トルコ共和国

全国小規模灌漑農村開発事業計画

プロジェクトファインディング調査報告書

平成 14 年 3 月

社団法人　海外農業開発コンサルタンツ協会 (ADCA)

まえがき

トルコ共和国はアジアの最西端に位置し、国土面積は約 78 万ｋ㎡で日本の約 2 倍の国土面積を持つ。人口は 6,200 万人であるが、人口増加率が高く食糧生産の向上が緊急の課題となっている。

このような状況に鑑み、1995 年 10 月、我が国政府に対し、同国政府により全国レベルでの小規模灌漑及び農村開発に係る計画を策定に係る技術協力が要請された。

これを受けて国際協力事業団（JICA）は 1996 年 12 月から 1998 年 1 月にわたり、トルコ国村落総局（GDRS）との協力の下、小規模灌漑及び農村開発計画調査を実施した。

調査対象地域は、トルコ全 80 県のうち 56 県、総受益面積は約 17 万 ha である。小規模灌漑及び農村開発部門に係るマスタープランを作成した後、同マスタープラン中の優先事業に関してフィージビリティ調査が実施された。

本調査は、これらの結果を踏まえ、計画の事業化を推進すべく、現状把握及び情報収集を目的とするものである。

トルコ国は農業生産の向上、農作物の品質改善、農家の所得改善などを目指しており、このような協力は今後も必要であると考えられ、トルコ国の日本に対する期待は大きい。将来、本調査で検討された事業計画が日本政府の協力する案件として取り上げられ、我が国と当該国の技術・経済協力として推進されることを期待します。

平成 14 年 3 月

株式会社　三祐コンサルタンツ
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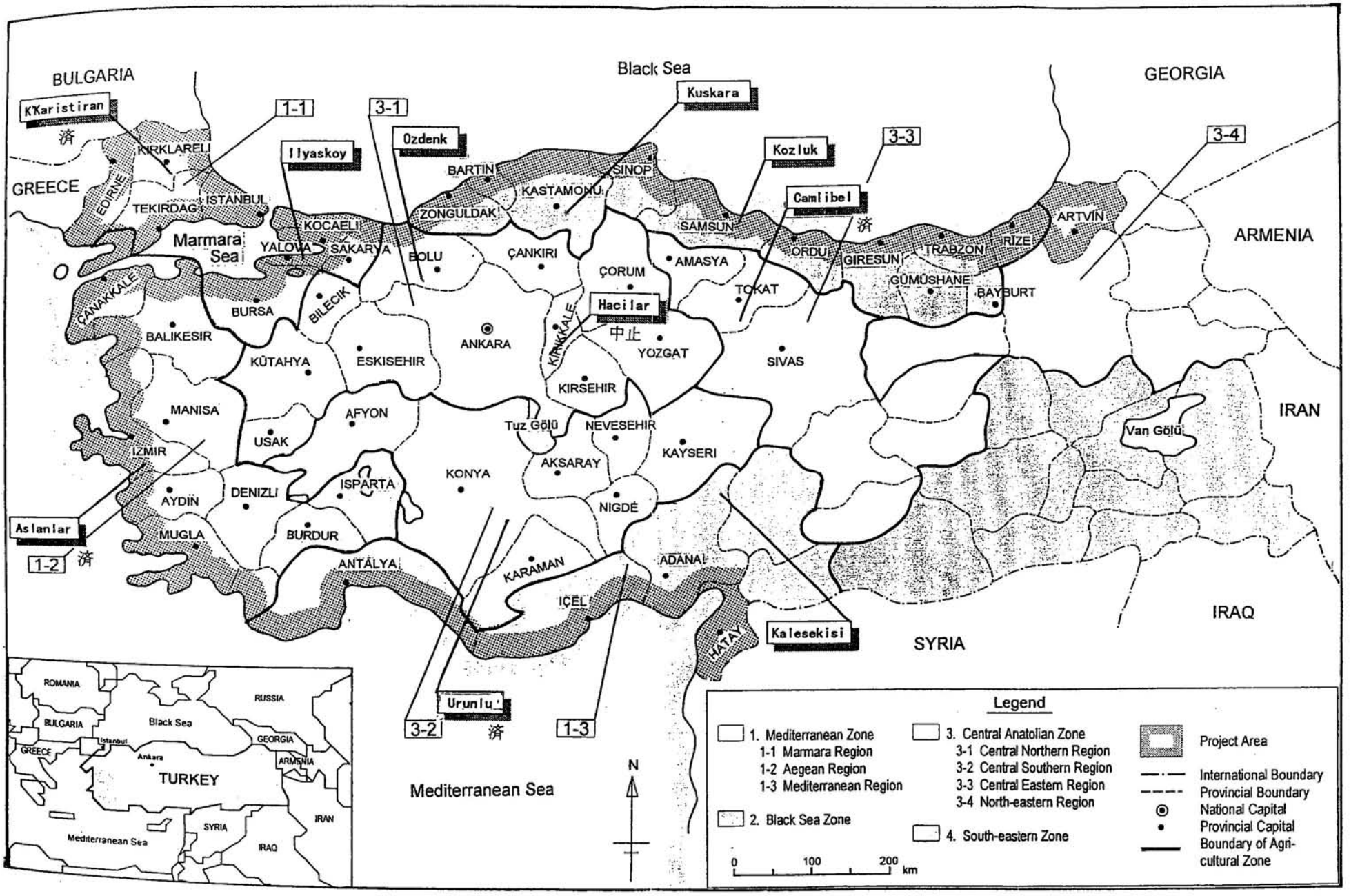
国名：トルコ共和国

案件名：全国小規模灌漑農村開発事業計画



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1. 背景

1.1 調査の背景

トルコ国は 1993～94 年に一時的に食糧自給を達成したが、現在は食糧の輸入超過に陥っている。近年は人口増加が著しく、干ばつなどの気候変動も発生しており、食糧自給を維持するためにはこれらに適切に対応して農業生産の増加、安定を図る必要がある。しかし、耕作地の拡大は限界に達しており、工業地、商業地へ転換した結果 1989 年をピークに毎年約 10 万 ha ずつ減少している。したがって、農業分野における生産性を拡大するためには、灌漑開発を通して単位収量を増加させることが必要である。一方、農村部では道路、上下水道など社会生活基盤の整備が遅れており、雇用機会も少ないことから都市部と農村部の地域格差が拡大してきている。

このような状況を鑑み、トルコ国政府の要請のもと、1996 年 12 月～1998 年 3 月に JICA の支援により「小規模灌漑及び農村開発計画調査」が実施された。本 M/P 調査ではまず既に事業実施候補となっている 1,418 のプロジェクトがロングリスト・インベントリー調査の対象として選定された。本インベントリー調査の結果では、灌漑事業地区が約 90%を占め、そのうち 2/3 が堰の建設、ついで地下水利用（15%）、貯水池建設（8%）となっている。この調査実施地区から受益面積、受益戸数、受益者の意欲、緊急性、設計および調査段階、実施の容易性を考慮して、更に 205 のプロジェクトがショートリストとして選定され、そのうち 10 地区を対象として F/S が実施された。

M/P 及び F/S の調査結果については 1998 年 3 月に調査報告書が提出されており、計画の早急な事業化が望まれている。しかしながら、トルコ国の GDP が借款水準を超え中堅国入りしたため、トルコは円借款の対象国からをはずれた。しかしながらその後トルコ国の再び経済状況が悪化したことから 2002 年 3 月現在では再び円借款対象国となっている。

1.2 対象地域の一般概況

(1) 気象

トルコは気象条件から、中央地域（アナトリア平原）、地中海地域、黒海地域、東アナトリア地域の 4 つに大別され、これらはさらにそれぞれ 5～7 の地域に細分される。調査対象地域は以下のの気候区分帯に属しており、その要約を下表に示す。

地域	年間降雨量 (mm)	平均気温(℃)	最低気温(℃)	最高気温(℃)	湿度(%)
Central	330~840	9~18	-35~-12	38-47	49-72
Mediterranean	390~1200	11~19	-28~-5	38-46	61-76
Black Sea	460~2300	10~15	-27~-7	38-41	70-77

(2) 行政区分、人口

調査対象地域は 56 県、253 郡から構成されている。調査対象地区の人口は 4 千 5 百万人、人口密度は 84 人／k ㎡である。人口増加率は 1950 年から 60 年の 2.85%をピークとして減少の傾向にある。1985～90 年の人口増加率は都市部 4.4%、農村部 0.60%である。総人口にしめる農村人口の割合は着実に低下しており、1985 年には都市人口の比率（53%）が農村人口（47%）を上回っている。アナトリア中央東地域では総人口の約 7.7%、黒海塩害地方では総人口の約 5.5%がマルマラ海地域、エーゲ海地域に移住している。

