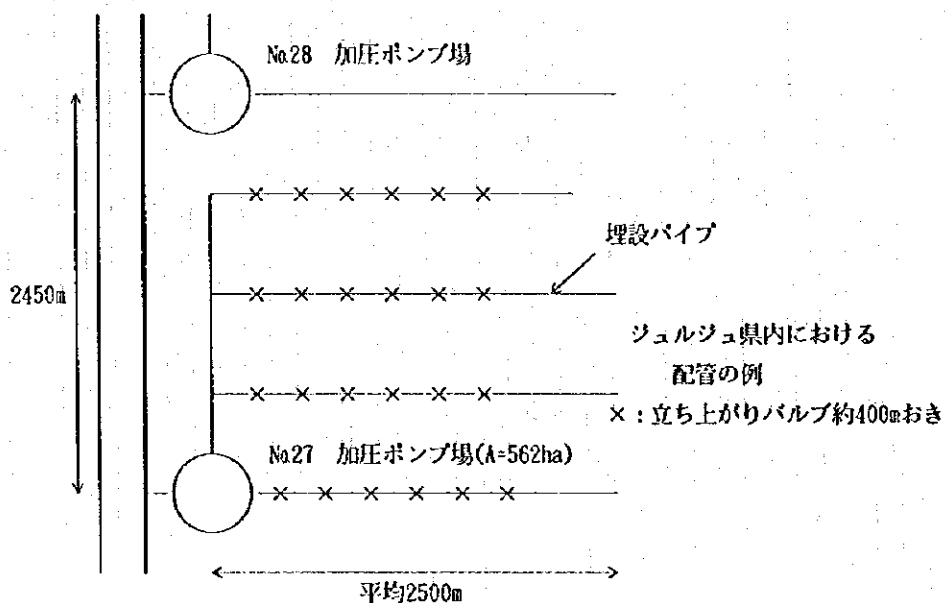
漏水の割合の評価が重要である。第2段ポンプ場の下流側での漏水のためしばしば水位を確保できない場合がある。

有効利用水量/全揚水量=最高55%である。

管内を見ると確かに通水が行われていない開水路をしばしば見る。これが漏水によ

るものか、農民が水の利用を断わっているためによるものかは不明。

加圧ポンプ場から埋設パイプへの加圧は7~9 kg/cm²で、埋設パイプの末端でも3 kg/cm²の圧力を維持している。埋設パイプはプラスチック管が多く、加圧ポンプの根元でφ600mm程度、末端でφ200mm程度である。



開水路のライニングのためGUNDLEというアメリカの会社のシートが導入検討されたようだが、高価なため断念したようである。

協力実施について

(水管理／情報管理担当・新保)

1. 協りに際し配慮すべき点

以下の自然・社会条件に配慮すべきである。

土壌： 日本の水田地帯のような沖積土ではなく、河岸段丘上の洪積土である。

また、一部では塩害、アルカリ土壌の問題もある。

地形： 従来、大規模な灌漑が行われていたのは、カルパチア山地とドナウ河にはさまれたラキア地方のうち、南側のドナウ河に沿う幅20～30kmの河岸段丘上の非常に平坦な平原部分である。

この帯状の地帯でも段丘斜面や起伏の激しい部分は、大規模灌漑の恩恵に浴していない。これは、開水路の建設が難しかったからではないか。

水文： 灌漑期間中の雨量は500～800mmである。畑の立地が河岸段丘上ということもあり、地下水位が低く、畑灌漑計画、地下水からの水分補給が少ない可能性が高い。

社会的条件

： ルーマニア側から、以下のように、調査期間中、再三にわたった発言があった。

「西欧諸国は、旧東欧諸国が、その潜在的農業生産力（ポテンシャル）の高さと安い労働賃金から、西欧諸国に対する安価な農業生産物の強力な供給基地となり、EUの農業政策の根幹を揺るがすことになるのではないかと非常に恐れている。このため、西欧諸国は、増産に結びつくようなルーマニア農業への援助をしてくれない。このような背景から、ルーマニアの農業生産と直接、利害関係のない日本に援助を求めるしかない。」

非灌漑地域等

： 今回の調査では、灌漑事業が行われていないカルパチア山地南麓地帯、山地の北側のトランジバニア地方ブラショフ県についても踏査を行った。また、同じく灌漑事業が行われていないカルパチア山地東側モルダヴィア地方のブランチャ県には、灌漑計画樹立を目指す開発調査が行われた。これら、灌漑が行われていない地方では、夏場の畑作物は非常に限られており、畑地灌漑の必要性は高い。

この非灌漑地域に対する灌漑の導入は、将来的には興味深いものがあり、協力開始後、時期を見て現地調査を実施することも検討されたい。

また、水食を対象とした土壌保全、排水改良についても、ルーマニア側は問題意識を持っており、このプロジェクトでは取上げないが、同じく将来の問題として興味深い。

EXPLANATORY NOTE
ON
THE LONG-TERM INVESTIGATORS
OF
THE IRRIGATION SYSTEM READJUSTMENT PROJECT IN ROMANIA

1. BACKGROUND

The Land Reclamation Department of Ministry of Agriculture and Food of Romania submitted the request of "Irrigation System Readjustment Project" (hereinafter called "the Project") to the Japanese Embassy through the Ministry of Foreign Affairs of Romania on April 26, 1994. A cooperation program called "Project-Type Technical Cooperation" was proposed to apply for the Project. The Government of Japan appreciated the request, and sent the preliminary survey team through the Japan International Cooperation Agency (JICA) from September 3, 1994 to September 28, 1994. The JICA is an official agency for implementing technical cooperation programs. The preliminary survey team had a series of discussions with authorities concerned of Land Reclamation Department (LRD), the Research Institute of Irrigation, Drainage and Reclamation (ICITID), and the Institute of Studies and Design of Land Reclamation Project (ISPIF), and conducted field survey in order to define the details of the request. As the result, the preliminary survey team recognized the necessity and importance of the Project, and recommended the Government of Japan to send long-term investigators for the next step of implementing the cooperation program. The details of survey results were compiled as a document called "Minutes of Discussions" and signed by the General Director of LRD and Leader of the survey team on September 23, 1994.

After the preliminary survey, the LRD has been changed to Regia Autonomous for Land Reclamation (RAIF).

The Government of Japan has appreciated the survey results and decided to send the long-term investigators (hereinafter called "the Investigators") through JICA to follow the recommendation and to clarify the functional changes from LRD to RAIF.

2. REQUEST SUMMARY AND PRELIMINARY SURVEY RESULTS

Request Summary and Discussions in Japan

The request of the Project (hereinafter called "the Request") explained the purpose, activities, operational bases, Japanese experts, equipment and materials, training items in Japan and contributions by the Government of Romania. The Project purpose was stated to improve the efficiency of the irrigation schemes. Five activities were implied in the Request, namely, (1) installing new pumping equipment with high efficiency and viability, (2) upgrading of many of the existing pumping and electrical equipment, (3) modernizing self propelled irrigation equipment and flow meters, (4) redesigning the schemes to be better serve for the small farms, (5) training of the specialist in management of irrigation schemes in the new condition of the land privatization. The operational base was ICITID in cooperation with ISPIF. The proposed experts were a leader, coordinator and experts on irrigation systems, water management, design and information systems. A list of equipment and training items were also included.

Despite the detailed request contents, the Project definition was not clear to

decide application of the technical cooperation program. The following reasons were suggested.

- (1) The specific project activities on each expert are not described.
- (2) Technical cooperation activities are defined by agreement of requests from the recipient country with the availability of experts or expertise in Japan. More specific information should, thus, be collected for the definition.
- (3) More detailed information on the proposed operational base is necessary.
- (4) Details on the proposed equipment and training items are not clear.

The former three reasons were concerned with the Project concept in cooperation. To delineate the concept, the Government of Japan sent the preliminary survey team.

Preliminary Survey Results

The survey purposes were to define the details of the Request, to collect supplemental information and to discuss with responsible persons for the Project concept. (The concept was stated as the cooperation framework draft in the preliminary survey.) As a result of discussions, both Romanian side and the preliminary survey team agreed to the followings on the Project concept.

Goal: The goal of the Project is to readjust the schemes in consideration of privatization of the land.

Purpose: The purpose of the Project is to improve the technical efficiency of irrigation schemes on research, implementation, management and training.

Activities: Four subjects will be suggested for the Project activities, namely, (1) irrigation system research, (2) system water management, (3) information system, and (4) in-country training. Assigning long term Japanese experts and short term experts and training the Romanian counterpart personnel in Japan will be provided to assist the activities.

Implementation structure: The implementation organizations are LRD (now RAIF), ICITID and ISPIF. The main office is provided in LRD (RAIF).

Management: The joint coordinating committee will be set up during the Project for the management. The committee consists of Personnel of Romania concerned with the Project, Japanese experts, Representative of JICA Austria office and Personnel concerned to be dispatched by JICA Headquarter, if necessary. A Representative from the Embassy of Japan may, further, attend the joint coordinating committee as an observer.

Recommendation for the next step: In order to define the concrete Project contents, the preliminary survey team will recommend to send the Investigators.

3. INVESTIGATION PURPOSES AND MEMBERS

The investigation purpose is to formulate the final draft of the cooperation framework and implementation schedule by means of collecting supplemental information, clarifying influences of the structural change from LRD to RAIF and discussing the cooperation framework and schedule.

The Investigators are listed below.

Name	Assignment	Title and Organization
Hideyuki KANAMORI	Field Irrigation & Training	Irrigation Development Specialist, Institute for International Coopera- tion, JICA
Yoshitake SHIMBO	Water Management & Information	Deputy Director, Overseas Land Improvement Coopera- tion Office, Agricultural Structure Improvement Bureau, Ministry of Agriculture, Forestry and Fisheries (M.A.F.F.)
Hisatomo KANAYA	Technical Cooperation	Deputy Director, Agricultural Technical Cooperation Division, Agricultural Development Coopera- tion Department, JICA

The investigator on field irrigation and training is supposed to stay in Romania from June 4 to 28, 1995 except trip days. Other investigators are from June 18 to 28, 1995.

4. GENERAL DESCRIPTION OF THE PROJECT-TYPE TECHNICAL COOPERATION

For smooth conduction of the investigation, contents of the Project-Type Technical Cooperation (hereinafter called "the Project-Type") are described here although you have known the outline.

4.1 Significance

The Project-Type is one of technical cooperation programs. Its essential role is human resource development by participation of the recipient country's personnel in specific works with Japanese experts. In this regard, there is an important difference when compared with financial cooperation (Loan aid or Grant aid) that contributes directly to realization of physical development. Therefore, construction works for reclamation or rehabilitation are not carried out in the Project-Type although small construction works for providing a Pilot area or showing new technologies may be done with participation of some local costs from the recipient country.

4.2 Characteristics

There are three principal characteristics of the Project-Type.

- (1) The Project-Type consists of three basic components, namely, providing Japanese experts, technical training in Japan and provision of equipment and materials.
- (2) Implementation of the Project-Type is over a period of several years (usually five years).
- (3) The cooperation is carried out at a specific site or sites which are managed by a government organization or agency, such as an agricultural experiment center, research laboratory, specific agricultural development area, etc.

4.3 Purpose and Objectives

The Project-Type aims at integrated technical cooperation making it possible to implement a specific technical cooperation project comprehensively and

systematically from planning to implementation with a cooperation support system established in Japan. The objective of the Project-Type is the transfer of technology to the engineers, extension officers and key farmers in the recipient country by means of their participation in working for specific items.

4.4 Responsibilities of Japan and the Recipient Country

The Project-Type is jointly implemented by the Government of Japan and the recipient country. The Government of Japan provides technical cooperation by combining effectively the dispatch of various teams, assignment of experts, provision of equipment and materials, training of counterpart personnel in Japan. The recipient country provides land, building, facilities, etc., which will serve as the project base as well as the local experts who work as "counterpart" personnel with the Japanese experts. The recipient country is also to bear the local costs such as operational expenses.

4.5 Implementation Procedure

Implementation of technical cooperation programs are entrusted by the Government of Japan to JICA. Fig.1 shows the flow of procedures from request to after-care.

4.6 Project Implementation Structure

Programs implemented under the project can become very complex. In order to put such programs into practice in an appropriate and effective manner, it is essential to set up a fully functioning local system that will ensure implementation of the project. JICA establishes the system with the governments of recipient countries to ensure the smooth implementation of projects. Fig.2 shows the implementation structure. The details are described below.

A system that ensure implementation of project activities: The core of the project is a team of Japanese experts and their counterparts who are responsible for implementing the project in the recipient county.

The Japanese team consists of at least one expert who is assigned to the recipient country on a long-term basis, as well as short-term experts who are assigned as the need arises. The team of long-term experts normally includes one leader and one staff member who acts as a liaison and is responsible for coordination.

One of the conditions of the collaboration is that the recipient country appoint one or more qualified counterparts for each Japanese expert. In addition, the recipient country must appoint a project manager, who will be the person responsible for actual operations on the part of the recipient country. This manager is the counterpart of the Japanese team leader.

Committee to determine operations and management: A joint coordinating committee is established to make decisions concerning operations and management of the project. This committee follows the overall progress of the technical cooperation program, formulates annual work plan, monitors the need for revising the Tentative Schedule of Implementation (TSI), and reviews and exchanges opinions on major issues that arise in connection with the program.

The presiding officer of a relevant government organization in the recipient

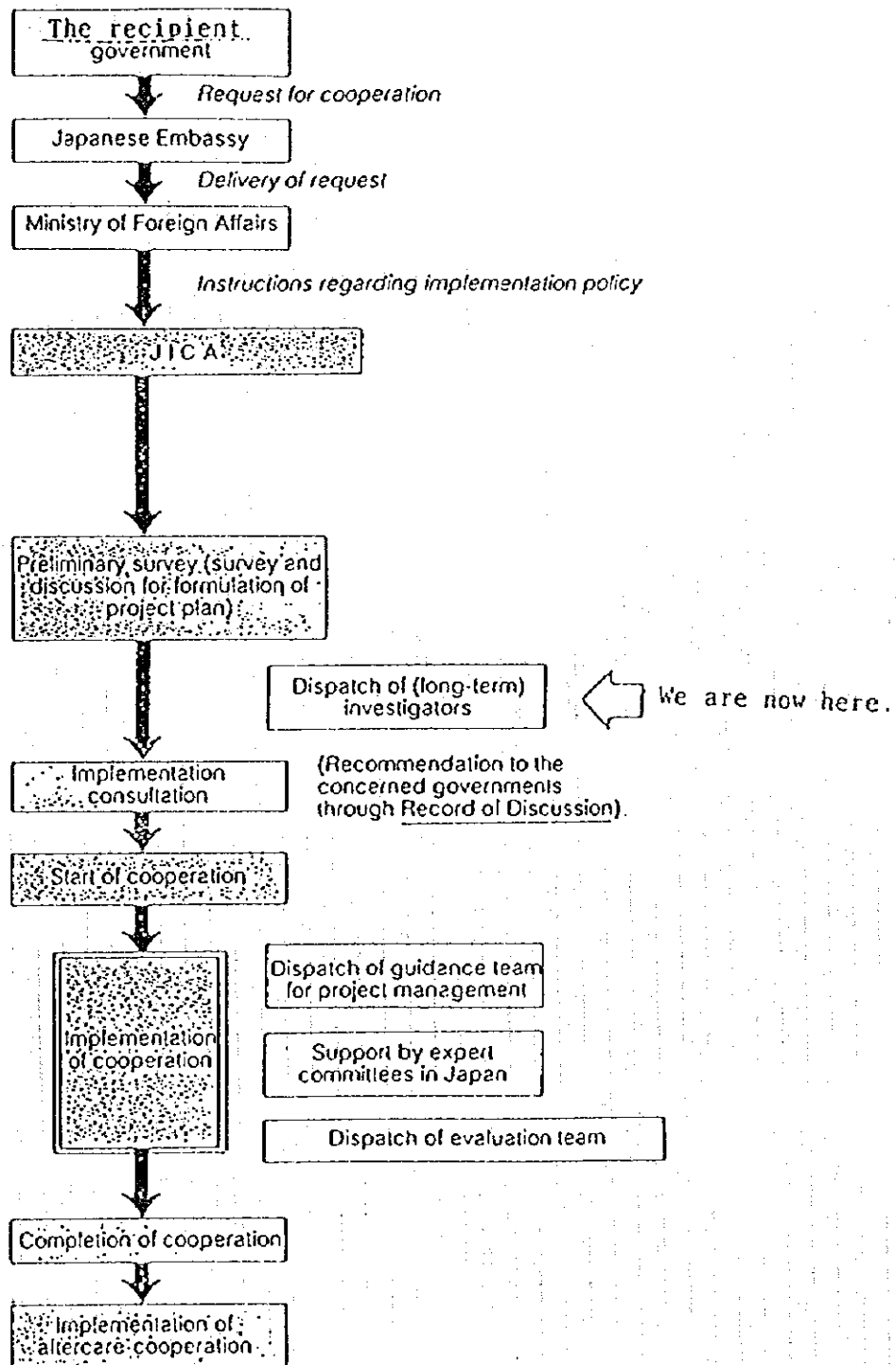


Fig.1 Flow of Project-Type Technical Cooperation.