(3) 農業の現状

1) 土地利用及び作付体系

調査対象地域の農業土地利用面積は休閑地も含め約 1,900 万 ha である。その内訳は作物類 72.6%、牧草類 0.8%、野菜 3.2%、果樹 9.6%、休閑地 13.7%であり、近年は野菜、果樹、牧草類が増加している。灌漑面積は 1991 年統計で 275 万 ha、その内訳は一般作物類 189 万 ha、野菜 38 万 ha、果樹 48 万 ha、作付面積に対する灌漑面積の割合はそれぞれ 17.8%、79.6%、26.2%である。作付け体系は秋播き麦類の育成日数が長いため、1 年 2 年体系はほとんどの地域で困難となっている。温暖なエーゲ海や地中海沿岸地域においてはヒマワリなど収穫時期の早い夏作物のあと小麦を播種する体系が多く、中央アナトリアでは夏作にマメ類を入れ、収穫後に麦を播種し収穫したあとは休閑とする体系が多い。

2) 営農及び農業投入資材

調査対象地域の一農家平均耕作面積は 4.94ha である。耕作面積を規模別にみた場合、この平均に近い 5ha 未満の農家数が 69.3%を占めているものの、一方それら農家の耕作面積は全体の 27.6%に過ぎない。野菜・果樹を含む作付面積に対する化学肥料の施用量は窒素 52kg/ha、燐酸 22kg/ha 程度であり総じて少ない。これは半乾燥地域では施肥量だけを高めても高収量が期待できないためであると言える。農業における機械化は年を追って進んでいる。各種タイプのトラクターなどが増加し、小麦・大麦畑の耕耘及び収穫作業はほとんどが機械によって実施されている。

3) 単収及び生産量

作物の単収は小麦で 2~2.5ton/ha 程度であり、その他の作物も単収は一般に低い。また、ここ 20 年来の単収の動向は、トウモロコシ・ヒマワリ・ワタ・などを除いては伸びも小さい。野菜類は、露地では葉菜類・野菜類の生産が多く、ハウスではトマト・キュウリなどの果菜類が多い。近年、地中海沿岸やエーゲ海沿岸地域でハウス栽培が増加している。果樹は種類が多く、それぞれの地域の気象条件に応じ、ヘーゼルナッツなどの堅果類、サクランボ・桃などの核果類、リンゴ・梨などの仁果類・柑橘類・ブドウなどが栽植されている。

4) 農産物の流通、市場及び価格

農産物の流通機構は 2 種のタイプに大別される。その第一は政府が価格介入を行う小麦、

甜菜、綿花など特定作物の政府買い上げによる専売的な流通である。小麦その他の穀類は一般的には収穫後国営穀物公社支社（TMO）へ売却される。第二は民間の市場メカニズムを通ずる流通であり、地方農村の生産者直売的小規模流通と都市部の大規模需要及び輸出需要に対応する大規模流通業者を通ずる大口な商業的流通とがある。価格支持政策の適用される穀物、加工原料となる工芸作物については毎年度官報に公示される。

5) 主要作物の生産価額

一般に土地条件の良好な耕地では単収が上がるため投入に対する産出対応が良く、生産価額水準が高い。作物の収益率（粗収益率から生産費を引いた差額の粗収益に占める率）が高くても灌漑事業の増加収益が低い場合もあり、下表は現在の主要作物価額水準（単位：ha 当たり百万 TL）を示す。

作物名	小麦	大麦	ｱﾙﾌｧﾙﾌｧ	てんさい	ひまわり	わた	トマト
天水栽培下	44	21	-24	-	21	-	982
灌漑下	107	115	2	176	50	2	1,726
収益額	63	94	26	-	29	-	744

出典：1997 年 7 月時点庭先価格による、GDRS 事例調査に基づく推定値

6) 農家経済

農業 GNP は GNP 総額の 7 分の 1 を占めるが、農業依存人口は全人口の 35%を占めるため、農業依存人口 1 人当りの所得は全人口平均所得の 3 分の 1 に過ぎない。1996 年の推定国民 1 人当り GNP は 50 百万 TL、農家聞き取り調査 42 戸の平均年間所得は 91 百万 TL（4 人家族）であり、農村部の家計収入は全国平均の半分以下と見積もられる。

7) 農業支援組織

農業支援は、①農業試験研究機関による研究と、②技術普及及び指導の側面から行われている。①については、農業村落省に所属する機関と村落総局に所属する機関とがある。農業村落省に所属する試験研究機関は主に基礎的研究に、村落総局に所属する機関は中央の他に 10 の地域にあり、灌漑技術などの実用化研究に中心を置いて研究している。②は、農業村落省の農業生産・改良総局（GDDAP）の所管であり、県事務所・郡支所によって行われている。県事務所には、農業・畜産などの専門家が所属し指導にあたっている。

そのほか、農業振興のため各種クレジットも行われている。銀行や各種の基金を通して融資が行われ、作物生産、農業投資、家畜生産、農村工業、水産、畑地灌漑などの発展に貢献している。

上述のとおり、農業普及は農業省のみによって実施されており、GDRS は灌漑農業を含めて、一切の農業普及サービスに関する活動は行っていない。一方農業省は、灌漑事業を実施する立場にないため、実質的には灌漑農業普及サービスは、ほとんど実施されていないことになる。

(4) 灌漑・排水の現状

1) 概要

トルコ国においては、GDRS と DSI の 2 機関が灌漑に携わっている。GDRS の責務は、500l/s を超えない範囲での小規模灌漑開発、DSI によって開発された大規模灌漑地域の圃場整備、ならびに土壌保全、換地、排水、農地開拓、村落道、村落給水、農村電化等きわめて多岐にわたっている。また、法令 3203 を参照すると 500l/s を超える灌漑開発についても、DSI の承認を得て GDRS が実施可能である。

2) 水資源

水資源ポテンシャルに関しては、1995 年時点で 107.2km³ が確認されており、このうち表流水は 95km³（89%）、地下水は 12.2km³(11%)を占めている。1995 年までに公的機関（国家及び地方公共団体）によって開発された水資源量は 33.5km³ である。これは、技術的に開発可能な水資源量の 31%を占めているが、2000 年には 38%に達すると見積もられている。なお、これまで開発された水資源量のうち約 75%は農業開発に関連している。

3) 灌漑

トルコ国においては 25.9 百万 ha の農地が技術的に灌漑可能であり、このうち、経済的に灌漑可能と考えられるのは 8.5 百万 ha である。8.5 百万 ha のうち、7.9 百万 ha は表流水による灌漑、0.6 百万 ha は地下水による灌漑である。1995 年末時点における灌漑面積は、表流水によるもの 3.7 百万 ha（47%）、地下水によるもの 0.4 百万 ha(67%)であり、計 4.1 百万 ha は、経済的に灌漑可能な面積の 48%に達している。GRDS は過去、数多くの小規模灌漑事業を実施してきたが、これらは 1996 年 1 月時点で表流水関連 90 万 ha、計 115 万 ha に達している。すなわち GDRS は、過去において国家が開発した表流水灌漑の 33%、地下水灌漑の 74%に及ぶ面積を開発してきた。

4) 排水

1995 年末時点における GDRS 実施の排水事業に注目すると、GDRS はこれまで約 1,200 事業、面積にして 319,000ha を実施してきた。これら排水事業のほとんどは、湿地帯や排水不良地において開拓とともに実施されてきており、工種的には開水路がほとんどである。

5) 維持管理

GDRS によって建設された表流水灌漑施設は完成すると、その事業の申請者である Muhtar（村長）に移譲される。農民は、現在のところ表流水灌漑に関する限り、建設費に対する負担は一切ない（ただし圃場内施設除く）が、施設移管後の表流水灌漑施設の操作・維持管理は、受益者である農民自身が行うことになる。一方、地下水灌漑に関しては、GDRS によって建設された灌漑施設の初期投資に関する負担はないものの、DSI によって施工される井戸およびポンプ施設についてはその投資額の 25%を償還する義務がある。

(5) 農村社会

1) 農村の特徴

トルコ国の村落法によれば、人口 2,000 人以下の集落が村落と定められている。ショートリスト地区を含めた 305 ヶ村における農業生態別の村落調査によると、平均村落人口は 982 人である。農業生態別では、地中海地方（1,646 人/村）が多く、黒海地方（429 人/村）が少ない。一戸の平均家族数は 5 人である。村落における農業従事者の比率は、黒海地方、地中海地方が 95%を超え、マルマラ海地域が 85%である。全農家の 93.5%が、農畜複合農家である。平均所得が高いのは、マルマラ海地域で 303 百万 TL、低いのは黒海地域の 130 百万 TL で、2.3 倍開きがある。

農村電化、農村給水、教育、通信等はほぼ整備されているが、生活排水及び廃棄物処理に関連する施設の整備は比較的低い。

2) 農村開発にかかわる公的機関

農村開発には、以下の国家・地方機関がかかわっている。

- 農業村落省（MARA）
- 村落総局（GDRS）
- 公共事業・住宅省国家水利総局（Ministry of Public Works and Settlement DSI）
- 森林省
- 環境省

3) 農民組織

トルコ国の農民組織としては、農業会議所と農業協同組合があり、いずれも農村の生活向上とその活動を支えることを目的としている。

農業協同組合には農業開発協同組合、農業信用共同組合及び農業販売共同組合があり、農業開発共同組合は、村落開発協同組合、灌漑協同組合、水産協同組合に分かれる。

灌漑協同組合は灌漑施設の維持管理に関する業務を行っており、現在のところ灌漑農業の普及指導は行っていない。農業に関するあらゆる分野の普及、支援、指導は農業村落省の管軸となっているが、農業村落省は灌漑事業を実施しないため、普及指導も行っておらず、灌漑農業の普及、指導は国家的レベルで空白域となっている。

このような状況を鑑み、M/P においては GDRS 内に灌漑農業普及担当課の設置と灌漑協同組合の普及サービスへの参加することが提案されている。

4) ジェンダー

調査対象地区における就業人口にしめる女性の割合は、約 34%である。地域的な特徴は、黒海地域の女性の就業人口の割合がもっとも高く 45%、一方マルマラ海地域の女性の就業人口は 24%である。農村の女性は、調理、子供の世話、洗濯等の家事のほか、労働不足と

所得をえるため農作業に従事している。このように、農家経済及び日常生活における女性が果たしている役割を考慮すると、開発計画における女性の役割、参加を無視することはできない。

一般に農村部はイスラム教文化が主流であり、村落内に女性の組織（グループ）は現在存在しない。しかしながら、灌漑施設の維持管理については女性が行っている現状もあり、女性の組織への参画が組織の団結力を高め、施設を効率的に利用することにつながると考えられる。よって、施設の円滑な操作および運営維持管理にあたる維持管理組織への女性の参画は必須であると考える。

2. 上位計画

2.1 第8次国家開発5ヶ年計画

トルコ国においては1995年までの状況を評価分析の上、1996～2000年をカバーする第7次国家開発5ヶ年計画を実施された。当該国家開発計画は人的資源開発、民主化、工業化、技術開発に重点をおくとともに、税制、民生安定、農業開発、あるいは公共サービス、地方行政、社会基盤などの整備・拡充、新規導入についても言及していた。これらの重点事項は第8次国家5ヵ年計画（2001～2005年）においても引き続き主要事項とされている。

2.2 農業政策

国家開発計画の農業部門における主目標は、増加する人口に対応して食糧を確保し、農家所得の向上を図ることである。2000年においては農業部門のGDPの割合を全体の13～13.5%ならびに農業生産高割合を全体の10.7～11.2%とし、その間の年平均成長率を2.9～3.7%と設定している。

農業基盤開発部門の目標は持続的で周辺環境に負荷を与えない農業開発に必要な基盤を整備することであり、新規灌漑システムの開発及び圃場整備も行われている。また、新規投資に対する資金手当および施設の効率的な使用に寄与するための農民の資金面での負担についても方策を導入する計画である。

3. 計画概要

3.1 目的

本事業の目的は以下の通りである。

－作物の収量増加及び農家の生産性の向上

－収穫物の品質向上による農家の市場競争力の増強

－農家の収入増加

－上記の項目を通じて、農村地域の生活水準の向上、村落部人口の都市部への流出の抑制、開発の公平性の確立、食糧安全保障の確立を図る。

3.2 優先対象地域

上述マスタープラン調査 10 優先地区が事業対象と考えていた。しかしながら、本優先地域のうち、URUNLU 地区、CAMALIBEL 地区、ASLANLARK 地区、K.KARISTIRAN 地区の 4 地区は既にトルコ国政府によって施工済みであり、HACILAR 地区については事業取りやめとなっていることが判明した。よって今後優先事業としては、残り 5 地区にあわせ、追加事業を含んだパッケージを想定する。追加事業の選択にあたっては、ショート及びロングリスト調査で行った優先度付けに基づくが、かつ事業の規模そのものが平均事業面積より大きいものに限ることとする。

実施の有無	地区名	地域名	州名	県名	村名	受益面積	受益戸数
中止	Hacilar	Ankala	Kirikkale	Keski	Hacilar	200	500
済	Urunlu	Konya	Konya	Cumula Torbari	Urunlr	465	50
	Kalesekisi	Adana	Adana	Saimbeyli	Kalesekisi	210	250
済	Camlibel	Sivas	Tokat	Merkez	Camlibel	1,100	177
	Kozluk-Kusuka	Sumsun	Samsun	Terme	Kozluk	862	640
	Kuskara	Kastamonu	Kastamonu	Merkez	Kuskara	80	35
	Ozdenk	Eskisehir	Eskisehir	Alpuyenice	Ozdenk	172	75
済	Aslanlar	Izmir	Izmir	Torbali	Aslanlar	244	350
	Ilyaskoy	Bursa	Yalova	Ciftlikk	Ilyaskoy	137	120
済	K. Karistiran	Istanbul	Kirlareli	Luluburgaz	K.Karisti	120	84

3.3 計画内容

(1) 内容

主な事業内容は、ダム建設、堰の建設、ポンプ機材の設置、地下水開発、地力の回復、土壌保全である。また、全体を通して、水資源開発、灌漑システムの建設及び改良、地力回復、土壌保全、農業従事者の組織強化、普及サービスの強化を行う。

F/S 結果によって選定された 10 地区のうち、既に事業が実施されている 5 地区を除く 5 地区にインベントリー結果からいくつかの優先事業を追加したパッケージ事業計画とする。追加事業の選択にあたっては、ショート及びロングリスト事業に対して行った優先度付けに従うが、かつ事業の規模そのものが平均事業面積より大きいものに限ることとする。1 パッケージ事業の実施期間は 3 年、更なる追加事業を 2 年とし、計 5 年間を想定する。

(2) 事業費

F/S 時には算出した事業費としては、GDRS の管理能力を基に、60 百万 US ドルの外的資金導入を考えた場合、10 優先事業（＝1 パッケージ事業）は事業費 13.5 百万 US ドル程度、全工期 3 年を要するが、他の追加事業は残り 46.5 百万 US ドルを用いて 2 年目より順次実施に移されることを想定している。

3.4　現地調査で確認した事項

本調査においては、事業の効果を確認するために、既にトルコ国政府によって既に施工が実施された Urunlu 地区を視察した。Urunlu 地区は地下水利用による灌漑である。参考までに当 Urunlu 地区の事業概要は以下のとおりである。

［Urunlu 地区の事業］

本事業は 8 本の井戸からの地下水を用いて実面積 465ha（総面積 490ha）の灌漑を行うものである。事業内容は 8 本の井戸（既に DSI によって建設済み）、パイプライン、圃場内灌漑施設より構成される。灌漑システムは各 8 本の井戸ごとに独立させることとし、井戸よりパイプラインを経由して圃場給水栓までは GDRS、圃場内灌漑施設は受益者である農民の負担となる。

主要な工事量は次の通りである。

ポンプ置換およびゲート類設置：	8 式
パイプライン総延長：	17,290m
φ 175mm：	1,165m
φ 150mm：	1,910m
φ 125mm：	3,800m
φ 100mm：	9,050m
給水栓：	46 個

本灌漑施設は、現在農業協同組合によって運営・管理されている。組合のメンバーの協力関係もあり、現在のところ問題なく成果が得られていると見られる（現地写真集参照）。

3.5　効果

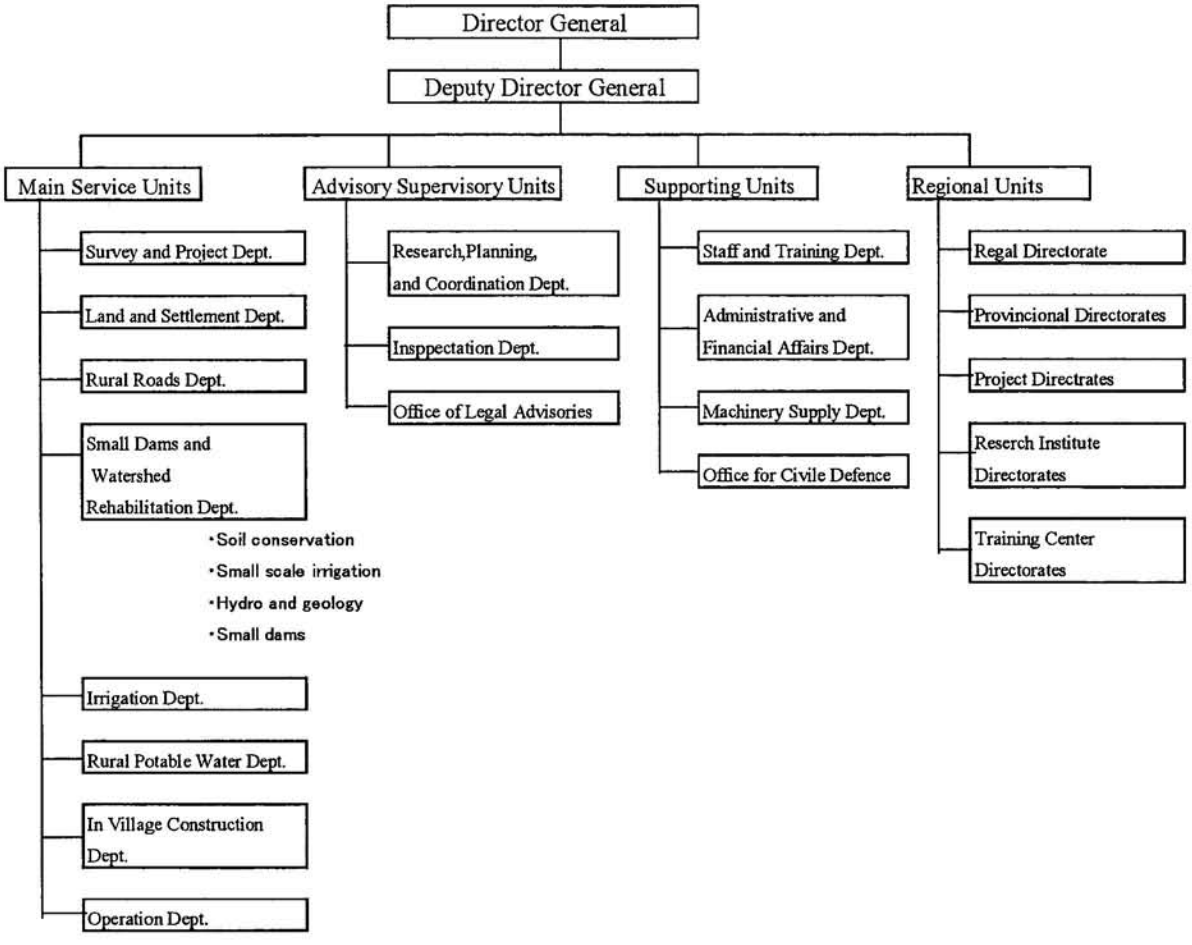
マスタープラン調査結果によれば、本事業が実現した場合、戸当たりの収益の増加は 1997 年価格で年間 107-280 百万 TL と概算されていることから、経済便益は高いといえる。