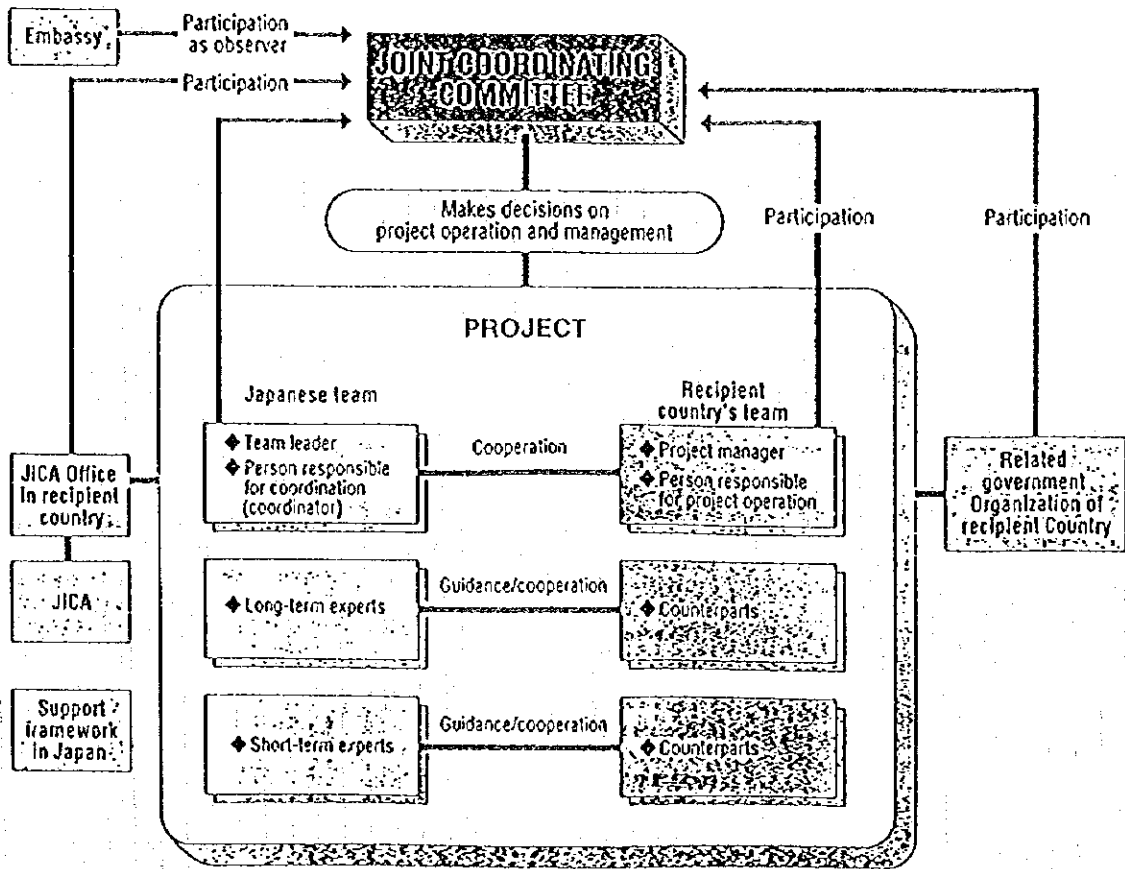


Fig.2 Project Implementation Structure.

country is normally appointed to chair the committee. The Japanese team leader is a member. Other long-term experts as well as JICA's resident representative also take part. Relevant officials from the Japanese Embassy and members of missions sent by JICA headquarters participate in the committee's work when necessary. For some projects, sub-committees are also set up to address specific matters.

4.7 Record of Discussions (R/D)

There is an important document for implementation, which is called Record of Discussions (R/D). The R/D is prepared for each project and is signed by JICA and the authority concerned in the recipient country. This recommends the project to the respective governments for their acceptance, the details of the implementation plan as well as the obligations to be observed by the two parties concerned. On the basis of this recommendation, both governments execute the project defined in the R/D by mutual agreement. An example of R/D is shown in Annex 1.

The cooperation framework is defined in the R/D, whose main items are as follows.

- (1) Project purpose
- (2) Expected outputs (objectives) and project activities
- (3) Project base(s)
- (4) Technical fields and number of Japanese experts
- (5) Technical fields and number of Counterpart personnel and administrative personnel
- (6) Provision of land, buildings and facilities
- (7) Function and composition of Joint coordination committee

The main job of the Investigators is to define contents of the above items.

4.8 Tentative Schedule of Implementation (TSI)

An overall schedule of each activity of the Project, provision by the recipient country and provision of the Government of Japan is prepared before implementation. The schedule is called Tentative Schedule of Implementation (TSI). The TSI is shown with bar charts, and decided by signing when the R/D is signed. An example of TSI is shown in Annex 2.

5. TERMS OF REFERENCES OF THE INVESTIGATORS

1) Recognize the present conditions of the agricultural readjustment programs. To define the Project purpose in the overall agricultural development programs, the investigators will know the present progress on land privatization and provisions of regulations to encourage summarizing small farms. Furthermore, the progress of authorizing the recommended development strategy and ten years investment program in "Study of Irrigation and Drainage" will be known.

2) Define the RAIF as the Project base.

The main office of the Project was to be provided in LRD. The LRD has, however, changed to RAIF. The Investigators will, thus, know the points of the structural change from LRD to RAIF on the function, activities, personnel (especially assignment of Counterparts), budgetary system, relations with ICITID and ISPIF, and others.

3) Collect specific information of each division and laboratory.

Some more specific information of each division or laboratory are necessary to identify the counterpart division(s) or laboratory (or laboratories). These information are also required to identify the training items in Japan and assignment of short term experts.

4) Discuss the main contents of R/D and TSI.

To have concrete framework of the Project the Investigators will discuss the Project objectives, concrete activities, scope of cooperation works and other key items.

5) List up the required equipment and training items.

More specific information on the required equipment & materials and training items in Japan than those shown in the Request are necessary to discuss the cooperation budget, especially running expenses. It should be noted that the list is used just for reference, and listing does not mean to guarantee providing them. You can add or reduce some of them through discussing with the long-term experts after starting the Project.

6) Conduct supplemental investigations to the preliminary survey.

Some information or data have not been collected in the preliminary survey due to time constraints and others. The Investigators will collect them.

7) Discuss the draft of R/D and TSI.

The next step is implementation consultation, in which R/D and TSI are signed and the cooperation is started. To smoothly complete the consultation and quickly start the Project, the Investigators will discuss the draft of R/D and TSI.

6. INVESTIGATION METHOD AND DISCUSSIONS

6.1 Questionnaire Survey

To efficiently carry out our investigations, the team prepared questionnaires. We would like to ask you to answer the questions in English. Please note the followings when you answer.

(1) There are example answers shown as "ex.a." These are just examples to ease your understanding. Please, thus, answer the questions from your viewpoints.

(2) If it is difficult for you to answer some questions, please skip them.

6.2 Field Observation

The Investigators will observe the following things. Please recommend the suitable sites and trip schedule for site visits, and provide a translator from Romanian language to English.

(1) A "House of Agronomist" in GIURGIU

(2) A large project site locating other counties than four counties, namely, Giurgiu, Ialomita, Calarasi and Prahova.

6.3 Discussion

The Investigators will discuss the time limit to finish answering the questions and investigation schedule on the period of one investigator's stay (4 to 11, June) and of the whole investigators' stay (12 to 28, June).

Annex 1: An Example of Record of Discussions (R/D).

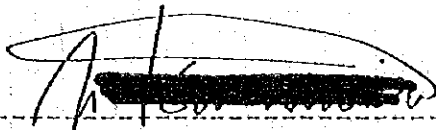
THE RECORD OF DISCUSSIONS BETWEEN THE JAPANESE
IMPLEMENTATION SURVEY TEAM AND THE
AUTHORITIES CONCERNED OF THE GOVERNMENT OF
[REDACTED]
ON THE JAPANESE TECHNICAL COOPERATION
FOR THE IRRIGATION ENGINEERING [REDACTED] PROJECT

The Japanese Implementation Survey Team (hereinafter referred to as "the Team") organized by the Japan International Cooperation Agency (hereinafter referred to as "JICA") and headed by Mr. [REDACTED], visited the [REDACTED] from February 27, 1994 to March 9, 1994 for the purpose of working out the details of the technical cooperation program concerning the Irrigation Engineering [REDACTED] Project in the [REDACTED] of [REDACTED].

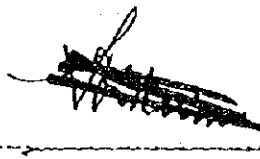
During its stay in the [REDACTED] of [REDACTED], the Team exchanged views and had a series of discussions with the [REDACTED] authorities concerned in respect of the desirable measures to be taken by both Governments for the successful implementation of the above-mentioned Project.

As a result of the discussions, the Team and the [REDACTED] authorities concerned agreed to recommend to their respective Governments the matters referred to in the document attached hereto.

Jakarta, March 8, 1994



Mr. [REDACTED]
Leader,
Implementation Survey Team
Japan International Cooperation
Agency, Japan



Mr. [REDACTED]
Director General of
[REDACTED],
Ministry of [REDACTED],
[REDACTED]

THE ATTACHED DOCUMENT

I. COOPERATION BETWEEN BOTH GOVERNMENTS

1. The Government of the ~~Republic of Indonesia~~ will implement the Irrigation Engineering ~~Cooperation~~ ~~Project~~ Project (hereinafter referred to as "the Project") in cooperation with the Government of Japan.
2. The Project will be implemented in accordance with the Master Plan which is given in Annex I.

II. MEASURES TO BE TAKEN BY THE GOVERNMENT OF JAPAN

In accordance with the laws and regulations in force in Japan, the Government of Japan will take, at its own expense, the following measures through JICA according to the normal procedures under the Colombo Plan Technical Cooperation Scheme.

1. DISPATCH OF THE JAPANESE EXPERTS
The Government of Japan will provide the services of the Japanese experts as listed in Annex II.
2. PROVISION OF MACHINERY AND EQUIPMENT
The Government of Japan will provide such machinery, equipment and other materials (hereinafter referred to as "the Equipment") necessary for the implementation of the Project as listed in Annex III. The Equipment will become the property of the Government of the ~~Republic of Indonesia~~ upon being delivered C.I.F. to the ~~Indonesian~~ authorities concerned at the ports and/or airports of disembarkation.
3. TRAINING OF ~~Indonesian~~ PERSONNEL IN JAPAN
The Government of Japan will receive the ~~Indonesian~~ personnel connected with the Project for technical training in Japan.

III. MEASURES TO BE TAKEN BY THE GOVERNMENT OF THE ~~Republic of Indonesia~~

1. The Government of the ~~Republic of Indonesia~~ will take necessary measures to ensure that the self-reliant operation of the Project will be sustained during and after the period of Japanese technical cooperation, through the full and active involvement in the Project by all related authorities, beneficiary groups and institutions.
2. The Government of the Republic of ~~Indonesia~~ will ensure that the technologies and knowledge acquired by the ~~Indonesian~~ nationals as a result of the Japanese technical cooperation will contribute to the economic and social development of the ~~Republic of Indonesia~~.

- (3) Running expenses necessary for the implementation of the Project.

IV. ADMINISTRATION OF THE PROJECT

1. The Director General, Directorate General of ~~Water Resources Development~~ (hereinafter referred to as "~~WRD~~"), Ministry of ~~Water Works~~ (hereinafter referred to as "~~MWW~~") will bear overall responsibility for the administration and implementation of the Project.
2. The Director, the Directorate of Irrigation I, ~~Banda, NDV~~, as the Project Director, will be responsible for the administration and implementation of the Project.
3. The Head, the Irrigation Engineering ~~Service~~ Center (hereinafter referred to as "~~IES~~"), ~~Banda, NDV~~, as the Project Manager, will be responsible for the managerial and technical matters of the Project.
4. The Japanese Team Leader will provide necessary recommendations and advice to the Director General of ~~WRD~~, Project Director and the Project Manager on any matters pertaining to the implementation of the Project.
5. The Japanese experts will give necessary technical guidance and advice to the ~~WRD~~ counterpart personnel on technical matters pertaining to the implementation of the Project.
6. For the effective and successful implementation of technical cooperation for the Project, a Joint Coordinating Committee will be established whose functions and composition are described in Annex VI.

V. JOINT EVALUATION

Evaluation of the Project will be conducted jointly by the two Governments through JICA and the ~~WRD~~ authorities concerned, during the last six months of the cooperation term in order to examine the level of achievement.

VII. MUTUAL CONSULTATION

There will be mutual consultation between the two Governments on any major issues arising from, or in connection with this Attached Document.

VIII. TERM OF COOPERATION

The duration of the technical cooperation for the Project under this Attached Document will be five (5) years from June 10, 1994.

ANNEX I. MASTER PLAN

1. Project Purpose

The technical standard(s) as well as guideline(s) and manual(s) necessary for the appropriate implementation of irrigation projects will be continuously improved/developed and extended through the implementation of the training by ~~XXXX~~, ~~XXXX~~.

2. Outputs and Activities of the Project

2-1. The outputs of the Project

- (1) The technical capability of ~~XXXX~~ technical staff is to be enhanced;
- (2) The technical standard(s), guideline(s) and manual(s) including related computer system in the fields of investigation, planning, design, operation and maintenance, and rehabilitation and upgrading are to be developed and improved;
- (3) The training of capable irrigation technical staff in the fields mentioned in 2-1-(2) is to be implemented.

2-2. The activities of the Project

- (1) Development and improvement of technical standard(s), guideline(s) and manual(s)
 - 1) To review, modify and develop technical standard(s), guideline(s) and manual(s) in the following fields
 - a) Investigation, planning and design
 - b) Operation and maintenance
 - c) Rehabilitation and upgrading
 - 2) To introduce, modify or develop computer system to support the activities mentioned in 2-2-(1)-1)

(2) Training

- 1) Preparation of a training plan, curriculum, and materials
- 2) Implementation of training for irrigation technical staff

3. Japanese Technical Cooperation

The Government of Japan will assist the Government of the ~~Republic of the Philippines~~ in carrying out the activities for obtaining the outputs described in paragraph 2.

4. Project Site

- (1) ~~Manila~~ in ~~Manila~~ as a main site
- (2) ~~Quezon~~, ~~Manila~~ in ~~Manila~~ as a sub site for supporting the Project's activities
- (3) Irrigation offices of the provincial government in ~~Manila~~ and ~~Manila~~ as model satellites to support supplementary activities such as data collection and case studies necessary for improving the standard(s), guideline(s) and manual(s) in the project sites described in 4- (1) and (2)

Note : Activities in the model satellites are implemented by the ~~Manila~~ side with technical guidance from Japanese experts.

ANNEX II. JAPANESE EXPERTS

1. Team Leader
2. Coordinator
3. Experts in the field of;
 - (1) Investigation, planning and design
 - (2) Operation and maintenance
 - (3) Rehabilitation and upgrading
 - (4) System development

Note : a) Coordinator and experts mentioned in 3 will cover the training activities.

b) Short-term experts will be dispatched when the need arises for the smooth implementation of the Project.

ANNEX III. MACHINERY AND EQUIPMENT

Taking account of the efficient use of equipment provided through grant aid and the project-type technical cooperation named the ~~Construction~~ ~~Construction~~ ~~Construction~~ ~~Construction~~ Project, the following will be provided:

1. Equipment necessary for developing and improving standard(s), guideline(s) and manual(s);
2. Equipment necessary for training;
3. Other machinery and equipment necessary for the implementation of the Project.

ANNEX IV. ~~ANNEX IV~~ COUNTERPART PERSONNEL AND ADMINISTRATIVE PERSONNEL

1. Project Director
2. Project Manager
3. Counterpart Personnel in the field of;
 - (1) Investigation, planning and design
 - (2) Operation and maintenance
 - (3) Rehabilitation and upgrading
 - (4) System development
4. Administrative Personnel
 - (1) Administration
 - (2) Accounting
5. Counterpart personnel in each short-term expert's field
6. Other necessary supporting staff

Note : At least two(2) full time counterpart personnel and one(1) administrative counterpart person shall be assigned in each field referred to in 3-(1), (2), (3) and (4).

ANNEX V. LAND, BUILDINGS AND FACILITIES

1. Land, buildings and facilities necessary for the implementation of the Project in [REDACTED] headquarters, [REDACTED], and the model satellites
2. Office space for Japanese experts;
Office space in [REDACTED] and [REDACTED] headquarters
3. Training space in [REDACTED]
4. Other land, buildings and facilities necessary for the implementation of the Project

ANNEX VI. JOINT COORDINATING COMMITTEE

1. Function

The Joint Coordinating Committee will meet at least once a year and whenever the need arises, and function:

- (1) To give direction and guidance to the activities carried out by the Project and to coordinate inter-related activities within ~~the Project~~ and other related agencies of ~~the Government~~;
- (2) To review and approve the Annual Work Plan of the Project to be formulated under the framework of the Record of Discussions;
- (3) To review the overall progress of the technical cooperation program as well as the achievement of the Annual Work Plan;
- (4) To review and exchange views on major issues arising from or in connection with the technical cooperation program;
- (5) To select, examine and evaluate the technical standard(s), guideline(s) and manual(s) including computer system to be developed and improved by the Project.

2. Composition

(1) Chairperson

Director General of ~~the Ministry of Agriculture~~, ~~the Government~~

(2) Vice Chairperson

Assistant Director General of ~~the Ministry of Agriculture~~, ~~the Government~~

(3) ~~Government~~ side

- 1) Director of the Directorate of Irrigation I, ~~the Ministry of Agriculture~~, ~~the Government~~
- 2) Director of the Directorate of Irrigation II, ~~the Ministry of Agriculture~~, ~~the Government~~
- 3) Director of the Directorate of Rivers, ~~the Ministry of Agriculture~~, ~~the Government~~
- 4) Director of the Directorate of Swamps, ~~the Ministry of Agriculture~~, ~~the Government~~
- 5) Director of the Directorate of Planning and Programming, ~~the Ministry of Agriculture~~, ~~the Government~~
- 6) Representative of the Research Institute of ~~the Ministry of Agriculture~~, ~~the Government~~

- 7) Representative of the Center for Data Processing and Mapping (SISCOM, MOP)
- 8) Representative of the National Development Planning Agency (NDPS)
- 9) Representative of the Ministry of [REDACTED]

(4) Japanese side

- 1) Team Leader
- 2) Other Japanese experts including personnel dispatched by JICA
- 3) Representative of the JICA [REDACTED] Office.

Note : Official(s) of the Embassy of Japan may attend the Joint Coordinating Committee as observer(s).

Annex 2: An Example of Tentative Schedule of Implementation (TSI).