また本事業実施によって農業ポテンシャルが拡大すれば、農村部への人口の定着が見込まれる。

更に地区への灌漑施設の導入による営農方法の改善は、農産物の高収量と高品質を生み出し、従来営まれていた畜産経営と高度に複合化され、土地の持続的利用を可能とすることも期待できる。

3.6 実施機関

本事業の実施機関となる GDRS の組織図は以下に示すとおりである。行政組織とは別に GDRS は数県単位で全国に 22 の地方局を設置しており、調査対象地域には 13 の地方局が関連する。



4. 総合所見

トルコ国政府は小規模灌漑事業が当国の農業生産を増加させるのに有効な手段であると考えていることから、今後も灌漑事業を推進していく計画である。

調査団としても、本調査において Urunlu 地区の事業実施サイトの見学を通じ、その効果が確認されたことから、灌漑農業のポテンシャルは高いことを確認した。

本調査により、優先対象地域のうち、5 地区が既に事業実施済みであることが判明したが、それによりトルコ国の事業実施へ向けての意欲、及び実施能力も証明されていると言える。今後の小規模灌漑事業の推進のためにもトルコ国政府は円借款の供与を強く希望していることから、今後は当国政府が I/P（案）を修正し、事業化に向けて推進していく努力が必要であろう。

付属資料

付属資料

1．調査団員

洲浜　紘一　　(株) 三祐コンサルタンツ　海外事業本部取締役

2．調査日程

日順	月日	曜日	行程・作業内容	宿泊
1	03/14	木	ダマスカス発アンカラ着 日本大使館、JICAに挨拶、趣旨説明	アンカラ
2	03/15	金	首相布村落振興局表敬、打合せ	アンカラ
3	03/16	土	アンカラ発コンヤ着 地方村落振興局表敬、打合せ	コンヤ
4	03/17	日	Urunlu地区現地調査 コンヤ発アンカラ着	アンカラ
5	03/18	月	村落振興局調査報告 アンカラ発	機中泊
6	03/19	火	東京着	

3．面談者

(1)大使館

寺尾和彦：一等書記官

Kageyama Yoshihito：二等書記官（寺尾書記官の後任）

(2)JICA

稲葉泰：所長

木下勝義：専門家

(3)General Directorate of Rural Services(GDRS)

Hasan Balaban : The Head of the Watershed Rehabilitation and Small Dams Department

Kani Birgic : Director of Small Dams

Yurudanur Surmeri : Director of Small Irrigation

Sadi Kasapoglu : Small Irrigation

Sevki Unsaldi : Small Dams

Nevzat Erdogan : Small Irrigation

Ceral Yenginol : Director of Soil Conservation

Terfic Alkaranci : Small Irrigation

Halil Arli : Konya Regional Directorate, Assistant Director

4. 収集資料リスト

(1)Turkish Economy Statistics and Analysis October-December 2001

発行年月 : Oct.-Dec.2001

区分 : Original　State Institute of Statistics Prime Ministry Republic of Turkey

(2)The Summary of Agricultural Statistics 1981-2000

区分 : Original　State Institute of Statistics Prime Ministry Republic of Turkey

(3)地図一式

1/1700000、1/1000000、1/500000 : 各 1 部

５．先方機関提出簡易プロポーザル（案）

REPUBLIC OF TURKEY
GENERAL DIRECTORATE OF RURAL SERVICE (GDRS)

THE PROJECT ON NATIONAL SMALL-SCALE IRRIGATION AND RURAL DEVELOPMENT IN THE REPUBLIC OF TURKEY

IMPLEMENTATION PROGRAM

IMPLEMENTATION PROGRAM
CONTENTS

1. INTRODUCTION

In relation to this Implementation Program, a study titled "Study on National Small-Scale Irrigation and Rural Development Program in the Republic of Turkey" was carried out according to the following schedule by Japan International Cooperation Agency (JICA) on basis of the Scope of Work agreed upon between JICA and General Directorate of Rural Services (GDRS) on August 21, 1996:

- Phase I Master Plan Study; from December, 1996 to June, 1997
- Phase II Feasibility Study; from July, 1997 to March, 1998

The Study identified 1,418 number of projects that have been waiting for implementation, and those were summarized in a long list inventory. Among the projects by type of works, irrigation projects account for 90% of the total inventory with a share of weir construction of about two-thirds, followed by groundwater use (15%) and reservoir construction (8%). Upon completion of the long list inventory, 205 projects were further short-listed taking into consideration survey and design level, implementation readiness, implementation urgency, willingness of the beneficiary, etc.

The Study contributed to national small-scale irrigation and rural development in Turkey by producing a Master Plan that constituted of long- and short-listed projects and identified 10 representative projects, defined as "Core Projects", for which a feasibility study was undertaken. Taking into consideration the outcome of the feasibility study, a project implementation program was proposed, aiming at smooth implementation of not only the core projects but also ones, with high priority, listed on the short and long list inventories.

This implementation program is to facilitate the project implementation with a loan assistance provided by "Overseas Economic Cooperation Fund of Japan". The loan is to be a form of sector loan, and composed of 60 million US$ and disbursed over 5 years.

2. PROJECT BACKGROUND AND NECESSITY

Although Turkey accomplished food self-sufficiency in the past, at present the state food imports outweigh exports and necessity is arising to increase national food production to improve food balance. In order to meet needs of a growing population in recent years and unstable weather such as droughts, the Government plans with the Seventh Five-Year Plan to raise and stabilize the agricultural production.

Despite the fact that the share of agriculture in GDP fell from 17.5% in 1990 to 15.6% in 1995, its share in total civilian employment remains as high as 45%. This means a considerable portion of the population, inhabiting mostly in rural areas, continues to make a living on agriculture. The agriculture produces virtually all the commonly needed food crops, largely coming from rural areas, and also plays a key role in supplying raw materials to industry.

High attention is given to mitigating regional imbalances and improving income distribution among various sectors of society. While the urban population grows at an annual rate of 4.5 %, the share of rural population has been decreasing as a result of substantial migration to urban areas. It is estimated, based on the past population trend between rural and urban, that the

share of urban population will reach as high as 70 to 75% while rural population share decrease to 25 to 30% by the year of 2000, causing inequitable and imbalanced development in the country.

Therefore, the promotion of "small scale irrigation and rural development" is recognized to be a most effective instrument for improving rural standards currently affiliated with poverty, creating employment in the rural areas, and curbing rural to urban migration. This approach gives an additional advantage that could also mitigate urban problems caused by over-migration in search of elusive job opportunities.

Thus, rural development enhanced by small-scale irrigation is considered essential to raising and stabilizing the agricultural production, improving greater food self-sufficiency and food security, as well as eliminating regional disparities and achieving equitable national development.

3. PROJECT OBJECTIVES AND SCOPE OF WORKS

The Project objectives are to: 1) increase crop yields and farm productivity, 2) improve crop quality and farm competitiveness, 3) realize farm income increase, and thereby contributing to improving rural life standards, mitigating rural to urban migration, achieving equitable national development, and national food sufficiency and security.

Major works of the Project are dam construction, weir (barrage) construction, pumping facility installment, groundwater development, land consolidation and soil conservation. The scope of the works includes not only these major works planned for the core projects but also similar activities for a number of projects that have high priority among long-listed projects. As a whole, the works are to include water resource development, irrigation facilities construction and upgrading, land consolidation, soil conservation, and strengthening of farmers organization and extension services.

4. PROJECT DESCRIPTION

The Core Projects, feasibility-studied by JICA, are 10, among long-listed 1,418, representative projects, composed of two pump irrigation, three groundwater development, two dam construction (one with pump), one weir construction, one land consolidation, and one soil conservation projects. These Projects are briefly described below and the major facilities are summarized in Appendix-1:

4.1 Hacilar Project (Pump Project)

Hacilar town, in which the project site is included, is connected to the center of Kyrykkale province with 17 km asphalt road. The project site is accessible throughout the year. The project area's latitude is N39°40' and longitude is E33°30'. The topography of the project area can be defined as undulating. The major surface water source of the Hacilar town is Kapulukaya Dam which has been in operation since 1989.

The site, where the pumping station is to be installed, is just beside the reservoir of Kapulukaya Dam. The site situates at about 3 km upstream from the dam body, and the elevation is about

720m. The slope of the abutment is very steep, giving approximately 40% inclination. The highest elevation of the hill, at the foot of which the pumping station is to be constructed, is 857.21m.

The altitude of the project area is changing from 724 to 800m. The irrigable area is divided into six categories in terms of agricultural usage. The first class land is nearly flat with an inclination of up to 3 %, and the area is as small as 60 ha. The second class land is nearly flat with an inclination of 3 to 6%, occupying an area of about 510 ha, and the third class land has an inclination of 6 to 8 % on almost 550 ha.

The project is to irrigate 522 net ha (gross 552), and composed of boosting pumps, rising and distribution pipelines, regulating pond, and on-farm facilities sprinkler. The irrigation water is extracted from Kapulukaya Dam, boosted into a regulating pond, and then distributed to farms by gravity. Irrigation system, from the pumping station to hydrant, will be constructed by GDRS, while on-farm facilities will be born by the farmers themselves. The major project dimensions are as follows:

- Pump; ϕ 300 mm x 190 kw x 5 units
- Pumping discharge; 428 l/s
- Discharge tank; 520 cum (regulating pond)
- Boosting Pipeline; ϕ 550 mm, L = 2,250 m
- Distribution Pipeline; Main pipe: ϕ 550 - 350 mm, L = 6,535 m
  Lateral pipes: ϕ 300 - 100 mm, L = 31,434 m

4.2 Urunlu Project (Groundwater Project)

This project area, which is to be irrigated by groundwater, is 55 km away from the center of Konya province. Urunlu village is connected to Cumra administrative district center with 10 km conventional asphalt road. The highest altitude in the project area is 1,012m and the lowest is 1,005m. Latitude of the project area is N37°40' and the longitude is E32°50'. The land is mostly flat with an inclination changing gradually between 0 and 2%. Further, in deferent areas are observed sites that are slightly undulating with up to 1% inclination.

The typical lithology obtained in and around the project area is: surface soil with about 1m depth, clay soil of about 15m, marl of 45m, limestone of 120m depth, and clay-stone downward. The aquifer, which has been identified, is limestone. Taking into consideration the characteristics, the wells required for this project, were designed as shown below and already opened in 1996 & 1997:

- Well depth: 150 m
- Yield: 50 l/s
- Average static level: 10 m
- Average dynamic level: 20 m
- Manometric head: 30 m

The Urunlu project is to irrigate 465 net ha (gross 490) by means of groundwater which will be supplied from 8 wells. The project components include 8 wells, already opened by General

Directorate of State Hydraulic Works (DSI), pipeline, and on-farm facilities of sprinklers. The sprinkler type is to be hand-move, since the system is of low cost and has mostly been popular in Turkey. The irrigation system is to be of independent in a way that each well will have its own command area. Irrigation system, from the well to hydrant, will be constructed by GDRS, while on-farm facilities will be born by the farmers themselves.

4.3 Kalesekisi Project (Pump Project)

The project area is located, with a coordinate of N37°50' and E36°10', at 156 km from the center of Adana province. Though the road connecting Adana and Saimbeyli, where Kalesekisi villagers live, is asphalt paved, it takes more than three hours drive because the road is of mountainous one. The road between Saimbeyli and the irrigation area is unpaved with steep inclination and the irrigation area is located on a steep slope.

The irrigation source of this project is Kirkok River, from which water is taken by pumping. Although no flow measurement has been conducted, it is well-known that the river flows throughout the year and the runoff even during summer season could be more than hundreds litters per second. The water comes from Karst geological formation of a relatively stable flow throughout the year. The catchment area at the planed pumping station is 42.7 sqkm. According to the villagers, April usually has the maximum discharge with a depth from 0.7 to 1.0m.

The irrigation area is located on the eastern side slope of a valley stretching to the south. The elevation starts with about 800m and reaches as high as 1300m, giving fairly steep inclination. The irrigation area is broadly divided into two parts, both of which are separated by a ridge, and the parcels, to which the irrigation is introduced, are scattered in the areas.

This project is to irrigate 210 net ha (gross 233), stretching on the steep hill, by pumping. The project components are pumps, rising pipeline, regulating pond, distribution pipeline, and on-farm dripping facilities. To economize the operation cost and to reduce the project risk, the project implementation is to be divided into two phases, composed of 100 ha irrigation for phase I and another 110 ha for phase II. While the phase I is to irrigate the lower part with about 150m static head, the phase II if for the upper part between 150 to 250m in static head.

4.4 Camlibel Project (Land Consolidation Project)

The project site is located alongside the Fineze river in Çamlibel plain. The latitude of the project area is approximately N40°05' and the longitude is E36°29'. Regarding the topography of the project site, about 90 % of the area is plain with an inclination changing between 0 and 2%. The rest 10% of the area is of gentle slope with minor undulation. The average altitude is 1,130m. The highest hill is Gürcütepe (1,951m), included in the Güzelce dam basin.

No difficulty constraining transportation to the village is found. The village is connected to Tokat province with asphalt road. Nearly all roads between districts and towns, and between towns and Tokat province are asphalt. The village roads are usually passable, however, become muddy during winter season due to snowfalls.

The Guzelce irrigation project have been implemented by the DSI, which aimed at flood

control and irrigation for the land area of 4,337 ha along the Fineze river. The Camlibel land consolidation project will be implemented by the GDRS, in line with the Guzelce irrigation project. The major components of the project are as follows:

- Land consolidation area: 1,438 ha
- Land grading works: 1,398 ha
- Soil improvement works: 40 ha
- Drainage canal works: 19,700 m (h = 1.0 - 1.8 m)
- Under-drainage works: 15 ha
- Irrigation canal works: 20,850 m
- Farm road works: 47,600 m
- Improvement of village environment:
  - Stock farm land development: 23 ha (terracing 10 ha)
  - Living environment improvement: 11 ha

4.5 Kozluk Project (Weir Project)

The project site is located near Black Sea, about 80 km away from Samsun to the east. Latitude of the project area is N41°07' and the longitude is E37°07'. The transportation is well kept throughout year between the village and other areas. While the main road leading to Samsun is asphalt paved, the road connecting the main road and the village is conventionally paved.

The irrigation area's elevation ranges between 1m and 50m. The topography of the lower elevation area is very flat, suitable for paddy cultivation, and it becomes relatively steep and undulating when goes to higher elevation. The weir is to be constructed in a place of about 7 km upstream from Black Sea. Fairly hard foundation was found at the both sides of the river. The western downstream side of the river is characterized with a very steep slope, implying difficulties for constructing canal.

The irrigation water is taken from Akcay River which flows throughout the year. The catchment area at the weir site is 220 sqkm, and the main river channel's length is 42 km with an average slope of 2.2%. Since this project came up in 1978, the runoff of Akcay River had been periodically measured until 1992. The measurement had been done in periods when the river gave little discharge mostly during the dry season coresponding to the irrigation period. Total of 16 measurements had been done in 8 years. The minimum runoff among the measured and minimum in July, requiring peak irrigation water requirement, are 470 l/s and 850 l/s respectively.

The project planned to irrigate 550 net ha (gross 610) is composed of a weir and open canal. The weir of 50m in length is of floating type. The lengths of the main and lateral canals are 20,200 m and 12,100 m respectively. The on-farm irrigation is to use furrow and flood methods.

4.6 Kuskara Project (Soil Conservation)

The project area is the land of Kastamonu-Merkez-Kuskara village at a coordinate of N41°30' and E34°00'. The village is connected to the center of the province with 13 km of asphalt

paved road which is accessible throughout the year. The project area is located south of the village with the elevation between 670 and 700m.

The village has a total land of 250 ha, 81 ha of which had been opened for irrigation between the years 1992 to 1994. The project area covers a total of 117 ha, including the irrigable 81 ha. The 117 ha, soil conservation area, is categorized into two such as Class II (37%) and III (63%) in terms of land classification. The slope of Class II land is about 5 to 6% and there are uneven topographic condition. Class III's slope is about 8% to as steep as 9%, causing soil erosion with irrigation water applied.

The project aims to protect the farmland from soil erosion, to maintain the productive capacity and enhance productivity of the farmland as well as improvement of irrigation efficiency. The major works are as follows:

- Farmland conservation area: 117 ha
- Terracing:
  A block (with averaged slope of 6 %): 44.1 ha
  B block (with averaged slope of 8 %): 72.8 ha (≒117 ha in total)
- Canal construction: 3,325 m (Q = 50 lit/sec)
- Road construction: 4,100 m (B = 3.0 - 8.0 m)

4.7 Ozdenk Project (Dam Project)

The project site is located, with a coordinate of N39°50' and E31°00', about 3 km away from Ozdenk village that is the beneficiary. The village is connected to Eskisehir with 53 km asphalt-paved-road and 13 km with conventionally paved-road. The accessibility, to the village and the dam site, is kept throughout year.