1. Activities of the Project

Item	Year	1994	1995	1996	1997	1998	1999	Remarks
		June					June	
1. Development and improvement of technical standard(s), guideline(s) and manual(s)								Refer to ANNEX I. of the R/D Including water management aspect
(1) Improvement of technical standard(s) for investigation, planning and design								
(2) Improvement of guideline(s) and/or manual(s) for operation, and maintenance								
(3) Development of guideline(s) and/or manual(s) for rehabilitation and upgrading								
(4) Improvement of system development for investigation, planning, design, operation and maintenance, and rehabilitation and upgrading								
a) Improvement of technical calculation system								
b) Improvement of data base system								
2. Training								
(1) Preparation of training plan, curriculum and materials								
(2) Implementation of training								

2. Technical Cooperation Program (Japanese side)

Item	Year	1994 June	1995	1996	1997	1998	1999 June	Remarks
1. Long-term experts								Refer to ANNEX II. of the R/D
(1) Team Leader								
(2) Coordinator								
(3) Investigation, planning and design								
(4) Operation and maintenance								
(5) Rehabilitation and upgrading								
(6) System development								
2. Short-term expert(s)								If necessity arises
3. Equipment and machinery								Refer to ANNEX III. of the R/D
(1) Equipment necessary for developing and improving standard(s), guideline(s) and manual(s)								
(2) Equipment necessary for training								
(3) Other machinery and equipment necessary for the implementation of the Project								
4. Training of Indonesian counterpart personnel in Japan								Some personnel per year
5. Dispatch of survey team								If necessity arises

3. Technical Cooperation Program (Amman side)

Item	Year	1994	1995	1996	1997	1998	1999	Remarks
		June					June	
1. Assignment of counterpart and administrative personnel								Refer to ANNEX IV. of the R/D At least two(2) full time counterpart personnel and one(1) administrative counterpart person mentioned in (3)- a), b), c) and d)
(1) Project Director								
(2) Project Manager								
(3) Counterpart personnel in the field of:								
a) Investigation, planning and design								
b) Operation and maintenance								
c) Rehabilitation and upgrading								
d) System development								
(4) Administrative personnel								
a) Administration								
b) Accounting								
(5) Counterpart personnel in each short-term expert's field								
(6) Other necessary supporting staff								
2. Allocation of running cost of the Project								
3. Provision of land, buildings and facilities								Refer to ANNEX V. of the R/D

June, 1995

QUESTIONNAIRE AND ANSWERS
ON
THE LONG-TERM INVESTIGATORS
OF
THE IRRIGATION SYSTEM READJUSTMENT PROJECT IN ROMANIA

1. AGRICULTURAL POLICY & PROGRAM

Q-1-1: (for MAF) The former survey team obtained the following data on the progress of land privatization at the date of September 12, 1994. If you have the latest data, please show us.

(Answer from MAF)

The progress at the date of June 6, 1995 is as follows.
Certificate - 99% of the target people which cover.
Title - 44.0% of the target people

Q-1-2: (for MAF) The former survey team heard that the Government of Romania planned to provide two regulations for farmers to smoothly sell or buy the land, namely, a regulation on cadaster and regulation on establishment of the agency of rural development to intermediate selling land. How is the present progress of the provision?

(Answer from MAF)

"Cadaster Law" is still in discussion in the parliament. If the law is approved, the agency will be established.

Q-1-3: (for RAIF) The Government of Romania re-evaluated the requirements of the irrigation and drainage sector with assistance of a loan from the World Bank and support from British consultants and ISPIF. The consultants and ISPIF submitted a report called "Study of Irrigation & Drainage in Romania" on July, 1994. In the report, "Development Strategy" and "Ten year development programme" were recommended. Have the strategy and programme been approved by the Government?

(Answer from MAF)

The study has been approved in MAF, but by the government. Now all the ministries has been told to have the own strategy. In this sense, MAF has gone ahead.

Q-1-4: (for RAIF) If the strategy and programme have been modified through approval, please describe us the modified points and the reasons.

(Answer from MAF) No.

Q-1-5: (for RAIF) How will the Irrigation System Readjustment Project (hereinafter called "the Project") be defined in the ten year programme?

(Answer from MAF)

Because the study has not been approved, it cannot be said.

2. ORGANIZATIONS

2.1 RAIF

Q-2-1-1: In your request for the Project, the LRD was defined as follows. How were these changed for RAIF.

The LRD is the Government Agency:

- conducts the official policy in land reclamation and controls the 41 companies for operation and maintenance of the land reclamation projects (SCELIF) and of others 67 companies for civil works, earth moving equipment, drilling for water supply, etc.;
- distribute and audit the investments and subsidies for operation and maintenance given by the Government for Land Reclamation works;
- plan the future developments in irrigation, drainage and soil control works. In this respect programme new projects, review and approve all important projects;
- cooperate with foreign companies and financial institutions in the field of land reclamation works.

(Answer from RAIF)

RAIF is a commercial society subsidized funds by the government. (the amount of 80% of the total need is from the government. The difference, 20%, is from water users. RAIF has, in the field (territory), 41 subsidiaries representing in fact former SCELIF. "Subsidiary" is an attached company.

Activities: The main activity is to maintain, operate and repair the land reclamation works. Comparing LRD, the 67 companies have not belonged to RAIF any more. So, RAIF is involved in operation and maintenance of land reclamation schemes. The civil work activity is no role any more for RAIF. If RAIF wants to achieve some civil works (construction works), we have to organize the auction (biting) which will be won by the best construction company. If RAIF wants to design, the auction is also done. Inside MAF, every year, there are funds for investment for rehabilitation, modernizing, etc. These funds are provided to the RAIF as a state subsidy. RAIF disposes them as its wish.

Romania is passing through a very difficult transition period. During this period, state budget is poor enough, and funds provided are not sufficient in order to modernize and rehabilitate and develop existing works. We cannot talk about new works any more.

RAIF is conducting training courses among other things such as economical activities, operation and maintenance and others. Inside RAIF, we have a compartment for human resources. This compartment is involved also in training of the specialists. The main goal is to adapt our specialists to the new capitalist market conditions.

The main difference between LRD and RAIF is the fact that RAIF is not more involved in civil construction works, but only in maintenance, rehabilitation and operation of the land reclamation works and schemes. So RAIF is deeper involved in operation activity because RAIF is considering these things very important. We want to come closer to the private small land owners. RAIF is very much interested in rehabilitation of existing facilities.

Comments from Mr. Voicu

Problems: International organizations visited RAIF, such as FAO, international funds for agriculture under UN. They conclude that something has to be undertaken in order to create water users' association. In order to be able to use in efficient way of irrigation water, there is great importance we see for the

pilot demonstration areas. One of the scopes of this project is to achieve pilot demonstration areas equipped with the newest technologies as the world level. Those pilot demonstration areas are considered to become reference term or example, having two main scopes or goals. One is to show private farmers which are the production ways in order to work more efficient; second goal is to increase trained farmers and specialists. The first one is promotion of farmers and the second is training. That is the reason we are considering this project very important. It is the thing we carry out today for tomorrow.

Studies: The best institutes having specialists who provided studies are ISPIF and ICITID. RAIF will talk with Japanese counterparts that we establish which will be the partner. We can contact in this matter with any Romanian research institute.

RAIF: There is a big difference between a letter of intention (request) and final cooperation contract. We have to have a draft of participating to carry out this response. RAIF cannot talk for ICITID and ISPIF.

The final results of cooperation project have to be useful to RAIF for operating and maintenance, because ICITID is as a research institute. All the results of its work are available for the owner of the facility of the scheme, who is RAIF. Every one research, ISPIF is a design institute, which should be implemented the activity. No body is conceding to put the design in a store. Between three units, it must be contract base.

Q-2-1-2: On the budget, we heard that the LRD 1994 budget was as follows. Could you show us the RAIF budget for 1995 in the same manner.

(Answer from RAIF)

The amount of 250 billion Lei is the total budget in 1995, out of which 50 billion Lei for investments, the rest, 200 billion Lei for repairing and operating land reclamation works. The 200 billion lei include salaries and wages.

Q-2-1-3: We heard the LRD ranking as follows. Please describe the RAIF ranking.

(Answer from RAIF)

General Director
1
Deputy Director
1
Adviser
1
Department Manager
1
Division (Office) chief
1
Adviser engineer
1
Simple engineer

Q-2-1-4: Please describe the responsibility of the above each rank.

(Answer from RAIF)

Deputy director is coordinating all the activities on its department. The advisers are consulting special jobs like cooperation jobs such as reporting MAP, consulting to start projects, etc. Division manager is coordinating all the activities of its division. There are two engineers, adviser engineers and simple engineers. Adviser engineers are higher rank of the simple engineers. There are some differences on salary among engineers, but these depend on age.

Q-2-1-5: We heard the number of LRD personnel was as follows. Please list up the RAIF personnel with the same manner.

(Answer from RAIF)

In the headquarter of RAIF, there are 120-125 persons working, which include about 60 diploma engineers and 40 economists and medium level employees.

Q-2-1-6: We obtained a brief organization chart on RAIF as shown in Fig. 1. We need more specific chart with number of personnel like ICITID chart shown in Fig. 2 Could you provide it?

(Answer from RAIF)

See the attached New Fig. 1.

Q-2-1-7: Please describe specific tasks of each section of RAIF.

(Answer from RAIF)

(1) Managing Council (MC)

MC is involved in important decisions concerning the strategy, budget on incomes and expenses, adopting important domestic documents, investment plan and the plan for rehabilitation of irrigation systems (schemes), involving documents written from the point of view of Law for the RAIF in cooperation with other Ragia, Ministries, enterprises, etc.

(2) General Director (GD)

GD makes important decisions, discussing with the council.

(3) Counselors (Advisers)

The advisers are consulting special jobs like cooperation jobs such as reporting MAP, consulting to start projects, etc.

(4) Deputy Director

Diplomaed engineer on land reclamation is in charge of all the important technical matters, activities, etc.

Financial Deputy Director (Economist) is in charge of all the financial accounting matters, activities, etc.

(5) Low Office (LO)

LO include lawyers who are assigned to verify all the documents which are compliant with Laws.

(6) Financial and Economical Control Office

This office treats all the financial documents related to the economical or financial principles.

(7) Operation Department

(7) Operation Department

This department is in charge of all the problems on operating land reclamation systems; facilities, etc., and is also in charge of services for the private farmers on irrigation equipment. The problems on water users' associations is treated by this department.

(8) Mechanical Department

This department is in charge of all the problems concerning to mechanical equipment which does not mean irrigation equipment because these belong to farmers.

(9) Development Department

This department is in charge of coordinating investment, promotion of technical documents. This department advises to technical (project) documents through technical and economical council (see 21) which are not permanent organization.

(10) Human Resources, Salary Payment, Organizing and Social Relation's Department

This department has two divisions. The tasks are shown in descriptions on the two offices (see 23 and 24).

(11) Financial Department

This is financial accountant department. It has two divisions.

(12) Division for Operating Schemes

This division is in charge of services on operating land reclamation schemes.

(13) Division for Operating Pumping Station

This division is in charge of operating pumping stations.

(14) Division for Technical Development Plan

This division is calculating quantity and amounts of funds on all the technical activities (operation, maintenance, etc.)

(15) Division for Electrical Energy

This division is in charge of all the expenses on electrical power and energy related matters.

(16) Division for Mechanization

This division is in charge of providing spare parts, services for repairing pumping stations, repairing cars and equipment and operating equipment.

(17) Division for Standards of Under Pressure Equipment, Lifting Equipment and Measuring Devices

This division is in charge of operation of all the equipment and kits, mechanical and electrical devices and kits, reservoirs and hydro hose concerning protection measures and the other things related with meter standards which are electrical context, lifting equipment, etc.

(18) Division for Providing Materials and Equipment

This division is in charge of service for purchasing goods. It is coordinating store houses.

(19) Division for Measures to Prevent Overflow and Border Water
This division is in charge of measures to prevent overflow of river water and border water.

(20) Division for Marketing, Auctions and International Cooperation
This division is in charge of marketing and international cooperation.

(21) Division for Technical Advisers to Promote Project Designs and Document
This division include CTE and the other parts. The CTB means technical and economical council, which is not a permanent working group, and usually composed of experts of RAIF, together with Professors in Faculties and Academies, specialists from research institute including ICITID, ISPIF, Ministry of Finance, Ministry of Science and Research, from factories producing pumps and irrigation equipment. Every activity has its own speciality. According to this specifics, RAIF is looking for most suited specialists. The other parts are in charge of discussing technical matters of every project.

(22) Division for Investment
This division is charge of investment. It is elaborating investment programs. It is cooperating with (21) in order to prepare all the projects to be included in the investment plans. It is organizing auctions, in order to choose most proper construction company to fulfill to carry out some investment purposes. It is very fine to obtain the most economical way. This division is supervising activities in order not to exceed the budget.

(23) Division for Human Resources and Training
The human resources mean staff members who are in charge of hiring personnel, calculating wages and keeping employee record. In addition, this treats the followings: (1) establishing needs of high degree specialists involving after faculty training courses, selecting personnel for training abroad. This division may involve preparing courses with JICA. "Prepare" means to select personnel, organize activities etc.

(24) Division for Salary, Management and Social Relation
This division is involved in accounting all the salaries. Afterward, it is organizing production activities which establish the number of employees and others for every subsidiary, involved in social relations including staff records.

(25) Division for Work Protection and Measures to Avoid Fire
This division is in charge of protection equipment.

(26) Division for Finance
This division is in charge of banks, funds, etc.

(27) Division for Accounting
This division is in charge of accounting.

(28) Division for Internal Services
This is an administrative service office including drivers, etc.

(29) Office for Computers
It is for the moment, for instance, it is development till 1990, we don't have computers. He has three main tasks: (1) cooperating with 11, and also office

costs), (2) elaborating documents for all the technical activities of RAIF, amount of rainfalls over the country, water irrigated, and fulfilled works, (3) assign and conceive new calculating programs for the new calculations for RAIF.

2.2 ICITID

Q-2-2-1: Please show us the procedures of research implementation and present research titles specifically on each laboratory of the six.

ex.a: Research laboratory for soil-water-crop-climate has five "Studii Superidate (S)" and 12 "Studii Medii (SM)." Each Studii Superidate makes a team with several SM. There are, thus, five topics as shown bellow:

(1) Soil moisture movement under irrigated land (under Dr. K. since 1992).

.....
(5) Soil moisture stress on corn (under Dr.A, since 1993).

The former two topics are conducted in ICITID, and other three are in local research points.

(Answer from ICITID)

The research themes are shown in Annex-1. The research years for one theme is two to ten years. To carry out a research, a team is made, which is consist of one or several principal reseachers, several "studii medii" and field workers.

Q-2-2-2: We heard the ICITID study budgets were from the Ministry of Science. Are there other financial sources for study? If Yes, what are they?

(Answer from ICITID)

Yes. 90% of the budget is from Ministry of Science. The remaining 10% is from economical contract with other institute or enterprises.

Q-2-2-3: Please describe the procedures to start a joint study with ISPIF.

(Answer from ICITID)

There is a start agreement, called "general agreement." If there is a problem, make a general agreement showing responsible part of each institute. Then, the both institutes go to Academy to be approved. After approval, the research and study are started.

Q-2-2-4: Please describe the occupational ranks of "studii superidate" and "studii medii."

(Answer ^{for} ICITID)

"Conducere" include three directors and one economical director. "studii superidate" includes Principal Researchers (grade 1-3), and "studii medii" includes high school graduates.

2.3 ISPIF

Q-2-3-1: Please describe specific tasks or responsibilities of each department.

(Answer from ISPIF) Note: The modified organization chart is shown in Fig.2. 1) Border of the Directors including five managers. General manager, Deputy

- 1) Border of the Directors including five managers. General manager, Deputy manager and three department managers.
- 2) Mr. Pasarica (general manager)
- 3) Dept. of Design having three divisions which design all land reclamation projects, research and development studies on land reclamation area. Especially, the division of energy and hydrotechnical structure is treating pumping stations for other ministries.
- 4) Department of scientific counsel coordinates research and development studies on land reclamation conducted by Dept. of Design.
- 5) Dept. of Economic director is in charge of financial terms on institute.
- 6) Dept. of Study and Field Investigation conducts all the field studies and writes reports for designers from pedological, hydrogeological, hydrological, geotechnical and topographical points of view.
- 7) CRUTA is a special branch on remote sensing in collaboration with French companies for agriculture.
- 8) Office of Public is doing nothing.

(Answer for the question of canal lining)

Usually lining materials and forms of slabs are made by ICITID. In ISPIF use the results and design. What material, cost and their quality. How much and so on.

2. TECHNICAL MATTERS

3.1 Field Irrigation (Irrigation System)

We will discuss the specific activities carried out in the Project on crop water requirements and farm irrigation systems.

3.2 Training

Q-3-2-1: (for RAIF) Please show us the latest training curriculum for technical staff.

(Answer from RAIF)

The last course fulfilled was 1991 with about 200 participants.

On a MAF training center called "30 December" (See the Answer of Q-3-2-3) Till 1990, this center was used for training specialists having high degree studies for not only Horticulture but also Land Reclamation. It was a MAF training center, and we were working in department of Horticulture and LRD. The training course had 150 participants, and the duration was 7 days to one month.

Till 1989, during the time when Land Reclamation Department existed, in November, December, January and February, we were managing to train almost 1500 specialists. Usually the teachers were specialists from ICITD and Training center specialists. All the problems were discussed. There were higher developed classes having a lot of movies and video tapes. We still now have all the equipment including TV, movie operators, projections and TV networks, etc. After finishing all the theory training, we conducted field trips for practical applications. Beside the courses undertaken for high degree of engineers, in the same center, we were organizing qualification courses for irrigation staff such as technicians who are operating and maintaining equipment.

One example of a course held in 1990: "Training course for chief of irrigation schemes"

7 days course, 1989 Jan., 8 hours per day

Every part of the course was done by different teacher. The lecture titles are as follows.

- 1) "Conceiving and undertaking of technical plan at the level of irrigation system" taught by LRD specialist.
- 2) "Measures to decrease water losses on the hydrotechnical or transportation network and measures to decrease electric energy consumption" by Teachers from University of Land Reclamation Faculty and from the politechnical institute from Bucharest.
- 3) "Technology for irrigation by furrows" by specialist from ICITID and Land Reclamation Faculty
- 4) "Measures, solutions and technology for maintaining and operating pumping stations from irrigation schemes having as a conclusion of increasing technical efficiency and fidelity in operation" for one day course by specialists from ICITID and Land Reclamation Faculty.
- 5) "Modern Watering (irrigation) Technology" by a specialist from ICITID.
- 6) Field trip by bus to see how these problems are implemented for one or two days.