The elevation of the dam site is about 1000m at its river-bed, and the both abutments are relatively steep, about 1 vertical to 2 horizontal slope, giving good topographic condition as a dam site. The river branches into two at its upstream of 400m from the dam axis. The catchment area extends towards NNE, occupying 8.612 sqkm. The southern part of the catchment area is characterized with poor vegetation, which requires terrace and/or reforestation, while the northern part is covered with good vegetation like trees.

The irrigation area starts at just downstream of the dam, and runs along the river-sides. The irrigation land is composed of alluvial and terraces deposit, originating in river sedimentation. The topography is gentle, and the elevation goes down as one goes to downstream. The lowest elevation in the irrigation area is about 890m. The slope is nearly flat in the central part of the irrigation area, which runs along the river, and changes up to about 8% inclination beside the foothills.

The source of the irrigation is Ozdenk River that is seasonally flowing. The river usually starts flowing at the beginning of November and the flow peak shows up in March. The flow, then, becomes less and finally stops flowing in June. Periodical runoff measurement has not been done, however GDRS once carried out the measurement throughout the rainy season in 1995 to 1996. According to the measurement, the discharge between November in 1995 and May in 1996 was 808,000 cum, arriving at 93.8 mm taking into the catchment area of 8.612 sqkm.

This project is to irrigate 126 net ha (gross 140) with the water released from the dam. The project components are Ozdenk dam, distribution pipeline connecting between the dam and the farms, and on-farm facilities of either furrow or sprinkler. The on-farm facilities will be constructed by the farmers themselves. The irrigation system is to be of gravity distribution flow, for which the dam water comes to the farms by gravity thanks to the elevation difference. The dam dimension is as follows:

- Usable volume: 800,000 cum (including evaporation and seepage losses)
- Dead volume: 100,000 cum (sedimentation: 47,000cum + supplement)
- Total volume: 900,000 cum (newly designed)
- Full water level: 22.4m (with 900,000 cum reservoir capacity), EL1000.400m
- Dead water level: 8.6m (with 100,000 cum dead volume), EL987.000m
- Dam height: 22.4 + 2.50 (Normal free board: 1.0 + 1.5) = 24.9 m
- Dam type: Zone type earth fill dam

4.8 Aslalar Project (Groundwater Project)

Aslanlar village is connected to the center of Izmir-Torbali district with a distance of 7 km, and 45 km to the center of Izmir province via an asphalt road with good condition. The latitude of the project area is N38°10', and longitude is E27°27'. To the east of the project area, there is Taþkesik village and Balýk mountain (97m), while there is Fetrek stream to the west. There is mountain named Burgur with the elevation of 392m in north and Pehitler village is located in south of the project area.

The project area is located in a plain, however the topography varies in different parts. The altitude is about 60m in the north of the project area, and is about 30m in the south of the project area, giving about 30m elevation difference between the highest and the lowest. Accordingly, the inclination is about 0.2% from north to south.

The project area has two formations, which can yield water, such as Neogenic aged conglomerates and Paleozoic aged marbles. Both formations, having a fissured, cracked, and cavernous geological structure, create a suitable aquifer for this project. There are 7 wells, already opened by DSI in 1993 and 1994, for this project, the yield of which varies 10 to 50 l/s and amounts for 200 l/s in total.

This project is to irrigate 250 net ha (gross 263) by the 7 wells. The project components are 7 wells, boosting pumping station, rising and distribution pipelines, and on-farm facilities of drip (farmers' responsibility). The irrigation system is to be of collective, for which the irrigation water to be extracted from the 7 wells is to be once stored in a collecting pond, and then boosted to a regulating pond that will be constructed on a hill located northern side of the project area. After the regulating pond, the water is gravity-distributed to hydrants.

4.9 Ilyaskoy Project (Dam Project)

Latitude of the project area is N40°35' and the longitude is E29°26'. Ilyaskoy village is connected to the center of Yalova province with 24 km asphalt road. The village is accessible throughout season. The dam is located about 1 km from Ilyaskoy village. The road is conventional asphalt paved and the accessibility is available throughout year. The irrigation

area is located on the hills downstream from the dam, and the topography is undulating specially for the north-eastern area.

The source of the irrigation is Orencik River. There is a continuous flow throughout year though summer season's flow is very little amount often less than 1 l/s. The catchment area is 4.3 sqkm, stretching towards ESE, and mostly covered with forest. There is no other river flowing throughout year around Ilyaskoy. The Orencik River has no any runoff measurement. Based on the interview to the villagers, the maximum water depth during rainy season reaches to as high as about 1m, just overflowing the river channel of approximately 0.6m (depth) x 2.0m (width).

The project is to irrigate 108 net ha (gross 130),and composed of Ilyaskoy dam, boosting pumps, rising and distribution pipelines, regulating pond, and on-farm facilities of either drip or sprinkler (farmers' responsibility). The elevation of the dam site is about 225m. The slope of the abutments is 1 vertical to 8 horizontal for the northern side and 1 to 7 for the southern side, giving relatively gentle slope as a dam site.

The water released from the dam is to be lifted up onto a hill by a boosting pumping station. Then after storing the water into a regulating pond, the irrigation water is to be distributed by gravity. Irrigation system, from the dam and up to hydrant, will be constructed by GDRS, while on-farm facilities will be born by the farmers themselves. Based on the reservoir operation simulation, the dam dimension is as follows:

- Usable volume: 560,000 cum (including evaporation and seepage losses)
- Dead volume: 40,000 cum (sedimentation: 5,000 + fishery: 35,000cum)
- Total volume: 600,000 cum (newly designed)
- Full water level: 14.3m (with 600,000 cum reservoir capacity), EL240.300m
- Dead water level: 4.8m (with 40,000 cum dead volume), EL230.800m
- Dam height: 14.3 + 2.50 (Normal Free Board: 1.15 + 1.35) = 16.8m
- Dam type: Zone type earth fill dam

4.10 K. Karistiran Project (Groundwater Project)

The project area is located between Luleburgaz and Çorlu, 5 km to the north of E-5 Highway. Regarding transportation, the accessibility is kept throughout year from the highway to the village. The latitude of the project area is N41°19' to N41°30' and the longitude is E27°31' to E27°34'. Altitude of the project area is approximately 117m, and the lowest spot height is 90m. The land in the project area is nearly flat with an inclination of 1 to 2%. There are places gently sloping or depleting with a slope changing between 2% to as steep as 4%.

In Ergene river basin and its around, there is Babaeski formation, belonging to Pliocene, which is composed of clay, silt and sand. The formation reaches as thick as 100m. Corlu formation exists below the Babaeski formation. The Corlu formation is composed of fine sand, coarse sand, fine gravel, clay and silt in a form of layers.

There are 4 wells for this project, already opened in 1993 by DSI. Groundwater is found in Corlu formation. The designed yield is 30 l/s each, totaling to 120 l/s. The project is to irrigate 120 net ha (gross 126) by means of the wells. The project components include 4 wells, pipeline,

and sprinkler on-farm facilities. The irrigation system is to be independent, thus each well will have its own command area. The on-farm irrigation system, prepared by the farmers themselves, is to be of hand-move sprinkler.

5. PROJECT COST AND DISBURSEMENT

Project cost is composed of facilities construction cost, consulting service fee, made up of detail design and supervision, and contingency cost. Construction costs are estimated on the basis of construction amount and correspondent GDRS unit prices, and on-farm facility costs will be born by the beneficiaries. Detailed design and supervision costs cover the detail design including necessary survey, preparation of tender documents, tendering and tender evaluation, and supervision works. Contingency consists of physical contingency and price escalation contingency.

The cost for the Core Projects is detailed in Appendix-2, and the cost excluding on-farm facilities, which are to be born by the beneficiaries themselves, is summarized below. The project cost ranges between 316,675 US$ and 2,791,474 US$. The total amount is calculated at 13.4 million US$.

Table 5.1 Summary of Core Projects Costs, Million TL & US$

Project	Construct'n MTL	Design & Supervision	Contingency MTL	Total MTL	Total US$	Remarks
Hacilar	343,540	60,805	23,309	427,654	2,791,474	
Urunlu	102,381	23,619	9,054	135,054	881,552	
Kalesekisi	76,532	15,373	5,893	97,798	638,367	Phase I only
Camlibel	164,898	37,029	14,194	216,120	1,410,708	
Kozluk	195,246	34,237	13,124	242,607	1,583,596	
Kuskara	38,971	6,899	2,645	48,515	316,675	
Ozdenk	316,060	65,592	19,678	401,330	2,619,644	
Aslanlar	133,243	29,719	11,392	174,354	1,138,081	
Ilyaskoy	206,480	44,163	13,249	263,893	1,722,537	
K. Karistiran	43,662	8,681	3,328	55,671	363,388	
Total	1,621,013	326,117	115,865	2,062,995	13,466,024	

Note: The exchange rate is 1 US$ = 153,200 TL at July 1997.

Taking into consideration the above Core Projects, a sector package, covering 5 years, would need a loan assistance of 60 million US$. On condition that approximately 12 million US$ is considered appropriate for the construction amount per year with the loan assistance, the first package, composed of 5 years, would give the following allocation for both the Core Projects and the other high priority projects which come after the former:

Table 5.2 Budget Allocation for Core and Additional Projects for Package I

	Total	1st year	2nd year	3rd year	4th year	5th year	Remarks
Million TI							
Core projects	2,059,744	980,700	1,053,881	25,163	0	0	10 projects
Million US$							1$=153,200TL (at Jul '97)
Core projects in MUS$	13.4	6.4	6.9	0.2	0	0	
Total prospective loan	60						
For high prioritized projects	46.6	5.6	5.1	11.8	12.0	12.0	

Note: The exchange rate is at July 1997 since the 10 core projects cost estimation was made on the rate in July 1997.

Accordingly (on condition that 60.0 MUS$ available from loan assistance), the Core Projects will be completed within 3 years taking into consideration the construction amount (except Kalesekisi Phase II project to be carried out 8 years after the Phase I), and other additional projects could be implemented within the rest of total 46.6 MUS$. The additional projects will be selected on a basis of project priority covering all short and long listed projects (prioritization was made in the Study undertaken by JICA).

6. PROJECT IMPLEMENTATION SCHEDULE

A conceptual implementation schedule is tabulated below. TheCore Projects are to be implemented, starting with the related detail design, in three years since the inception of the first package, at the second year of which next projects (referred as high prioritized projects above) are to be selected, following which detail design and then implementation of the projects come, and the same continues until the summed project cost reaches the assumed 60 MUS$ within the duration of 5 years:

Table 6.1 Conceptual Implementation Schedule for the First Package

Package	First Package					Remarks
Year	1st	2nd	3rd	4th	5th	
Core Projects (10)						Total 13.5 MUS$
2nd group						
3rd group						
4th group			As available for the budget			
Project cost, MUS$	12	12	12	12	12	
Summed cost, MUS$	12	24	36	48	60	

: Selection of high prioritized projects
: Detail design, preparation of tender documents, and tendering
: Project implementation

7. CONSTRUCTION AND PROCUREMENT

An engineering consulting firm will be recruited through an international competitive selection for both detailed design and construction supervision of whole project facilities.

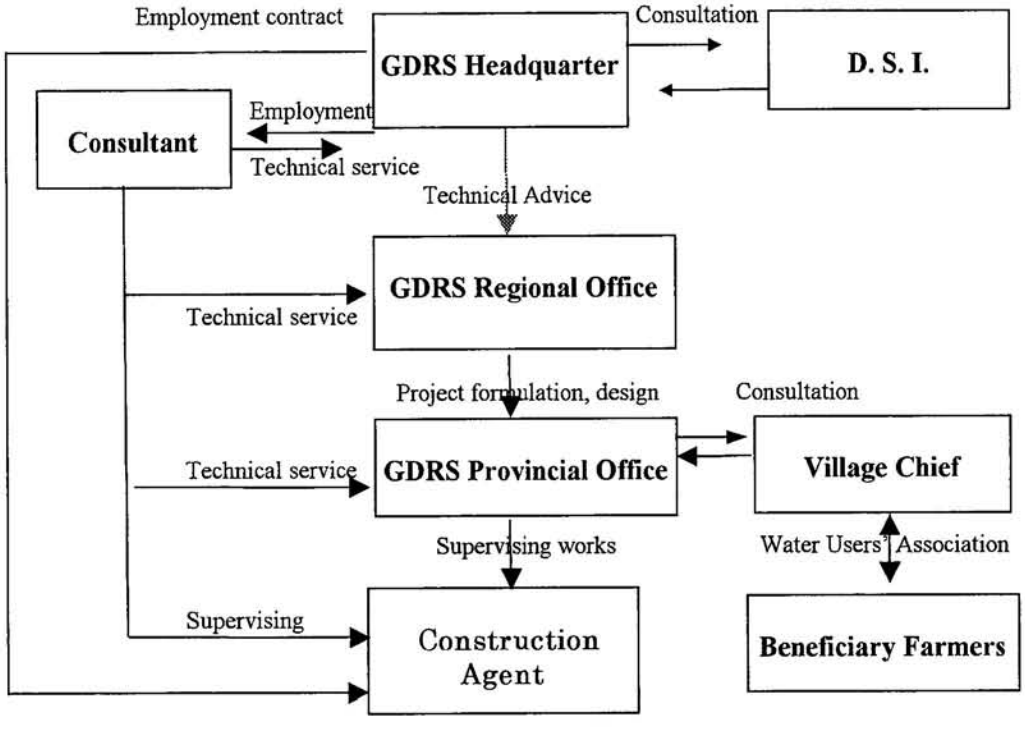
The contractor(s) for the construction as well as for the supply of necessary equipment will be employed through international competitive tenders. The tenders may be short-listed through pre-qualification tenders, and the same consultants will conduct tender evaluations.

8. PROJECT IMPLEMENTATION ORGANIZATION

Organization networks involved in the project implementation, especially GDRS headquarter, regional and provincial offices, are illustrated below. GDRS headquarter is responsible for general implementation planning, financing provision and technical advice, while regional and provincial offices concern local request for project implementation, operation works after completion, instruction for creating water users' associations and general operation and maintenance affairs.

Provincial offices are authorized in the supervision of construction works based on the contract agreed between GDRS headquarters and ordered construction companies. On the other hand, the contracted consultant offers, on the contract basis, technical services and management of construction works at both GDRS headquarter and the sites concerned.

Figure 8.1 Project Implementation Arrangement



9. OPERATION AND MAINTENANCE

Farmers are expected to establish water users association (WUA) in order to well-maintain the irrigation system and to practice their farming on a cooperative basis. In organizing and legalizing WUA, an orientation shall be given to the farmers. Also, an advice and training for operating the on-farm irrigation facilities will be called by the farmers, as needs arise, since they are little familiar to irrigation agriculture.

Those tasks are undertaken by "Irrigation Department" in GDRS Regional and Provincial Offices. The department will: 1) help formulate WUAs, 2) give irrigation related advice and training to farmers, and 3) monitor and evaluate farmers' improved irrigation and feedback the outcome. Regional Office supervises Provincial Offices that will be in charge of directly contacting farmers. Contact with farmers will be made by Provincial officers, dealing with irrigation or field agents who are employed and trained by the farmers.

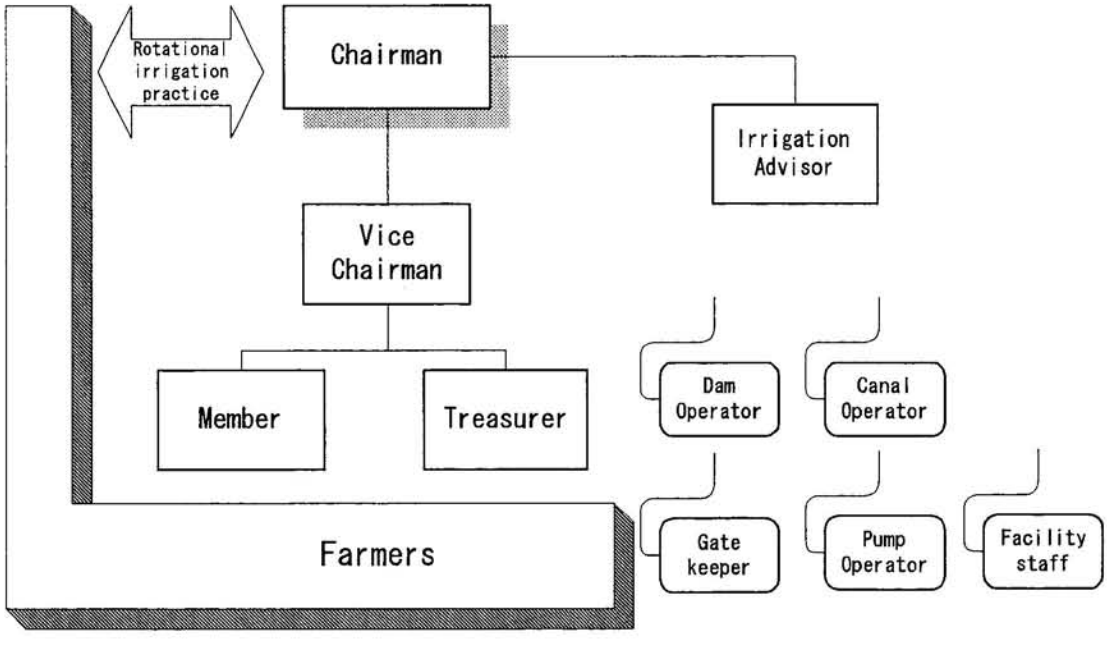
Water Users Association (WUA) will be established at each irrigation system, mostly on village level, comprising the beneficiary farmers. Besides operating and maintaining of the irrigation system, the following major roles of WUA are pointed out:

- To develop and implement operation plans for irrigation schedule and regular facilities

maintenance,

- To improve water use management through improve irrigation schedule and other useful irrigation practices,
- To develop roles and responsibility of the WUA's members and local rules for resolving water-related conflicts,
- To develop and maintain close coordination and good working relationships with organization for essential services such as banks, equipment firms, public and private lessor, and local village councils, and
- To develop and maintain an official and functional information linkage with GDRS officers.