Usually from 8 to 2 p.m., theoretical lessons were done. From 2 p.m. to 4 p.m., they have little break, and from 4 p.m. to 6 or 7 p.m., they took place a lot of discussions about problems suggested in the morning session. These trainings were accommodating in Hotel for teachers and trainees.

At the end of course, trainees are tested and those who are promoted good notes received a document for certification of training qualification. This certificate is very important for their jobs, because it was involved to increase salaries.

Main idea of the training was that firstly theoretical problems are discussed, and then field trips were done to see how the theoretical problems are effectively implemented.

We had 15 or 16 courses per year for land reclamation engineers, meaning 2,000 to 3,000 trainees per year.

Q-3-2-2: (for a House of Agronomist in Giurgiu) According to MAP, we understand that training farmers is conducted as follows:

In MAP "Teaching Education & Research" which is a special directory is in charge of training farmers, and in County level "House of Agronomist" is in charge. The MAP firstly shows "Frame Theme" such as Culture of Grains, Animal Breeding for Milk, Culture of Fruit Trees and others, to the House of Agronomist. The theme also includes irrigation. The House of Agronomist, then, formulates concrete courses such as Mechanical course for new land owners, Registrative teaching and others. Finally, the House of Agronomist conducts training in the House. The training budget is delivered from the MAP after 1994.

Is the above understanding correct? If not, please give us correct information.

(Answer from the House)

Yes.

Q-3-2-3: (for a House of Agronomist in Glurgiu) We would like to know the training farmers in detail. Could you inform us the course titles, contents, terms and frequency which you recently conducted or planned.

(Answer from A MAF Training Center Called "30 December")

This center conducts preliminary chief Farmers' training courses. These training courses are operated especially for private farmers as well as for state farmers. The director is cooperating with House of Agronomist (Agricultural Chamber). All the people participating here should pay. A part of training fees are supported by MAF. The private farmers pay for accommodation and food, and the fees for training and field trips are supported by MAF.

We had a lot of private farmers participating these courses. They are interested in the discussed problems. The scope is to train private farmers. Last year, we held 9 courses for horticulture; All are 7 days courses. This year, we planned 14 courses in Autumn and Winter.

Examples of a course's contents:

- 1) Two important new details in the technology of producing cereal seeds and technical crops, sunflower, sugar beat, etc.
- 2) Presentation of new maize hybrid and technological elements specific in the hybrid lots or plots. (All these seeds have to be obtained income pliancy for international standards for foreign market.)
- 3) Presentation of official document and laws concerning production control (testing method) certification and selling of the seeds. (All the seeds have to for international market.)

Q-3-2-4: (for RAIF) Under LRD, the costs of conducting training courses were shouldered by each SCELIF. After establishing RAIF, how has it been changed?

(Answer from RAIF)

We cannot conduct any training courses, and so we cannot answer.

3.3 Water Management

Q-3-3-1: (for RAIF or MAF) What is the present progress of organizing farmers?

(Answer from RAIF)

The official data shows that the land was given back to farmers more than 99% and farmers are working on the land. The owners having certificates are 44%.

Q-3-3-2: (for RAIF or MAF) What is the present feature of the water users association? Is it a functional association or just a community of general agricultural affairs?

(Answer from RAIF)

The fact that we have very low efficiency on farm level irrigation indicates non-existence of water users' associations. These associations do not have legal status or frame. Some trials, however, are done being based on family relationships or neighborhood relationships, etc. We strongly believe the necessity or needs of having some associations. It is only an issue to increase water consumption leading obvious increment of efficiency. We are very interested in establishing these associations. Proving we are very much inter-

ested in promoting the water users' associations is the fact that we submitted this cooperation request to Japan.

We imagine the association is as follows:

The association is to be provided with everything of needs including technical matters. Two steps are considered. The first step is to conceive an experimental association or experimental farm provided with everything which needs technologically situated at the level which is more efficient than the existing Romanian level. We will have also this experimental farm of agricultural technology at the highest world level. The results will be spectacularly big yield with high quality. The farm has to be a model through this created example, and this farm will be extended. In the second step, you can recommend to Romanian authority to give more financial facilities to the farmers willing to such a agricultural expectations. The financial facilities means possibility of loan aids with low interest. Technical assistance with free of charge is provided especially through RAIF specialists and Agricultural Chambers in order to give farmers high quality seeds, etc.. These two aspects joined with economical possibilities will lead obviously to the encouragement of these associations with no state directions. A lot of details will be comprised. The third step is to train specialists to learn modern technology, etc. It seems to be most realistic proposal.

Q-3-3-3: (for RAIF or MAF) How is the water users association managed?

(Answer from RAIF)

There are small associations as stated for Q-3-3-2. These are managed by their own way.

Q-3-3-4: (for RAIF or MAF) As for the subsidy on facility operation, please let us know its variety, subsidizing condition and progress, and the annual budget of the Government.

(Answer from RAIF)

The reasons why RAIF is established are that we dispose great land surfaces arranged for irrigation and that Romanian private land owner does not have financial possibilities, and that the state considers how the state can take in charge of a part of costs of the irrigation water. After establishing RAIF, almost 80% from the effective costs are supported by the state with subsidies from the state budget. The difference of 20% is paid by the farmers. Therefore, the state is in charge of all the electric power costs. Probably these percentage will be changed. The 1995 is the first year for working under these conditions. In such conditions, we strongly think it is fairly easy to establish water users' associations. Therefore, one of the scopes of existing RAIF is to create conditions to make associations. The budget is about 250 billion Lei out of which 50 billion Lei is for investments, 200 billions Lei for operation and maintenance (please check it to Mr. Todor).

Q-3-3-5: (for RAIF or ISPIF) Please list up the applicable laws and regulations on water supply system.

(Answer from ISPIF)

In 1990, there is free water any where. Between 1991 and 1994, the government subsidizes, but pressure pumping is to be paid by the farmers. In 1991, the average utilization rate in real is about 14 to 20%. Then, the government

tries to apply complete subsidy for energy and maintenance. Farmers, thus, pay for only operation works.

A New Law applied from 95, in which the state gives subsidy for electricity and all the maintenance and repairs on any pump. Farmers pay only operations through SCELIF. This law is the one which establish RAIF. About 34,000 Lei for 1,000 cu.m. of water was paid, out of which 21000 lei are for SPP, and 13,000 lei for re-pumping.

Project for the Law for land reclamation: "All the cost for operation and maintenance and repairs are done by RAIF. Land reclamation works are done by other persons, which must be done on commercial bases. The state may give compensations or subsidies for total or a part of the some kind of these works." Every year percentage is decided.

Q-3-3-6: (for RAIF or ISPIF) Please inform governmental organization dealing with execution of water supply facilities.

(Answer from ISPIF)

RAIF is the organization for irrigation water. "Water Regia" under Ministry of Water, Forest and Environment takes care of domestic water for drinking.

Q-3-3-7: (for ISPIF) Please inform us design standard values for water consumption (liter/capita/day).

(Answer from ISPIF)

Water Regia knows it.

Q-3-3-8: (for ISPIF) Please inform us water quality standard for drinking water.

(Answer from ISPIF)

Standard for drinking water is "1342/94 (standard number)."

Q-3-3-9: (for ICITID or Giurgiu) Could you give us data compilation samples on the following items:

- (1) Mean monthly evaporation
- (2) Mean monthly wind velocity
- (3) Mean monthly temperature
- (4) Mean monthly relative humidity
- (5) Mean monthly sunshine duration
- (6) Mean monthly rainfall
- (7) Daily rainfall data

(Answer from ICITID)

The examples are shown in Annex-2.

Q-3-3-10: Do you collect the above data over the 28 research points and compile them at the ICITID?

(Answer from ICITID)

Yes.

3.4 Information System

Q-3-4-1: Is the telephone stable over the country?

(Answer from RAIF)

We do not have, for instance, cell-phones, and do not have computerized digital centers. We have, however, modernized program for the telecommunication network over the country supported by funds from the World Bank and European Bank and others. We, thus, can call all districts.

Under RAIF, there are radio communication networks. In every district, there is a subsidiary. Every subsidiary has own radio network. If information arrive at a subsidiary by phone etc., it uses domestic communication network and radio to send information to every hydrotechnical scheme, pumping station. There is a system in the car too.

4. EQUIPMENT & MATERIALS

Q-4-1: (for RAIF or ICITID) Which Video type is popular in Romania, PAL, NTSC or SECAM?

(Answer from ISPIF)

PAL and SECAM

Q-4-2: (for RAIF) Is the voltage 220V?

(Answer from ISPIF)

Yes.

Q-4-3: Is electric supply voltage stable in Bucharest?

(Answer from RAIF) More or less, (fluctuate about from 200V to 250V)

Q-4-4: (for RAIF) How many kilocycle of the frequency is applied for electric supply?

(Answer from RAIF) 50 kilocycles

Q-4-5 (for RAIF) How frequently does the electric shortage occur in Bucharest; everyday, once per week, once per month or once per year?

(Answer from ISPIF) No shortage.

Q-4-6: (for ICITID) How frequently does electric shortage occur in ICITID; everyday, once per week, once per month or once per year?

(Answer from ICITID) No shortage.

Q-4-7: (for RAIF) Is it easy to purchase transformers from 220V to 100V, and electric voltage stabilizers?

(Answer from ISPIF)

It is difficult to find the transformers.

Q-4-8: (for RAIF or ISPIF) What makers' personal computers are popular?

(Answer from ISPIF)
IBM or IBM compatible.

Q-4-9: (for RAIF or ISPIF) What language is applicable to the computers?

(Answer from ISPIF)
Pascal and "C" are mostly applied; FORTRAN and Basic are also applied.

(Answer from RAIF)
Foxpro 2.6 for most use on economical data. "C", Fortran,
Windows 3.1, Microsoft office, Excell, Word, Quatropro, Pascal

Q-4-10: (for RAIF or ISPIF) On the above computers, how is it easy to obtain the consumer goods?

(Answer from ISPIF) It is easy to obtain them in stores.

Q-4-11: (for ICITID or ISPIF) What computer companies do have service branches in Bucharest?

(Answer from ICITID)
ODEROM (U.S.) which is compatible to IBM.
I.T.C. which is a private company to repair all the computers.
Xerox, IBM and Hewlet Paccard

Q-4-12: (for RAIF or ISPIF) On photo copy machines (Xerox), how is it easy to obtain the consumer goods?

(Answer from ISPIF)
It is easy to buy from shops.

Q-4-13: (for ICITID) How is it easy to have basic equipment and materials for scientific experiments or chemical tests? The basic equipment and materials include glass equipment, filter papers, resin materials and others.

(Answer from ICITID)
These equipment and materials can be obtained immediately from the stores.

Q-4-14: (for ICITID) What standards are applied for machinery, pipes and joints?

(Answer from ICITID)
Romania standards which are correlated with international standards.

Q-4-15: (for ICITID) Which unit is applied for the machinery, pipes and joints, millimeter or inch?

(Answer from ICITID)
Millimeter unit

Q-4-16: (for ICITID) Are there shops which import and sell foreign irrigation equipment? If Yes, please list up several shops with makers' name.

(Answer from ICITID)

Yes. The company examples are as follows.

IRRIDEX company for U.S. equipment.

IRRITEC company for French equipment.

Q-4-17: (for ICITID) Is electric supply voltage stable in ICITID?

(Answer from ICITID)

Yes. No shortage.

5. WORKING/LIFE CONDITION

Q-5-1 Please list up national holidays and almanac filling the form.

(Answer from ICITID)

No.	Date	Name of Holiday
1	Jan. 1-2	New Year
2	May 1	May Day
3	Dec. 25-26	Christmas
4	Dec. 30	National Romanian day

Note: Local holidays are also filled, if any.

Confirmation Results of the Answers for the Questionnaire of the Preliminary Study

2-1. Irrigation Facilities Water Resources Development

Q-2-1: How amount is the maximum of water resources in Romania?

(Answer from ISPIF)

The average water stock in Romania is 40 billion cu.m for the domestic rivers, 170 billion cu.m for the Danube and 9 billion cu.m for underground water. Of these amounts, only a supply of about 5,000 cu.m/ha could be reliable in the irrigation systems; we also take into account the Danube with 10 billions cu.m/year and underground water with 1 billion cu.m/year and domestic rivers with 5 billion cu.m/year.

Water Construction (water application facilities)

Q-2-1-8: If you have any troubles on water construction and maintenance, what is the cause of troubles?

(Answer from ISPIF)

Yes, we have troubles especially for electrical costs for pumping stations. Other troubles are erosion of the slope of the bed trailing, especially for the Danube. Erosions come from the modification of the main route of the Danube water.

Rehabilitation of water construction

Q-1-9: May you show the outline of investigation results of the condition about old water construction (exhausted conditions of the water application facilities)?

(Answer from ISPIF)

The conditions vary from poor to somewhere between medium and good. The difference are come from age of the scheme. Most problems are some intakes, flouting pumping stations and some canals, and less in SPP and underground pipes. The biggest is shortage of field irrigation equipment.

2.3 Water Management

Q-2-3-1: What is the present water management system from a diversion weir or water intake to farm gate?

(Answer from RAIF)

Each year, a RAIF subsidiary makes contract with farmers to supply water to their farm. The subsidiary proposes the delivery schedule. According to the contract and location of the farms within the scheme, the subsidiary decides how to operate the scheme. The delivery schedule is related to the areas to be irrigated to cropping patterns, and availability of irrigation equipment, and related to natural conditions and others. The actual water delivery schedules are discussed during weekly meeting with farmers and put into operation.

Q-2-3-2: How operation and maintenance is established?

(Answer from RAIF)

(1) On maintenance, the government is responsible for the maintenance from the main pump to pressure pump. From the pressure pump, main conduits belong to RAIF, but operating the other parts of the scheme belongs to farmers. If hydrant is broken, the farmer should pay.

(2) On operation, the government operates up to the main conduit, and the remaining schemes are by farmers.

(3) We have two kinds of expenditures. One is the maintenance and repair fee, which is obtained 1e1 per hectares. The 2nd is the operation fee, which is composed of fees for electrical power, costs with operation during water pumping; these costs are computed with 1e1 per one thousand cubic meters of water. There are volume meters but not much. We, thus, are estimating water amount with running hours of pump.

In the field, technical characteristics is known. Furthermore, number of hand moved equipment, how much time the equipment is working at the same position, and number of sprinklers of each hand moved equipment are known. As we have experienced, one hand moved equipment irrigates 17 to 22 hectares during 10 hours, which is 600 cu.m in volume of water per hectare.

The first expenditure, maintenance and repair, it is fully subsidized from the state budget according to the "Law 50" starting 1995 because of the fact of establishing RAIF. But the state budget is gave us only 74% of our request for 2,250,000 hectares. The 2,250,000 hectares means 75% of the total irrigated land, 3 million hectares.

We had to conservation (those irrigation schemes which are not working this year) of 25% of the 3 million hectares arranged for irrigations. The 25% of the 3 million hectares is 750,000 hectares. There are other reasons for conservation of 25%. One reason is that there were very high energy consumption and head of pumping is very high (more than 100m) and not efficient. Because of the fact that the height is more than 100m, the cost is high. Another reason is that new land owners have very small area each and do not want to irrigate for a lack of fund.

Irrigation equipment belong to land owner. We have very few irrigation equipment. A part of those are obtained partly from funds and the other from former cooperatives. Before revolution, out of 3 million hectare arranged for irrigation, one million was belonging to the state companies which were buying equipment for irrigation; the remaining 2 million hectares belonged to agricultural cooperatives having their own equipment bought by themselves.

After revolution, the cooperatives vanished. The 2 million hectares were divided and delivered to several millions of land owners. A lot of these equipment are very old, damaged and couldn't be replaced any more. The remaining good equipment are partly taken by RAIF, and the other parts were given to land owners with free of charge. For the one million hectares, the equipment exist in their store houses, and they are now state enterprises. But concerning the other 2 million hectares, the owners have very few equipment. When they want to irrigate, they have to borrow from RAIF with rental fee. Generally speaking, the irrigation equipment can cover for watering only 53 to 54% of the total area of 2 million hectares. But we have to emphasize that we are

Irrigating more than 1 million and 6,000 hectares because equipment is not used simultaneously and is irrigating different kinds of crops. One equipment may be used for several crops with the different time of coming back to the initial position according to the growth stage, etc.

The cost of electrical power is supported from the state budget with one condition that the owner of irrigated land signs the contract with RAIF. The owners have to pay their own maintenance costs meaning fees computed and agreed for transportation network from the river. The cost from the river (base pumping station) to pressure pumping is 13,500 Lei per 1,000 cu.m for all the area. At the pressure pumping station, the price is 21,100 Lei/1,000 cu.m.

From the base pumping station to repumping, the costs are computed with the average water flow of 3,600 cu.m/hour and average efficiency is 78%. For the pressure pumping station, 560 cu.m/hour of the average flow is the base. From the base pumping station to pressure pumping station, 13,500 Lei/1,000 cu.m. considers the 3,600 and 78%; for the pressure pumping station, the 21,100 Lei /1000 cu.m considers the 540 cu.m/hour. We computed for 1,000 cu.m pump water. The costs of 21,100+13,000 include salaries of workers, and hydrotechnical workers operating weirs.

The land owner should pay $21,100+13,500=34,600$ Lei per 1,000 cu.m.

But there is another possibility. If intake is done directly from the river for the pressure pumping, the owner has to pay only 21,100 Lei/1,000 cu.m.

The second expense for operation electrical power is fully subsidized by the state.

Expenditure and financial resource

Maintenance & Repair - from the State budget.