The WUA is to be composed of 5 committee members, elected in every 3 years. The committee consistes of 1) chairman, 2) vice chairman, 3) committee member(s) 4) treasurer, and 5) irrigation advisor from GDRS office (see below). WUA hires a person who may be a dam operator, gate keeper, canal operator, and facility staff as required. A pump attendant is required in case of pump irrigation system.



The general meeting with the presence of all members, will be convened annually or as required in order to elect the representatives, audit the account, decide the fees required, discuss and fix the cropping patterns in the year, and rule rotational irrigation among the members.

10. CONSULTING SERVICES

The consulting services are composed of detailed design works, formulation of construction plan, cost estimation, preparation of tender documents, tendering, and supervision works.

10.1 Detailed Design Works

- To carry out detailed design for the projects such as dam, weir, canal, pipeline, pump, land consolidation, soil conservation, pumping house, etc.,
- To prepare technical specification for mechanical equipment such as motors and pumps that are to be required for manufacturer's design,
- To plan temporary works as required,
- To prepare Design Drawings according to the detailed design,
- To estimate the work quantities based on the detailed design and Design Drawings, and
- To prepare construction schedule by critical path method, taking into account combination schedule of civil and mechanical works.
- Others as required.

10.2 Cost Estimation

- To prepare bill of quantity according to the works, and
- To estimate total construction cost and to classify the cost into foreign and local currency portions.

10.3 Tender

- To prepare the pre-qualification tender documents and evaluation criteria for selecting a qualified bidders,
- To prepare tender instructions and conditions of the contract,
- To prepare technical specifications for civil, mechanical and architectural works,
- To prepare bill of quantities and tender drawings,
- To prepare general information data for bidder's estimation, and
- To hold tendering and conduct tender evaluation under GDRS headquarter.

10.4 Supervision

- To supervise the construction works in accordance with the technical specification and related contract documents.

11. ENVIRONMENTAL IMPACT

11.1 Impact to Natural and Social Environment

The environmental impact for the Core Projects is shown in Appendix-3. The following could be pointed out from the table:

- The socio-economic conditions in the project areas will improve, and increase of population is expected,
- The project will result in an increase of employment in the areas, and the income levels of the local population are expected to rise,
- There is no problem on the Ramsar Convention because there is no call sites for migrating birds in the project areas,

- Improved farming practices using modern irrigation techniques will result in a higher productivity and better quality agricultural products,
- The residual matters of agricultural products is utilized for compound agriculture with stock raising which will enable sustainable land use,
- The projects will induce increasing fertilizer application for crop production, and there might be fear of salinity and salt accumulation to surface layer, and
- Increase of used agro-chemicals might cause soil pollution by remained toxicity.

11.2 Mitigation Measures

Following mitigation measures are proposed to reduce negative effects associated with the Projects.

(1) Soil Erosion

Soil erosion classes from slight to severe. The erosion is mainly water erosion, and dispersed soil particles are washed to downhill or downstream. This kind of erosion results in not only loss of topsoil but also loss of water and nutrient holding capacity. The mitigation measures are as follows:

- Contour farming
- Strip cropping
- Terracing
- Cover with permanent vegetation

(2) Soil Salinity

Soil salinity refers to the surface or near-surface accumulation of salts, mainly chlorides, sulfates and carbonate of sodium, calcium and magnesium. Such salt accumulation reduces the soil pores and the ability to hold air and nutrients. And, high salt concentration could be toxic to many crops. The mitigation measures are as follows:

- Selection of suitable crops and establishment of cropping pattern
- Suitable fertilizer control corresponding to the demand amount of crops
- Suitable drainage control by leaching water

(3) Soil and Soil Layer Improvement

For the purpose of maintaining soil fertility, it should be necessary to improve soil physical, chemical, and biological conditions. This results in an increase and continuance of soil fertility. For soil and soil layer improvement, the following measures are recommended:

- Return compost and manure to the soil for soil fertility and soil buffer action
- Removal gravel from soil layer for agricultural management

(4) Agro-chemicals

Agro-chemicals for insecticide, acaricide, and herbicide are widely used in the project areas. Large quantity of agro-chemical inputs might remain as residue in the soil which may cause harm to human body. Agro-chemicals that are banned by an advanced country should be

carefully dealt with. In case of using agro-chemicals, following attention should be given:

- Prohibition of agro-chemicals with strong toxicity
- Minimum application in the growth period and prohibition in the harvest time
- Development of ecological control by using the insects, etc.

12. PROJECT EVALUATION

12.1 Economic Evaluation

Considerably high project benefits are estimated for all the Core Projects, among which three projects with orchard as major crops have marked rates above 50%, higher than other ones, reflecting a higher level of international market prices of fruits. Since they are accompanied with longer embryonic periods, thus leading to rather conservative range of B/C ratio not greater than 5 because of sluggish benefit appearance.

In contrast, indicators of Ilyaskoy and Ozdenk show poor values mainly due to the initial cost impact and an extensive crop supply to the world markets. EIRR for the projects with higher ratio of cereals among irrigated crops shows intermediate levels.

Table 12.1 Economic Evaluation, unit of benefits:1,000 US$

Project	Life span	Mean annual B.	Net Benefit/year	B/C ratio	EIRR, %
Hacilar	50	582.7	1.12	2.67	41.4
Urunlu	30	553.7	1.19	3.17	36.7
Kalesekisi	50	1,452.7	6.92	4.13	55.6
Camlibel	50	3,672.0	2.69	5.07	30.6
Kozluk	50	1,347.8	2.45	1.84	43.8
Kuskara	30	83.9	0.72	2.15	26.5
Ozdenk	50	555.5	4.40	3.64	15.7
Aslanlar	30	1,480.6	5.92	2.29	50.4
Ilyaskoy	50	101.6	0.94	1.94	18.5
K. Karistiran	30	420.3	3.50	2.49	52.6
Aggregated	-	-	2.99	2.86	34.9

Note : B stands for benefit, C for cost, EIRR for economic internal rate of return

As an aggregate, the project has B/C ratio of 2.86 and EIRR of 34.9%, and it still keeps B/C of 1.86 and EIRR of 16.2% even when the construction and O&M costs increase by 30% coupled with failure of target production by 30%.

12.2 Financial Evaluation

What differs most from evaluation result by economic price lies in the point that the rate of contribution by industrial crops keeps high levels, hence higher cost-effectiveness is observed in the project sites where acreage covering rate of such crops remains high. Two projects planned with dams as water source has lower cost-effectiveness where benefit can barely offset cost.

Likewise, in two others with weirs serving as water source operation costs for water pumps stay at a prohibitive level affecting project returns, leading to lower rate of return. In the case of Camlibel, though it does not have much lucrative crops in its crop composition, economy of scale comes into effect in a way to bring higher rate of return.

No project has a rate of return above 50% as observed in the evaluation by economic price, since horticultural produce does not contribute so much as done in the case of economic price to benefit output. Projects with water source relying on groundwater have higher return despite shorter life span. In the three projects with groundwater source and already irrigated Kuskara past payment for DSI water source is omitted as sunk cost.

Table 12.2 Financial Evaluation, unit : trillion TL million TL/ha (figures in brackets in trillion TL)

Project	Life span	Mean annual B.	Net B./year	B/C ratio	FIRR, %
Hacilar	50	1,250(200)	2.4(0.38)	1.90	18.7
Urunlu	30	449(72)	1.0(0.16)	2.32	33.3
Kalesekisi	50	604(97)	2.9(0.46)	2.71	25.3
Camlibel	50	1,367(219)	1.0(0.16)	1.87	33.8
Kozluk	50	365(58)	0.7(0.11)	1.42	17.7
Kuskara	30	111(18)	1.0(0.15)	2.59	28.2
Ozdenk	50	82(13)	0.7(0.10)	1.39	4.4
Aslanlar	30	440(70)	1.8(0.28)	1.63	25.7
Ilyaskoy	50	51(8)	0.5(0.08)	1.36	4.2
K. Karistiran	30	183(29)	1.5(0.25)	1.70	28.6
Aggregate Project	42	601(96)	1.6(0.25)	2.10	26.9

Note : B stands for benefit, C for cost, FIRR for financial internal rate of return

13. CONCLUSION AND RECOMMENDATIONS

Turkey has called for "eradication of inter-regional disparity between urban and rural communities" as one of the political targets, and with reference to above it was pointed out that agricultural promotion could constitute the most important task to be addressed. Those projects in connection with small-scale irrigation promotion and rural development will play a key role to achieve the target.

The GDRS organization is considered fully capable of expanding annual implementation volume judging from current size of organization and staff number. Therefore, it is the Turkish Government's strong intention that GDRS procures fund(s), described in "5. PROJECT COST AND DISBURSEMENT", enabling early implementation of the Projects.

6．現地写真集

Regional Directorate、GDRS (Konya) にて Assistant Director、Halil Arli 氏と打合せ

Regional Directorate GDRS(Konya)の建設機械類置き場

住民負担によって設置された水中ポンプ

Urunlu 地区の農業協同組合のメンバーからの聞き取り風景

住民負担によって設置されたトランスフォーマー

配水弁

灌漑用揚水ポンプ

センターピポット式
潅水による畑