Operation: Costs for electrical power - from the State budget

Fees - paid by the land owners

Problems: The small private land owners do not borrow enough equipment from RAIF. Concerning the state companies, they have a lot of debt for services. We requested them to pay for the debt, which is the money to pay to the electrical power company. By 1994 the energy costs of the pressure pump were paid by the land owner, and thus the state companies should have had to paid, but they did not. As the result, they have had the debts for electrical energy costs. Now, RAIF is established and the state supports the funds of all the energy costs. But because of their debts, it is very difficult to sign the contract.

For 1995, we submitted a request for the state farms to provide water for more than 1 million hectares, but there is a problem. The delivery of electrical power will be carried out after the payment of the previous debt. The national power company does not give energy without the payment. But nevertheless, we are trying to complete our activity.

Land owners haven't been asked to give water for irrigating wheat and barley because it has been a lot of rain during spring. The crops are very beautiful. And the cereals do not need water any more. Irrigation is mainly done for vegetables, forages, paddy fields, maize, sugar beat, soybeans, orchard, vines and sunflower. In drought zones, irrigation is done for many crops.

Q-2-3-5: Do you have any law and regulation on water management?

(Answer from RAIF)

The Law of Land Reclamation Works has been passed through three ministries, and now submitted for discussion to the Romanian parliament.

Q-2-3-6: Do you have any technical guideline on water management? If you have, please show us some examples.

(Answer from RAIF)

We have technical guidelines and standards for designing and construction of the land reclamation schemes. We do not design and construct at random. We do everything under standard rules. Concerning the facilities, we have to point out the following things. Every hydrotechnical scheme is unique in his own way. So for every irrigation scheme starting from designing, it has an operation manual, where all the technical elements for correct operation are provided. Operation of hydrotechnical schemes is done in compliance with technical parameters for operation such as water levels of the river and distribution canals, flows, number of electrical motors working, pressure level, so that we avoid underpressure and high pressure, or avoid flood. So there is a management graphic which is connected with water consumption and water needs to the irrigation schedule surfaces. There is a very precise correlation. Radio communication system is conceived in order to follow the technical parameters of the network.

Q-2-3-7: How do you establish those guidelines? Please show us process of making those guidelines.

(Answer from RAIF)

These guidelines and operation manuals are prepared by designers at the same time with the last phase of design by ISPIF.

Q-2-3-8: How do you extend newly developed water management technology to users or farmers?

(Answer from RAIF)

This is done by a RAIF subsidiary which hold a meeting (usually Friday) with farmers for extension at the same time to establish the next week schedule. The Friday meeting is usually held for the next week irrigation. If the new technology is suggested, this will be extended through the meeting.

2-5. Training

Training Technical Staff

Q-2-5-1: Please give us the following information about training technical staff on RAIF.

(Answer by RAIF)

Training courses have not been conducted after 1991 due to a lack of budget. If, thus, the training is done, the procedures will be follows.

(1) Operation department of RAIF is in charge of these courses.

(2) These course for graduate engineers (University graduate) include 60-80 trainees per course.

Four to five courses for skilled labor and technicians (technical school graduate) include around 100 people. Those are conducted in only winter time.

(3) We ask to the subsidiary to recommend the participants. Most trainees are the subsidiary members and a few farmers. On the farmers, seasonal labors are farmers, and such a farmers brought to the courses.

(4) Teachers are various year to year. They are selected occasionally from ICITID, ISPIF and RAIF.

(5) The facility is in ICITID. Sometimes, we use the facilities of MAF and the Department of state Farms.

Q-3-5: Please explain the relationships between ICITID and ISPIF in terms of functions.

(Answer from ISPIF)

We use the results of their researches in crop water requirements, some materials and technology used for different works for lining canals, etc.

(Answer from ICITID)

We give our research data to the ISPIF by direct contract. All the projects made were done by this basis.

ICITID carries out investigations on crop water use, crop response to irrigation water, irrigation equipment, drainage, etc. ISPIF performs studies means topographic studies, soil studies, hydrology and hydrogeology and geotechnic studies, etc.

In the past, our Institute was in Bucharest, they were many other kinds of works done by ICITID like hydraulic modeling, geotechnical studies and others. The large institute is splitted into more parts, such as Institute of Soil Science, Institute of Hydraulics and ICITID in 1978. ISPIF had the same feature as today. Institute of Soil Science and ICITID is coordinated by Academy of Agriculture and Forest Sciences.

People working in ISPIF do not have any scientific degrees except the scientific director called Dr. "Virgil Dobre."

Personnel

Q-3-8: Please show the occupational rank chart of the technical staff in RAIF including ICITID and ISPIF.

(Answer from RAIF)

See the answer for new question 2-1-3.

(Answer from ICITID)

Director
 1
 Scientific Director (Principal Researcher Grade-1), Technical Director
 1
 Principal Researcher (Grade 1-3)
 1
 Researcher
 1
 University (Faculty) Graduates

The University or Faculty graduate are promoted to be a Researcher after 2 to 3 years experience with a test. From the researcher to the higher degree up to the Principal researcher grade-2, the promotion is done by evaluating publications, experience and test results. From the grade-2 to grade-1, the achievement is evaluated with Academy criteria.

In the laboratory for management and maintenance of irrigation and drainage systems, the number and work location are follows.

Principal Researcher Grade-1:	1 (RAIF or ICITID)
-2:	3 (RAIF or ICITID:1, Research point:2)
-3:	12 (RAIF or ICITID:1, Research point:10)
Researcher	: 6 (RAIF or ICITID:1, Research point:4)
Total	:22

The above numbers are changed every year for examination.

(Answer from ISPIF)

General Manager
 1
 Deputy Manager
 1
 Department Manager
 1
 Division Chief
 1
 Senior Engineer (Grade 1-3)
 1
 Engineer
 1
 Technician (Medium Trained People)

Engineers are University graduates or Faculty graduates, and technicians are high school graduates. To be the higher degree of engineer, there is an examination. The chief is supposed to be selected from the Grade-1 Senior Engineers, or after being the chief, they become the Grade-1 Senior Engineers

Q-3-34: What is the relation between the administration (ex. MAP, RAIF) and ICITID?

(Answer from RAIF)

ICITID is a research and engineering institute, his speciality is irrigation and drainage. He is a national institute by its organization. ICITID is covering all the branches of our activities on the whole Romanian territory. The

basic research is usually financed through Ministry of Science and Technology and through Agricultural Academy. The other side, operational research such as technology system's equipment, all kinds of figures and data which are requested by the designing branch and by operation branch in RAIF are carried out based on economical contracts, etc. Of course, amount of these contracts are paid or supported by ISPIF or RAIF. For concluding, the cooperation is possible.

Inside MAF, there is a department coordinating and implementing new technology, which is Directorate for strategies and development programs. This directorate is insuring together with agricultural academy for development or research program. Of course the ICITID is a part of them.

Because your mission include training program, there is another directorate, which is Directorate for staff training consultancy and agricultural propaganda. The both of the two directorates are coordinated by the same secretary state.

(Answer from ICITID)

we are doing research programs of the Academy of Forestry and Agriculture. They give their agreement and then the programs are sent to Ministry of Research and Technology (formerly Ministry of Science). Special committee is made by several specialists from the Academy of Forestry and Agriculture, Ministry of Agriculture and Ministry of Research and Technology, and they judge the programs and budgets.

Q-3-35: What is transition of budget in ICITID?

(Answer)

1990: 90 million Lei

1994: 600,000 million Lei

1995: 1 billion Lei

Q-3-37: What are the relations between ICITID, ISPIF, MAF and RAIF on this Project.

(Answer from ICITID, RAIF and MAF)

ICITID is a research institute, ISPIF is a project institute, and RAIF is an economical enterprise. The relations among the three are on contract basis. The three are very independent. MAF can coordinate them, but They are very few relation with MAF.

Q-3-38: What is outline of ISPIF?

(Answer from ISPIF)

In normal, 70% of the total are from state funds, but actually 100% are state. ISPIF is managed by itself. A part of the benefit is given to the state, and small part to people. In Law, ISPIF is a commercial company.

Regia very important company 100% state

The 30% is given to the people with free. but nobody come to share it, and 70% by the state. this is average.

Budget: 5 billion Lei In 1995 in hope. 3.7 billion Lei In 1994. No national

budget. About 780 million Lei from Academy and other institutes in Ministry of Science and research in 1995.

Activities of Experts

Q-4-3: What is your specific requests on objectives and activities of the expert on irrigation systems?

(Answer from RAIF)

The expert identifies the modification on the existing systems for the new situations. Engineers should asses the real condition and advise to modify. The expert manages the water after pressure pump.

Q-4-4: What is your specific requests on objectives and activities of the expert on water management? What is the demarcation to the expert on irrigation systems?

(Answer from RAIF)

The expert has to give advises on how to improve water distribution systems and to increase the efficiency of use. He will cover from the intake point to the pressure pump, main distribution conduits till the antenna and hydrant.

Q-4-5: What is your specific requests on objectives and activities of the expert on design?

(Answer from RAIF)

The expert advises design activities in ISPIF regarding rehabilitation of the existing irrigation projects achieved through Division with Technical Advisers to Promote Project Designs and Document.

Q-4-6: The following questions are for the expert on information systems.

1) What is improved in the information system on this project? And what is the purpose?

(Answer from RAIF)

The information system of RAIF is working for very short time after establishment. Using all the information from LRD, we can see information system which is very soon carried out. So in the next period of time, the idea will be fulfilled by providing everything needed.

Because of changing from LRD to RAIF, all the information systems have to be re-designed. Now we intend to establish new information system being able to collect data from bottom level (fields) by remote-transmission, recording all these data on data bases, and also being able to transmit them to MAF.

2) What is the concrete details of activities and objectives by expert requested in the improved field of information system? And what is the purpose?

(Answer from RAIF)

We intend to create an integrated information system. The purpose is this.

3) What is the concrete detail of activities and objectives by Romania in the improved field of information system?

(Answer from RAIF)

We want to connect our information system to other related information systems in Romania, for instance, the information system of environmental ministry called "Ministry of Water Resources and environmental Protection.

According to the organization chart of RAIF, we must have a subinformation system for each of division, and the raised problem is undertaken on the connection between those subsystems. We have to be able to collect data from the bottom level, from each Subsidiary and from each Office of RAIF. Integrated system means collecting data from field level, putting them together in data bases, transmitting proper offices, and then transmitting to the higher level. So we are talking about information network systems.

Problems are complicated because we do not have enough finance to purchase equipment, although the consulting company from Britain designed the draft of information system. (The copy was obtained.)

7. GIURGIU SYSTEM WATER MANAGEMENT

7.1 General in the Area

Q-7-1-1: Organizations and their responsibility of the water management in the area.

(Answer)

RAIF Subsidiary, Giurgiu is in charge of all the land reclamation activities. The general director of Giurgiu RAIF, Mr. Aurel Popa, and his deputy director Engineer Mr. Nicolae are working for five administration systems. So as an organizing way, the system, as an administration unit, is composed of many hydrotechnical units. The new organization chart is shown in Fig. 3. If you want to know more details about all the levels, we will answer.

Q-7-1-2: Comments, subjects (themes) and problems on the facility management in the area.

- A) Status of facilities
- B) Man-power, cost, equipment & materials
- C) Communication among persons/organizations concerned
- D) Others (other than irrigation, for example, water drainage)

(Answer)

Total surface arranged for irrigations cover 161,142 hectares, out of which 45,000 hectares are arranged for pumping drainage, and around 44,000 hectares are gravity drainage. Total budget amount is 6.5 billion Lei. In addition, 2.2 billion Lei are provided for energy costs. The 6.5 billion Lei does, thus, not include energy costs. About 1,000 staff members are working for operation and maintenance.

Communication methods are facsimile, telephone and radio equipment. For transmitting data by computers in information systems, we have equipment to transmit data through telephone wire (MODEM).

7.2 Water Resources

Q-7-2-1: Method of observation/measurement of water levels & flow rate, and method of data transmission

(Answer)

We are measuring water levels with some indicators (staff gauge) every two hours. The data are transmitted through telephone wire or radio equipment. Through this MODEM, the collected data are transmitted to Bucharest.

Q-7-2-2: Method of data storage and accumulation

(Answer)

The data are stored in a data base of a computer.

(Comments)

Every hydro-system has conceived this operation rules. The water levels which are communicated every two hours are processed in compliance with the operation rules, and decision of operating pumps is taken according to the operation rule and to taking into consideration from the fields. The technicians (engineers) are, thus, very important persons. The flow conveyed by canals are

very large, and it is the great responsibility for the technicians.

7.3 Water Intake

Q-7-3-1: How to decide water quantity (flow rate) necessary for farms/fields

(Answer)

After completing Fig.4, they make the functioning program (Fig.5) which is conceived with together with farmers. There are two signs; one is by the farmer, and another by the chief of the irrigation system. Based on the total water amount needed, they are scheduling operation of different pumping stations. "4" (in Fig.5) means number of hand moved irrigation equipment operated simultaneously.

Q-7-3-2: When, where, how to decide water intake quantity (flow rate)

(Answer)

The RAIF Giurgiu head quarter decides the flow rate based on the field data once per week.

Q-7-3-3: Equipment to be operated/controlled, and frequency of operation/control

(Answer)

The 99% of the irrigation equipment is hand moved equipment with sprinklers. The operation is done according to the schedule decided through 7-3-1.

Q-7-3-4: Measuring instruments/equipment, and files for (data) storage

(Answer)

We are measuring accurately the consumption of electric power, but we do not have devices for measuring water flow. The data are stored in computers.

7.4 Water Distribution

Q-7-4-1: Rules & regulations to decide water distribution quantity (flow rate)

(Answer)

Apparently we have the correlation between water levels and water flow (Q-H curves). We know approximately the flow rate. This is our estimating method.

Q-7-4-2: Method of distribution

(Answer)

Open canals, buster pumping stations and underground distribution networks.

Q-7-4-3: Who, when, how to operate water distribution equipment

(Answer)

Farmers (land owners) operate the equipment according to the information from a meeting held once per week including specialists from House of Agronomist (Agricultural Chamber).

7.5 Water Delivery to Farms/Fields

Q-7-5-1: Equipment, method, rules/regulations & their scope for water delivery to farms/fields

(Answer)

Please see the above 7-4-2.

Q-7-5-2: Maintenance and repair, working method, cost

(Answer)

The RAIF has two workshops per irrigation system, and repair the equipment. The costs are paid by the owners of irrigation equipment.

7.6 Organizations of Water Users' Group (WUG)

Would you explain or provide us the followings.

Q-7-6-1: Name and number of WUGs

(Answer)

No WUGs.

Q-7-6-2: Number of each WUG member

(Answer)

No WUGs.

Q-7-6-3: Present organization chart of each WUG

(Answer)

No WUGs.

Q-7-6-4: Relationship between RAIF and WUG at present

(Answer)

No WUGs.

Q-7-6-5: Roles and responsibilities of each WUG at the implementation stage

(Answer)

No WUGs.

Q-7-6-7: Roles and responsibilities of each WUG at O & M stage

(Answer)

No WUGs.

7.7 Operation and Maintenance Cost

Q-7-7-1: Irrigation facilities

- a. Name of office, responsible ministry
- b. Objectives of the work by the office
- c. Numbers and position of staff and their salary and allowances
- d. Work cost per year (please itemize the work and its cost)

e. Annual budget with its breakdown

(Answer)

- a. MAP created RAIF to be in charge of irrigation facilities. Concerning irrigation scheme, there is a head.
- b. The objectives at the level of RAIF are same as the headquarter RAIF.
- c. Total 1,000 staff members.
- d. (Please ask to the headquarter.)
- e. (Please ask to the headquarter.)

(Organization Chart on RAIF Glurgiu)

Organization Chart of RAIF Glurgiu Subsidiary

- (1) Managing Committee
- (2) Director
- (3) Law Counselor (Attorney)
- (4) Financial Control Office
- (5) Deputy Economical (Financial) Director
- (6) Deputy Technical Director
- (7) Operation Division and Technical Planning
- (8) Division for Energy Problems, Automation and Work Protection
- (9) Division for Providing Goods
- (10) Division for Investment, Designing and Techniques
- (11) Division for Salaries, Organizing and Human Resources and Personnel
- (12) Division for Financial Accountant
- (13) Division for Administration
- (14) Division for Computers
- (15) Store House
- (16)-(20) Hydro-Systems
- (21) Mechanization Division composed of cars, tractors, garages, workshops for repairing pumps, wiring electric motors, automation, maintenance for electrical parts, cranes, bulldozers, shovel cranes.

Q-7-7-2: Agricultural Support Facilities

- a. Name of office, responsible ministry
- b. Objectives of the work by the office
- c. Numbers and position of staff and their salary and allowances
- d. Work cost per year (please itemize the work and its cost)
- e. Annual budget with its breakdown

(Answer)

- a. One of the main facilities by the state is a free of charge support by the House (Chamber) of Agronomist at the level of every town. There are many diplomat engineers, including agricultural engineers, livestock engineers, and specialists for crops protection. This is one rink situated at town. Another situated supports at town level are veterinary offices those are paid by the state.
- b. The Chamber is to support agronomical works, and the veterinary office supports the livestock related works.
- c. One to three specialists depending on the total area of the agricultural area of the town are provided; total 140 to 150 specialists are in Glurgiu.
- d. 80% of the total prices of water is supported by the state.

e. We have to ask the agricultural direction.

7.8 Cropping Pattern

Q-7-8-1: Would you explain us the recommended cropping pattern in the area?

(Answer)

The 50% of the surface area are planted wheat and barley, 25 % maize, 15% sunflowers, 5% vegetables and 1% sugerbeat. The rest are forage including alfalfa and oat. The wheat and barley are cultivated in Autumn, and alfarfa is permanent crops. Maize, sunflower and vegetables are cultivated in Spring. Vegetables include onion, garlic, tomatoes and cucumber. Spring is from March to April; the duration depends on weather conditions. Autumn is from September to October. If Green Pease is grown in June, then beans and potatoes are grown in Autumn.

Technical crops are sunflower and sugar beat.

The following rotations are provided.

Wheat-Sunflower-Forage

Barley-sugarbeat-vegetables

The wheat and barley can stand two successive years at the same plot. After two years we can replace the wheat and barley with maize. Other crops are rotated. In this rotation it should be noted that sunflower an sugerbeat can come back to the same positions only after six years. If we do not respect this rotation, then we are risking to have to promote crop diseases. So we emphasize to necessity of having rotation crops.

There is theoretical cropping pattern provided by specialists. They are taking into considerations for the following points: the soil existing in the area, the climate conditions, the tradition, economical value of the crops and market requests. Between theory and practice there is a big difference. In the transitions of all, if there are big differences, the differences are effectively fulfilled the plant. Motivation is economical possibility and minimum costs. The land owner is contended to produce to satisfy his own needs.

The scope of associations is to achieve to undertake the agricultural operation situated at the theoretical plant level. The state encourage to make associations.

The problem is that all the seeds are given by the state enterprises. The private land owners, having no possibility of investing funds in reliable agricultural technology, cannot obtain reliable quality crops.

7.9 Public Facilities in the Area

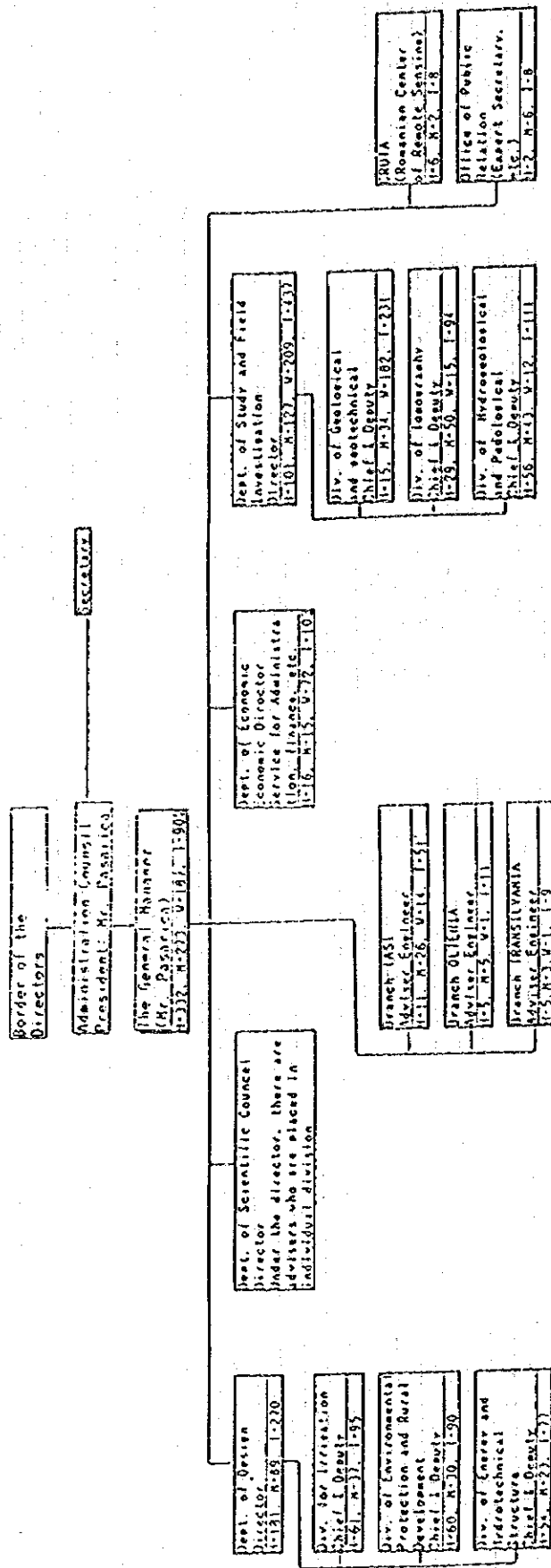
Q-7-9-1: Number of facilities of Primary school, Junior high school, Post office and Bank.

(Answer)

About 10 primary schools, 5 Jr. high schools, 2 post offices and 2 police stations, and 7 banks.

Q-7-9-2: Specific information of Material testing laboratory, Hospital and Police station.

Description	Name	Address	Tel. No.
Material testing laboratory	No labo. in Giurgiu.	All the materials are sent to Bucharest.	
Hospital	Giurgiu central hospital	Giurgiu	
Police station	Every village has a station, and thus, there are about 20 stations.		



Note: H-University graduates
 : K-High school graduates
 : V-Workers
 : I-Total

Figure Organization Chart of Institute of Studies and Design of Land Reclamation Project (ISPIF)

Fig. 2 ISPIF Organization Chart

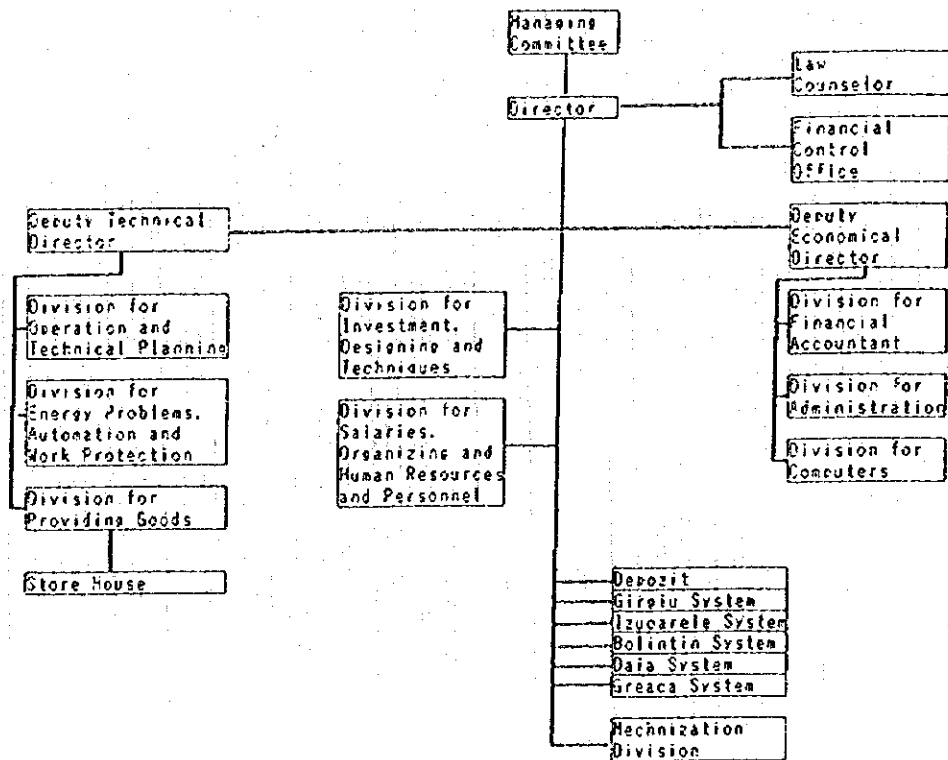


Fig. 3 RAIP-Giurgiu Organization Chart

SISTEMUL

Centrul de avertizare

UNITATEA AGRICOLA

Cultura

BULETIN DE AVERTIZARE

Data emiterii: ziua luna anul

N	Localizarea suprafeței de centrul	M de udare	Volumul m ³ /ha	Pondere m ³ /ha	Diferența față de planul minim	Consum efectiv m ³ /ha	Valoarea corespunzătoare	Diferența față de capacitățile de pomp.	Programarea udării		Elementele tehnice ale udării		Obs.		
									Perioada de udare	Norma m ³ /ha	Schemă	Tipul instalațiunii are			
0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
S.C. nr.	Pre1										Sistem de irigații cu pompare mecanică				
S.C. nr.	Pre2										Sistem de irigații cu pompare mecanică				
S.C. nr.	Pre3										Sistem de irigații cu pompare mecanică				
S.C. nr.	Pre1										Sistem de irigații cu pompare mecanică				
S.C. nr.	Pre2										Sistem de irigații cu pompare mecanică				
S.C. nr.	Pre3										Sistem de irigații cu pompare mecanică				
S.C. nr.	Pre1										Sistem de irigații cu pompare mecanică				
S.C. nr.	Pre2										Sistem de irigații cu pompare mecanică				
S.C. nr.	Pre3										Sistem de irigații cu pompare mecanică				

NOTA:

Sef centru avertizare.

Primiting. șef.

Tipografia Tulcea nr. 543 240 127/1981

Fig. 4 A Form of Water Balance Computation

Annex-1: ICITID Research Themes (Answer for Q-2-2-1)

THE LABORATORY FOR DEVELOPMENT OF AGRICULTURAL LANDS
FOR IRRIGATION.

1. Prospectings for identification the rehabilitation methods of irrigation developments.

2. Exploratory investigations and technical methods for irrigation of plane agricultural lands, with heavy clay soils, as well as of slopes (under the new privatised conditions).

3. Investigations into the strategies of identifying the efficient use of water pumping stations in irrigations schemes, correlated with the national system's power consumption possibilities.

4. Automatization and monitoring of water supply in the irrigation systems.

5. Engineering and technologies of irrigation, micro-irrigation and climatic protection of horti-viticulture crops.

6. Methods of improvement the irrigation projects on the agriculture lands affected by salinity, due to oil-field exploitation.

THE LABORATORY FOR MECHANIZATION AND AUTOMATIZATION OF
THE IRRIGATION SCHEME, OPERATION AND MAINTENANCE OF LAND RECLAMATION
WORKS.

1. Researches for drawing up technologies of application the waste water resulted from the swine breeding complexes, into crop irrigation, having in view the power consumption reduction and the environmental protection.

2. Basic researches of the advanced technology in utilization of irrigation devices and equipments, correlated with the property conditions.

3. Investigation of the advances methodologies and technology of lesser utilization in execution and operating of the land reclamation works.

4. Standardization of working technologies for the irrigation devices used from the home market and imported; for the protection of agricultural producers as well as of economical agents suppliers of irrigation equipments and installations.

5. Diversification and rehabilitation of machines equipments and devices for the operation and maintenance of land reclamation works as well as for setting up the technologies of their efficient application.

THE LABORATORY FOR DEPTH AND SURFACE DRAINAGE.

1. Scientific base of the works required to control the humidity and salts excess on the agricultural (lands including the water and salts balance and predication and warning of humidity salts excess).

2. Elaboration of technical solutions for management and technologies for operation - maintenance of the depth and surface drainage works (accomplished independently or together with other land reclamation works).

3. Influence of the depth and surface drainage developments works on the environment and ecosystems (soil, water, biologic and social - economic conditions).

4. Assessment of works economical potential in the depth and surface drainage schemes.

OPERATION LABORATORY

1. Assessment of parameters for irrigation forecasting and warning inclusively those involved in analysis of the irrigation scheme sizing and elements of soil water balance, in pedo-climatic areas used for irrigations.

2. Investigation of the possibility to decrease the irrigation water consumption of plants up to allowable economic limit.

3. Determination of solutions and technologies for reduction the water leakage in the irrigation canals.

4. Methods equipments used for water measuring and management in the irrigation development works.

5. Research with regard to the behavior of irrigation network and relevant hydraulic structures.

6. Basic investigations in determination of methods for preventing the negative phenomena in evolution of source water, ground water quality from the point of view of water chemism and level, as well as of irrigated soils having in view the ecologic balance.

THE LABORATORY FOR INTERRELATIONS IN SOIL-WATER-PLANT-
ATMOSPHERE SYSTEM.

1. Investigations in heavy capacity lysimeters (10 m^3) and (2,5 m) depth with accuracy weighing ($\pm 200 \text{ g}$) and data teletransmission by cable and radio to a processing mini-computer related to the theoretical bases of soil water retention and circulation and radioactive and nonradioactive pollutants towards plant and atmosphere.

2. Determination in due time of the climate factors evolution that influences the crops evapotranspiration with the help of automatic meteorological station and data teletransmission by cable and radio to the intercommunication system.

3. Field investigations in various ecological zones, to make an assessment of irrigation under water stress (matrix and osmotic) with view to diminish the irrigation rate and increase the production.

4. Evaluation of plants water supply, radicle system bio-activity and nitrogen circulation in the ground water.

5. Researches regarding the influence of irrigation and drainage on the soils physical-chemical-properties (in co-operation with ICFA).

6. Investigations made for conservation and characterization of geosystems and their evolution under the influence of complex irrigation projects (in co-operation with ICFA and Bucharest University).

7. Investigations made for physical and mathematical simulation of demand and supply phenomena, and correlation of the water demand for irrigation with the available resource (in co-operation with I.A.S.B. - F.R.G. and I.C.H.H. Bucharest).

OPTIMIZING LABORATORY

1. Irrigation crops with water resulted from the depth and surface drainage scheme.

2. Methods and technologies of crops irrigation correlated with agricultural technologies under various pedological and relief conditions.

3. Irrigation technologies correlated with agricultural technologies of minimum works.

Annex-2: ICITID Collected Meteorological Data (Answer for Q-3-3-9)

(Average Temperature on Year and Month)

Temperaturi medii lunare si anuale (Meteorological Station Baneasa-Giurgiu)
Stafia meteo Baneasa-Giurgiu

Tabel nr.1

Anul	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Anual	Iarna	Primăvara	Vară	Toamnă
<i>T. med. mult.</i>	-2.9	-0.6	4.5	12.1	17.0	20.9	23.0	22.5	18.1	11.8	-6.0	-0.6	11.0	-1.4	11.2	22.1	12.0
1986	1.0	-3.3	4.2	14.6	18.7	20.4	21.5	23.1	18.9	10.7	3.5	-1.4	11.0	-1.2	12.5	21.7	11.0
1987	-4.6	-5.7	0.1	9.2	15.4	21.3	23.5	20.1	19.0	9.7	6.8	-0.4	9.5	-3.6	8.2	21.6	11.8
1988	1.3	0.5	5.6	9.6	16.5	20.5	24.4	22.4	18.2	9.5	-0.2	0.3	10.7	0.7	10.6	22.4	9.2
1989	-0.2	3.5	7.7	13.5	14.4	18.3	21.5	21.7	15.6	11.0	3.3	0.0	10.9	1.1	11.5	20.5	10.0
1990	-6.4	3.2	9.0	10.6	16.0	20.3	23.0	22.0	16.0	10.7	6.7	1.0	11.0	-0.7	8.9	21.8	11.1
1991	-0.2	-2.5	4.8	9.8	14.1	21.4	22.5	19.9	17.1	11.0	4.2	-4.0	9.8	-2.3	9.6	21.3	10.8
1992	-1.5	-0.4	5.7	11.3	14.6	20.2	21.7	24.6	16.0	12.7	6.1	-1.8	10.8	-1.2	10.5	22.2	11.6
1993	-1.0	-1.6	2.3	10.6	16.9	20.0	21.5	22.1	16.2	13.2	-1.2	0.5	10.0	-0.7	9.9	21.2	9.4
1994	-1.9	1.3	7.7	12.3	18.0	20.4	22.1	21.4	20.2	10.5	3.4	-1.1	11.5	0.7	12.7	21.3	11.4

(Total Rainfall by Annual and Monthly)

Cantitatea de precipitații (mm) anuală și lunară
 în perioada 1986-1994 - stația meteo Băneasa-Giurgiu
 (Meteorological Station Baneasa-Giurgiu)

tabel nr. 22)

Anul	L u n a r i												Year Annual	Season rece	Warm Season (Apr. - Oct.) Sezon cald
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII			
Multianual	42,8	32,1	39,1	49,2	62,1	76,2	56,7	48,7	36,8	44,8	43,6	39,7	57,8	242,1	329,7
1986	36,4	98,2	20,9	28,3	18,1	107,2	44,4	39,0	21,6	64,4	2,5	45,7	52,6	268,1	258,6
1987	73,1	36,1	32,4	70,5	67,2	48,7	48,6	80,1	19,3	22,5	70,9	39,7	67,1	282,7	334,4
1988	27,7	19,0	73,3	69,2	47,3	43,5	39,5	8,7	41,9	58,1	52,5	27,9	508,6	258,5	250,1
1989	4,4	3,8	5,7	64,1	43,2	94,0	28,5	45,5	46,1	43,3	58,6	50,9	488,1	166,7	321,4
1990	16,2	11,7	1,0	34,6	90,7	68,2	29,5	41,8	29,7	15,4	26,4	100,0	465,1	170,7	294,4
1991	16,3	51,0	12,1	88,8	203,2	86,4	161,4	42,9	15,6	58,4	43,7	45,7	825,6	227,3	598,3
1992	4,8	35,4	34,7	46,3	22,4	71,1	34,3	4,1	8,2	9,9	12,8	23,0	307,0	120,6	186,4
1993	9,9	21,1	101,2	11,8	70,9	93,9	49,1	34,5	20,7	46,0	80,4	4,2	543,7	262,8	280,9
1994	31,8	35	32,1	37,4	42,1	83,2	278,5	12,4	0,3	112,4	6,2	93,0	732,9	279,0	453,9
	24,5	31,1	34,8	50,1	67,2	77,4	79,3	34,3	22,6	47,8	40,2	44,8	557,1	226,2	330,9

(Potential Evapotranspiration in 1986-1994)

Evapotranspiratia potențială (mm) în perioada 1986-1994

Stația meteo. Băneasa - Gr.

Tabel nr. 37

Anii	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Anual	S. rece	S. cald
Multiam.	0	0	14	56	97	128	146	131	86	45	16	0	719	75	644
1986	2	0	13	71	109	125	135	136	91	40	8	0	730	63	667
1987	0	0	1	39	86	132	151	174	92	36	19	0	723	56	667
1988	2	1	19	42	94	126	158	131	87	35	0	1	696	58	638
1989	0	9	28	65	79	109	135	126	71	42	8	0	672	87	585
1990	0	7	35	47	90	124	147	128	74	40	19	2	713	103	610
1991	0	0	16	43	77	133	143	113	80	42	10	0	657	68	589
1992	0	0	19	51	80	123	136	148	74	50	16	0	697	85	612
1993	0	0	6	47	97	122	135	129	75	53	-	1	665	60	605
1994	4	2	28	57	105	125	139	123	99	39	8	0	729	81	648

(Relative Moisture in % on Average of Year and Month)

Umezeala relativă(%).Media lunară și anuală (1986-1994)

Tabel nr.11

Anul	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Anual
1986	84	91	80	68	61	77	73	70	68	77	87	82	77
1987	85	91	82	77	83	77	75	76	73	85	90	93	82
1988	93	87	84	80	76	76	78	79	78	85	92	92	82
1989	90	79	75	76	75	80	71	72	82	81	91	91	81
1990	95	87	68	79	73	74	69	69	73	79	88	96	79
1991	88	94	83	83	81	85	87	88	84	89	96	95	88
1992	93	82	72	72	65	72	69	64	63	74	89	90	75
1993	82	75	87	71	78	72	66	68	69	80	90	91	77
1994	93	82	69	74	60	62	72	72	66	87	86	93	76
Media	89	85	78	76	72	75	73	72	73	82	90	91	80

Deficitul de saturație. Media lunară și anuală (1986-1994). (mb)

Tabel nr.12.

1986	-	-	6.9	7.0	9.8	6.4	8.1	10.3	9.3	3.9	1.2	1.2	6.4
1987	0.7	0.6	1.7	3.7	4.3	7.5	9.1	7.0	7.9	2.1	1.2	0.5	5.1
1988	0.5	1.0	1.9	3.4	5.5	6.7	10.4	10.3	5.9	2.4	0.6	0.6	4.1
1989	0.8	2.1	3.5	5.1	6.6	5.3	9.0	9.4	4.2	2.6	0.9	0.8	4.1
1990	0.3	1.6	4.9	3.8	6.5	8.1	11.1	10.2	6.6	4.0	1.7	0.3	4.9
1991	0.8	0.3	2.0	2.6	4.2	5.1	5.2	4.0	4.4	2.5	0.4	0.3	2.7
1992	0.5	1.4	3.4	5.3	7.2	8.0	9.8	13.7	8.3	3.0	0.6	0.4	5.1
1993	1.5	1.6	1.5	5.0	5.3	8.3	11.8	11.6	8.2	4.4	0.8	0.8	5.1
1994	0.6	1.6	4.4	5.1	10.4	11.9	9.5	9.9	10.6	2.6	1.5	0.5	5.7
Media	0.7	1.3	3.4	4.6	6.5	7.5	9.3	9.6	7.3	3.1	1.0	0.6	4.8

durata de strălucire a soarelui (ore) și fracția de însolație
 (Sunshine Durations in Hours & Insolation Rate)
 în perioada 1986-1994 - Stația meteo. Băneasa-Gr.

Tab. nr. 19

Anul	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Anul	S. rece	S. cald
<i>Bisect (16)</i>	2880	3037	3898	4036	4577	4628	4684	4324	3748	3407	2898	2775	4462	18695	15997
<i>Nebisect (15)</i>	2888	2934	3698	4026	4576	4630	4687	4329	3758	3413	2900	2773	4462	18606	16016
1986	D*	537	23.3	108.2	227.2	331.7	212.5	267.1	323.2	257.0	165.4	62.4	87.6	2085.2	470.6
	f**	0.16	0.08	0.29	0.39	0.72	0.47	0.57	0.75	0.69	0.48	0.12	0.32		
1987	D	350	15.2	104.2	128.4	212.9	278.8	339.0	220.0	163.3	132.6	77.5	51.1	2043.8	475.6
	f	0.12	0.26	0.28	0.44	0.46	0.60	0.72	0.68	0.71	0.38	0.27	0.18		
1988	D	498	107.4	113.4	166.5	210.2	275.9	333.3	317.2	245.6	174.3	77.2	87.1	2117.9	609.2
	f	0.17	0.35	0.31	0.39	0.46	0.60	0.71	0.73	0.58	0.57	0.27	0.31		
1989	D	1331	1448	1858	221.8	279.9	221.9	316.2	298.1	167.9	204.3	114.0	110.2	2345.9	892.2
	f	0.46	0.49	0.50	0.55	0.50	0.48	0.57	0.69	0.45	0.60	0.39	0.40		
1990	D	823	141.2	244.6	197.1	249.4	307.8	343.4	329.5	216.6	213.2	190.0	27.0	1611.7	998.9
	f	0.29	0.48	0.46	0.49	0.54	0.67	0.73	0.76	0.58	0.62	0.36	0.10		
1991	D	1283	62.5	135.4	157.2	207.3	260.3	278.4	274.7	263.0	158.7	48.0	48.6	2222.4	581.5
	f	0.44	0.21	0.37	0.39	0.45	0.56	0.59	0.64	0.70	0.46	0.17	0.18		
1992	D	1005	173.0	161.2	197.9	264.3	223.3	279.1	300.7	269.0					
	f	0.35	0.57	0.44	0.44	0.58	0.48	0.60	0.81	0.30					
1993	D	1449	133.2	142.3	223.2	200.1	270.0	261.9	311.1	303.0	162.0	55.1	110.2	2415.0	140.7
	f	0.50	0.52	0.38	0.53	0.34	0.64	0.77	0.72	0.80	0.68	0.19	0.43		
1994	D	96.7	111.7	200.8	204.3	285.9	292.2	238.1	320.0	197.9	144.7	132.6	89.8	2456.8	776.2
	f	0.33	0.38	0.54	0.51	0.63	0.64	0.59	0.73	0.80	0.42	0.46	0.32		
Media		91.7	110.3	135.1	195.8	243.4	263.9	310.6	313.4	250.6	169.5	105.9	77.7	2287.9	110.2

* durata de strălucire a soarelui efectivă (ore)
 ** fracția de însolație (raportul dintre durata efectivă și durata posibilă)

Numărul anual și lunar de zile cu soare în perioada 1986-1994
 stația meteo. Băneasa-Gr. Tabel nr. 20

Anul	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Anul
1986	11	6	16	25	31	26	29	31	28	22	12	18	255
1987	12	16	20	22	25	29	29	30	28	25	16	14	266
1988	13	22	21	24	28	29	31	31	29	26	15	19	288
1989	22	22	26	26	29	29	31	30	25	29	21	23	313
1990	20	21	31	27	28	29	31	30	28	28	24	8	305
1991	22	13	19	26	26	29	28	31	30	26	14	15	279
1992	21	27	27	25	29	29	30	31	30				
1993	25	25	21	28	30	29	30	31	29	25	12	23	308
1994	21	16	27	29	30	28	28	30	30	21	27	18	305
Media	18.5	18.7	23.1	25.8	28.4	28.6	29.7	30.6	28.6	25.3	17.6	17.3	289.9

(Maximum Wind Speed in m/sec)

Viteza maximă (m/s) în perioada 1986-1994

Stația meteo. Băneasa-Giurgiu

Tabel nr. 44

Anul	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Anual
1986	20/SV	20/NE	7/E	17/SV	10/NE	8/N	10/V	16/NE	10/NE	8/V	10/NE	20/NE	20-01;20-12
1987	17/NE	11/12	17/E	14/NE	20/V	14/NV	20/N	14/NV	12/NV	12/E	12/NE	10/V	20-05;07
1988	12/NE	14/NE	14/NV	12/E	14/SE	17/NV	14/E	17/N	14/V	14/NV	14/V	17/NV	17-06;08
1989	9/V	20/SV	20/V	20/V	20/V	12/V	8/NE	20/NV	14/E	12/NE	9/V	11/E	20-03;04,05
1990	9/E	20/NV	14/NV	9/V	12/E	17/V	17/V	8/SV	8/V	8/E	9/V	17/E	20-02
1991	14/E	17/NE	10/NE	12/NV	17/V	9/NV	17/V	12/N	10/NV	14/NE	10/E	17/NE	17-02,05,12
1992	20/NE	12/V	20/NE	20/V	17/NE	17/NV	9/E	9/E	20/V				20-01,03
1993	20/NE	14/V	17/NE	14/V	14/NE	12/V	17/NV	14/V	17/V	14/E	24/NE	20/NE	24-11
1994	14/V	14/E	20/NV	24/V	17/V	17/NE	24/V	17/NV	24/NV	14/E	20/NE	17/V	24-03

Frecvența medie anuală (%) a direcțiilor principale al vântului în perioada 1986-1994
Stația meteo. Băneasa-Gr.

Tabel nr. 39

Anul	N	NE	E	SE	S	(SW) SV	(W) V	(NW) NV	C	No wind
1986	9.0	21.3	14.9	4.1	1.7	4.0	8.3	10.8	26.5	
1987	8.1	17.6	12.1	6.9	3.3	4.7	14.6	12.1	28.2	
1988	4.3	16.0	15.8	5.4	1.7	5.5	13.9	19.2	25.8	
1989	4.6	11.6	15.5	7.0	3.4	4.0	23.7	7.0	30.4	
1990	5.4	6.2	17.4	2.7	3.6	2.2	24.8	6.1	37.4	
1991	10.3	12.0	12.0	1.2	2.2	2.3	18.7	12.0	28.2	
1992	7.3	14.0	13.0	1.6	3.7	1.7	17.3	7.9	34.8	
1993	6.0	16.4	14.0	1.0	1.9	1.7	19.0	6.1	37.2	
1994	1.9	9.5	17.0	1.2	1.9	2.0	17.0	8.0	45.2	
(Average) Media	6.3	13.8	15.7	3.5	2.6	5.1	17.5	9.9	32.6	

(Annual Frequency & Directions of Wind Blowing %)

(Cont.)

Tabel nr. 38

Nowind

Anul	Luna	N			NE			E			SE			S			SV			V			NV			Cabr					
		n	%	S	n	%	S	n	%	S	n	%	S	n	%	S	n	%	S	n	%	S	n	%	S						
1991	I	1	08	40	7	56	97	23	125	76																27					
	II	12	07	26	6	54	90	23	205	20	1	09	40														32				
	III	6	48	32	43	369	232	21	69	63	1	08	40															37			
	IV	4	33	53	19	118	58	25	209	57	3	25	53	4	33	60	3	25	53	11	92	50	14	47	42	16		39			
	V	6	48	40	18	143	72	13	125	61																		30			
	VI	8	67	50	13	118	48	21	125	51	1	08	40	2	12	65	2	33	43	15	125	42	20	67	54	16		36			
	VII	23	114	125	9	73	49	7	56	56	2	16	35	4	32	35	2	16	50	11	59	53	9	23	69	14		34			
	VIII	30	162	40	14	113	47	8	65	53	1	08	40																26		
	IX	16	116	44	13	125	47	4	67	39																			34		
	X	12	72	33	5	40	72	11	82	46																			32		
	XI	9	75	43	6	59	68	13	128	61																			33		
	XII	8	65	48	7	56	91	8	65	65																			50		
1992	I				12	112	25	4	32	80																	25				
	II	10	86	83	2	12	60	11	02	58																		60			
	III	6	48	57	9	73	93	7	43	51																			30		
	IV	4	29	50	18	150	55	19	158	75																			40		
	V	3	32	53	12	101	67	28	146	61	1	08	40	2	16	60	1	08	40	18	145	57	3	32	63	17		37			
	VI	18	150	61	21	125	67	11	92	64	2	17	30	10	43	40	4	33	58	19	132	32	19	25	58	12		30			
	VII	22	118	53	16	129	58	15	121	79	4	32	50	6	58	39	6	48	42	4	32	50	11	49	65	11		39			
	VIII	8	48	48	30	148	63	21	169	59	1	08	40	2	16	40	2	16	53	2	16	30	1	08	40				39		
	IX	2	17	45	8	67	46	35	190	56																				30	
	X																														
	XI																														
	XII																														
1993	I				12	112	25	6	48	57	1	08	40															31			
	II	6	34	42	10	89	65	8	71	46																			30		
	III	9	23	47	16	129	62	20	122	22																				36	
	IV	11	21	50	4	33	53	34	128	54	1	08	40	2	17	65														41	
	V	16	129	57	35	314	60	10	81	47	1	08	40	1	08	40	1	08	40	21	169	66	4	32	18	10			40		
	VI	10	83	37	6	50	53	14	116	46	2	17	55	5	43	48	1	08	40	13	132	59	6	50	18	11			53		
	VII	10	81	55	8	62	55	32	189	52																				41	
	VIII	6	48	63	32	157	61	25	142	54	1	08	40	4	16	60	1	08	40	5	40	38	2	16	40	10			50		
	IX	3	25	40				18	140	63																				67	
	X	3	23	40	21	143	63	22	179	63																				67	
	XI	3	25	67	59	44	86	9	155	63																				30	
	XII	1	02	50	8	65	40	6	48	40																				38	
1994	I	3	24	53	1	56	59	14	113	59																			36		
	II	1	02	40	13	120	61	20	159	23																				35	
	III	4	32	63	7	76	59	16	129	51																				42	
	IV	3	25	73	9	75	61	12	133	62	2	17	85	1	08	40	2	16	60	6	48	60	5	20	52	11	89	11	39		
	V				9	73	67	16	128	48	2	16	60	6	48	60	5	20	52	21	140	65	11	89	57	16			39		
	VI	3	17	50	2	15	62	24	120	62	1	08	40	1	08	40	3	25	49	23	132	53	16	110	57	14			44		
	VII	4	32	60	22	181	50	15	111	53																				20	
	VIII	1	18	40	14	113	52	5	40	54																					33
	IX	2	17	40	12	112	61	26	177	57	1	08	40	2	12	50	2	12	40	4	33	68	8	67	88	10			38		
	X	1	02	60	10	81	67	26	110	79																					48
	XI	2	16	35	10	108	85	15	129	58																					38
	XII	3	15	67	1	08	40	14	153	59																					63

(Frequency of Wind Speed (No. of Case))
 Frecvența vitezei vântului (număr de cazuri)
 in perioada 1986 - 1994 - stația meteo. Băncăuș-Gr.

Tabel nr. 10

Anul	(Month) Luna	0-1 m/s	2-5 m/s	6-10 m/s	11-15 m/s	16-20 m/s	21-24 m/s
1986	I	10	12	36	5	1	
	II	14	51	37	2	8	
	III	37	75	12			
	IV	15	53	40	3	4	
	V	36	71	17			
	VI	44	69	2			
	VII	24	87	13			
	VIII	49	61	13	1		
	IX	62	51	7			
	X	33	61	10			
	XI	45	69	6			
	XII	29	62	24	8	1	
1987	I	43	32	43	8	3	
	II	43	53	8	6		
	III	43	47	21	5	3	
	IV	23	46	31	20		
	V	24	63	31	6		
	VI	45	34	17	4		
	VII	61	50	11	1	1	
	VIII	39	61	21	3		
	IX	32	53	29	3		
	X	27	62	32	3		
	XI	29	76	14	1		
	XII	30	76	13			
1988	I	24	74	22	4		
	II	33	44	39	4		
	III	31	46	42	5		
	IV	34	46	39	1		
	V	26	62	33	3		
	VI	19	71	26	3	1	
	VII	16	91	14	3		
	VIII	29	64	21	9	1	
	IX	74	33	8	5		
	X	43	46	25	5		
	XI	23	53	33	6		
	XII	16	60	41	5	2	
1989	I	47	37	20			
	II	29	59	17	6	1	
	III	35	46	42		1	
	IV	12	50	32	3	3	
	V	23	63	30	6	2	
	VI	34	45	39	2		
	VII	39	58	27			
	VIII	32	43	27		2	
	IX	42	46	29	3		
	X	61	42	13	3		
	XI	36	54	30			
	XII	37	45	36	4	2	
1990	I	36	67	21			
	II	21	64	25		2	
	III	37	38	45	4		
	IV	38	47	35			
	V	30	69	24	1		
	VI	30	42	22	1	5	
	VII	66	39	13		1	
	VIII	58	33	28			
	IX	48	50	22			
	X	53	47	24			
	XI	87	27	6			
	XII	25	70	20	5	4	

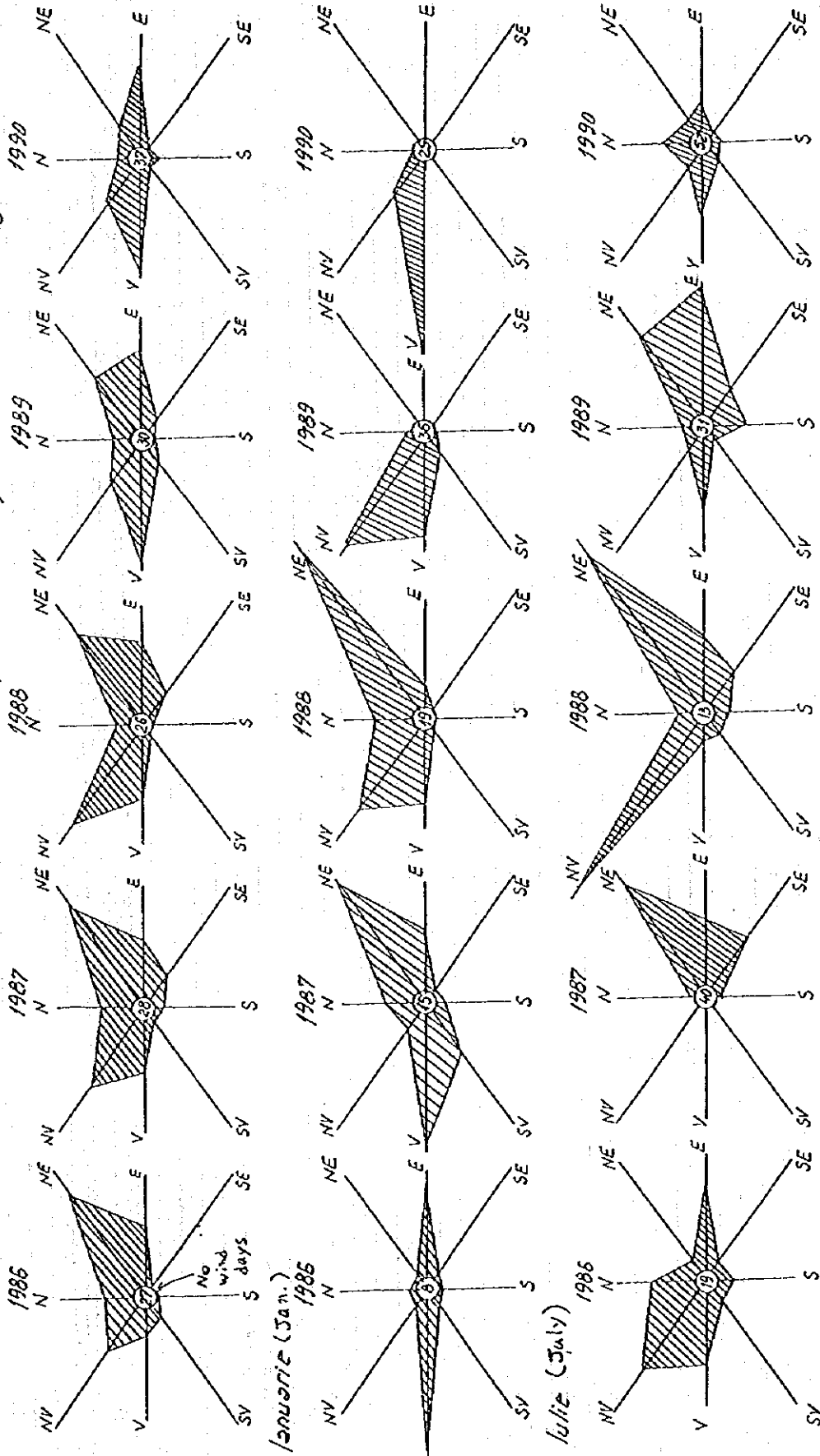
(Cont.)

Tabel nr. 40 (continuare)

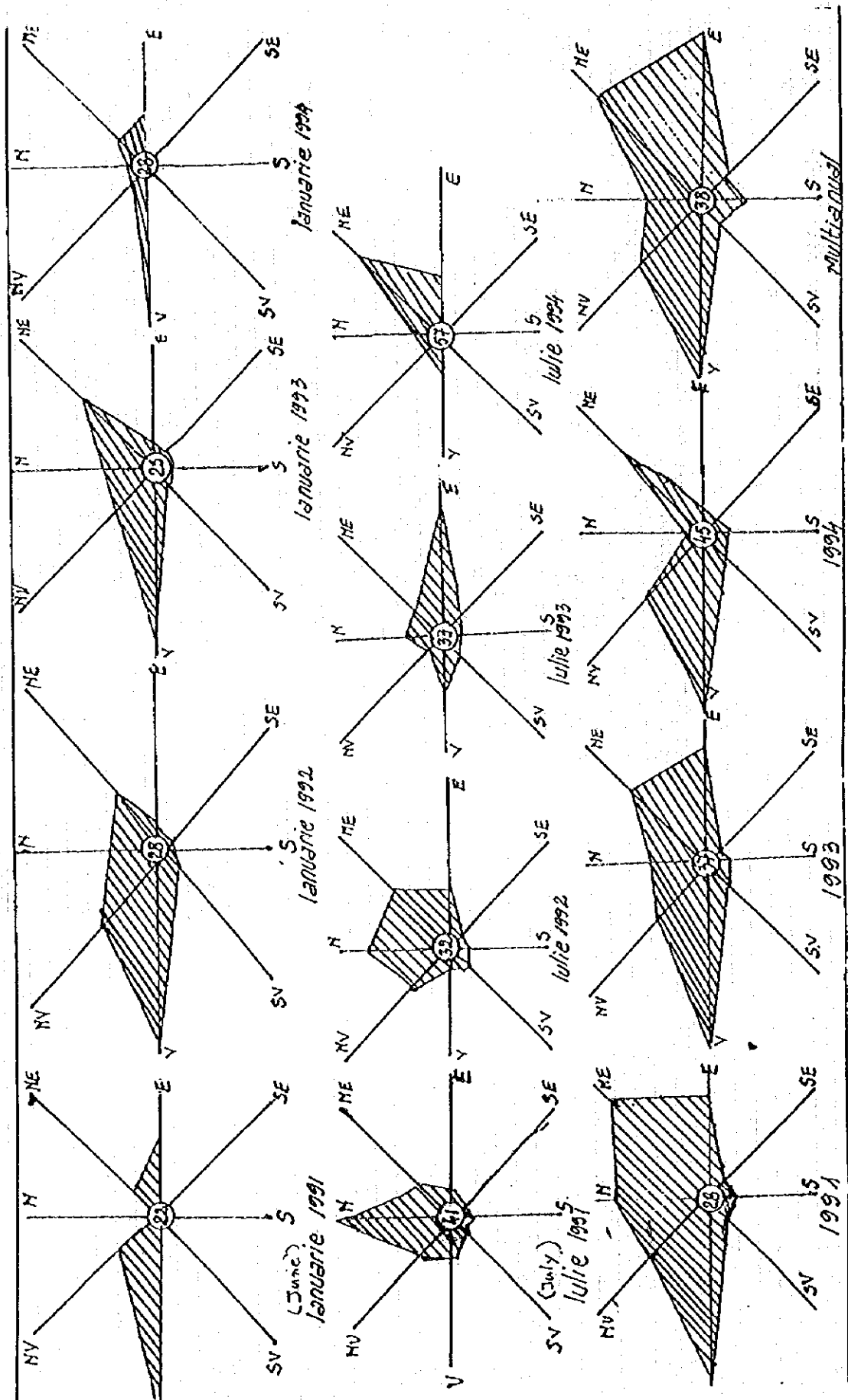
Anul	Luna	0-1 m/s	2-5 m/s	6-10 m/s	11-15 m/s	16-20 m/s	21-24 m/s
1991	I	27	55	33	9		
	II	36	38	21	16	1	
	III	35	25	60			
	IV	37	38	42			
	V	20	40	57	6		
	VI	36	51	33			
	VII	51	51	22			
	VIII	25	67	23	1		
	IX	36	55	29			
	X	54	33	37			
	XI	63	28	29			
	XII	30	30	42			2
Suma	474	513	437	31	3		
1992	I	35	42	34	10	3	
	II	60	20	33	3		
	III	50	18	53		3	
	IV	40	26	60	3	1	
	V	27	39	54	4		
	VI	20	44	53	2	1	
	VII	40	45	39			
	VIII	57	39	26			
	IX	50	31	32	2	5	
	X						
	XI						
	XII						
Suma	381	304	374	27	13		
1993	I	31	41	35	8	2	
	II	39	36	35	2		
	III	36	27	41	7	3	
	IV	41	15	42	2		
	V	40	32	40	5		
	VI	33	40	25	2		
	VII	41	43	37	1	2	
	VIII	50	28	46			
	IX	62	13	36	2		
	X	61	28	31	4		
	XI	39	27	43	2	2	
	XII	48	26	43	4	3	
Suma	548	323	434	37	26		
1994	I	56	27	40	1		
	II	25	33	43	11		
	III	42	27	42	1	5	
	IV	43	31	34	4	2	
	V	54	34	33	3		
	VI	44	41	33	2		
	VII	40	30	24			
	VIII	73	26	25			
	IX	38	22	39		1	
	X	68	19	33	4		
	XI	48	34	33	2	3	
	XII	63	27	30	2	2	
Suma	637	351	400	30	13		

(Graphical Representation of Direction of Wind Blow)

Viteza medie a vantului, la statiile meteorologice Băneasa - Giurgiu - 1986-1994



Graphic nr. 12



(Direction & Speed on Wind Blow by Monthly)

Directia și viteza lunară a vântului în perioada
1986 - 1991 - stația meo. Băncăsa-Gr.

Tabel nr. 88

n = numărul de zile în care a吹at vântul în direcția respectivă
 s = viteză medie lunară în direcția respectivă

Anul	(Month) Lună	N		NE		E		SE		S		SV		V		NV		Calm					
		n	s	n	s	n	s	n	s	n	s	n	s	n	s	n	s						
1986	I	1	10	62														10					
	II	6	4.5	45	80	7	4.6	8	6.0									14					
	III	6	4.1	26	3.9	27	3.2	1	4.0									36					
	IV	1	9.0	40	20	34	4.6	13	4.5	2	9.5	2	8.9	1	6.9	7	6.9	12					
	V	9	3.0	16	3.7	2.9	4.9	5	4.4	3	3.0	1	4	1	3.0	4	3.3	33					
	VI	19	3.7	8	3.6	2.4	3.5	7	2.3	2	3.5			2	5.2	13	3.2	44					
	VII	14	2.4	10	3.9	2.6	2.1	4	2.8	4	1.8	6	3.7	20	3.0	19	2.9	23					
	VIII	23	3.1	12	4.1	1.5	3.5	2	3.0	3	3.0			7	3.6	18	4.2	44					
	IX	17	2.9	26	5.0	8	3.5	2	3.0	3	3.3	7	3.1		10	3.5	61						
	X	10	2.9	1.7	3.1	1.7	3.1	2	7.0	1	4.0	2	4.5	3	3.0	13	3.3	20					
	XI	12	3.0	1.9	4.4	1.0	3.4				1	4.0	3	4.0	9	2.2	20	3.3	41				
	XII	11	3.2		3.4	4	3.8						10	4.2	21	7.2	31	5.8	28				
1987	I	7	2.0	26	7.6	17	2.9	2	3.5					11	2.7	37	6.9	6	4.8	18			
	II	4	2.0	26	5.6	13	4.3	3	2.0					5	3.0	14	3.1	6	3.2	41			
	III	2	2.5	41	5.3	21	6.6											19	3.5	63			
	IV	1	2.0	34	7.0	16	6.1	8	9.8	2	10.0	3	9.7	8	3.6	25	5.7	23					
	V	26	3.9	17	2.5	9	5.1	3	6.0	3	2.3	9	4.0	2.5	6.4	8	3.0	24					
	VI	8	4.3	14	3.0	6	3.0	4	3.8	3	2.7	4	3.0	7.4	4.8	2.2	5.5	1.5					
	VII	6	5.3	21	3.9	1.5	3.2	6	4.8	8	3.8							2	4.0	61			
	VIII	15	3.6	1.8	3.9	1.6	3.8								5	6.8	2.6	5.2	3.9				
	IX	2	4.0	21	4.7	21	4.1	1.9	3.4	7	2.4	2	4.0	7	4.7	9	5.8	3.2					
	X	27	3.4	1.4	4.9	1.4	6.9	2.0	6.5	3	2.7												
	XI	13	3.9	7	7.0	3	5.0	2	3.0	1	2.0				1.9	3.2	4.1	2.7	2.9				
	XII	3	7.3	1.3	3.0	2.6	3.8								4.4	4.2	3	3.6	3.0				
1988	I	10	3.0	4.0	2.4	8	4.5						2	4.5	2.0	3.4	2.0	2.7	2.4				
	II	4	4.8	21	2.9	1.6	6.3	8	6.6	2	5.5				2	5.5	3.0	5.0	3.3				
	III	4	4.0	2.8	5.1	3	8.3			1	8.0	7	4.3	1.2	6.6	1.2	6.6	3.1					
	IV	4	4.3	1.4	4.1	2.5	6.0	4	5.3	3	4.8				1.1	6.6	2.8	4.4	3.4				
	V	2	3.0	2.3	4.5	6	3.3	2.0	6.6			1.4	5.7	1.6	2.9	1.7	3.1	2.6					
	VI					2.2	3.4	9	2.9							2.3	5.0	4.7	5.0	1.9			
	VII	3	3.7	3.5	2.9	1.3	2.0	1.0	4.4						4	7.8	3.8	3.2	1.6				
	VIII	2	4.5	4	6.3	3.3	3.6	4	2.3	2	4.0				1.5	6.6	1.0	7.4	2.9				
	IX	12	3.3	6	4.3	5	4.0	3	4.0	2	4.0	4	6.0		8	7.8	6	4.0	7.4				
	X	6	3.2	2.4	4.3	3.0	6.0	2	5.0	2	4.0				4	2.5	8	7.3	1.8				
	XI					3.4	6.3	1	4.0						4.1	4.9	1.6	4.1	2.8				
	XII	6	5.3	2.1	5.3	6	6.3	5	5.6						4.7	3.7	2.5	6.3	1.4				
1989	I			4	5.0	2	4.0	1	6.0					7	3.9	3.7	3.6	2.8	4.0	4.5			
	II			1.3	4.2	3	3.0			2	12.0	7	9.1	4.3	4.1	1.9	4.5	2.9					
	III	1	6.5	2.4	5.1	2.8	2.5								2.3	4.5	5	4.2	3.5				
	IV	7	2.7	2.3	6.0	3.1	6.3	1.0	4.1	5	3.6	2	4.5	1.6	8.8	1.4	5.4	1.2					
	V	1	4.0	3.1	4.6	3	4.7	1.8	6.3	1	4.0	1.3	3.3	2.4	6.5	1.0	4.0	2.3					
	VI	7	4.3	1.2	4.6	1.5	5.8	1.5	4.9	1	4.0	7	4.0	3.0	5.5	1	6.0	3.4					
	VII	2	3.0	1.9	4.7	3.3	4.0								1.0	3.1	1	5.0	1.8	2.0	3.9		
	VIII	4	6.0	5	3.6	2.6	4.1	3	3.3	3	5.0	3	4.3	2.0	5.6	8	8.6	3.2					
	IX	9	3.8	1.0	4.0	3.2	4.8				4	3.3	2	3.5	1.3	6.1	3	8.1	4.2				
	X	4	4.3	2	7.0	1.0	2.2				7	3.3	4	3.3	3.3	4.2	3	8.7	6.1				
	XI	12	3.6	6	3.3	2.5	4.2	4	3.5						3.2	4.5	5	6.2	3.6				
	XII					2.1	8.3							3	2.7	6.3	4.6			3.9			
1990	I	1	2.0	2	5.0	4	4.8																
	II			1.7	3.7	1.5	3.6							1	4.0	5.0	5.0	3	5.6	2.1			
	III					3.3	6.1	1	4.0					1	7.0	4.3	5.3	9	5.6	3.7			
	IV	1	4.0	7	3.0	3.3	2.7	3	3.3	3	2.7	1	6.0	1.9	5.6	1.5	4.5	3.8					
	V	1.4	2.7	1.6	6.1	2.1	4.4	8	5.3	1.7	3.2	2	3.6	1.0	3.4	3	4.0	3.0					
	VI	1.9	4.4	5	5.2	7	3.7								1	4.0	5	3.2	2.5	6.2	10	5.3	5.0
	VII	1.0	4.7	9	5.3	1.2	3.7	1	2.0						2	4.0	1.7	5.8	7	5.0	6.5		
	VIII	5	3.4	3	4.0	3.8	3.2								8	3.9	4	5.3	6	4.8	2	2.0	2.8
	IX	6	2.7			1.1	3.3								3	3.3		4.9	4.2	3	7.3	4.8	
	X	1	4.0	8	5.3	3.5	4.0								4	2.5	4	7.0	2.8	1.3	1.9	4.8	5.3
	XI	1	4.0	1	2.0	3	3.3								4	4.5	1	4.0	4.3	3.5	5	3.2	8.7
	XII	1.0	4.0	1	2.0	3	3.3								4	4.5	1	4.0	4.3	3.5	5	3.2	8.7

Tabel nr. 88

Anul	Luna	N			NE			E			SE			S			SV			V			NV			Calm					
		n	%	S	n	%	S	n	%	S	n	%	S	n	%	S	n	%	S	n	%	S	n	%	S						
1991	I	1	08	40	7	56	37	23	128	76																27					
	II	12	07	86	6	34	70	23	25	70	1	09	40														32				
	III	6	18	32	45	34	23	21	69	63	1	08	40															39			
	IV	4	39	53	19	18	58	25	20	57	3	20	53															37			
	V	6	18	45	18	18	72	13	103	61																		30			
	VI	8	17	30	13	18	48	21	125	51	1	08	40																36		
	VII	29	14	12	9	73	69	7	76	56	2	16	55																34		
	VIII	30	14	14	14	13	47	8	65	53	1	08	40																38		
	IX	16	16	44	18	15	47	8	62	49																			34		
	X	12	17	33	5	40	72	11	83	46																			34		
	XI	9	15	43	6	50	68	13	108	61																			63		
	XII	8	15	48	7	56	91	8	60	65																			50		
1992	I				12	12	25	4	32	80																	35				
	II	10	16	83	2	12	60	11	105	58																		60			
	III	6	18	57	9	73	93	7	73	57																			60		
	IV	3	25	50	18	15	55	19	138	75																			47		
	V	4	32	33	39	30	61	28	126	61	1	08	40																	20	
	VI	18	15	57	21	125	67	11	22	64	2	17	40																	40	
	VII	22	18	53	16	120	58	11	11	49	4	32	50																	69	
	VIII	6	18	48	30	18	47	21	83	29	1	08	40																	50	
	IX	2	17	45	8	59	46	35	70	56																				50	
	X																														
	XI																														
	XII																														
1993	I				17	112	79	16	48	57	1	08	40															31			
	II	6	14	42	10	89	65	8	71	46																			32		
	III	9	23	47	16	119	62	20	123	52																				35	
	IV	11	21	50	4	33	53	34	183	64	1	08	40																	41	
	V	16	19	57	35	314	60	10	81	47	1	08	40																	40	
	VI	10	13	37	8	50	53	14	116	46	2	17	55																	53	
	VII	10	11	55	8	65	55	32	141	52																				41	
	VIII	6	18	63	32	45	51	25	104	54	1	08	40																	42	
	IX	3	25	40				18	130	63																				62	
	X	3	23	40	21	169	63	28	119	65																				67	
	XI	3	25	47	59	194	62	9	151	57																				30	
	XII	1	18	30	85	65	69	6	48	80																				38	
1994	I	3	24	53	7	56	59	14	113	59																			36		
	II	1	09	40	13	120	61	30	159	43																			35		
	III	4	32	63	7	26	59	16	129	51																				42	
	IV	3	25	73	9	75	61	28	133	62	2	17	45																	42	
	V				9	73	67	16	128	48	2	16	60																		34
	VI	2	17	50	9	75	62	24	120	62	1	08	40																		46
	VII	4	32	40	22	117	50	15	111	53																					40
	VIII	1	18	40	14	113	52	5	40	54																					73
	IX	2	17	40	12	112	61	26	117	57	1	08	40																		50
	X	1	08	60	10	81	57	26	110	79																					48
	XI	2	16	55	10	108	85	15	118	59																					48
	XII	3	25	67	1	08	40	19	153	59																					63