

ATTACHMENTS

ATTACHMENT I

RE: SCOPE OF WORKS FOR THE FEASIBILITY STUDY ON MKOMAZI
VALLEY AREA IRRIGATION DEVELOPMENT PROJECT IN THE
UNITED REPUBLIC OF TANZANIA

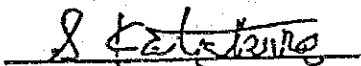
Scope of Works Team for the Feasibility Study on Mkomazi Valley Area Irrigation Development Project (hereinafter referred to as "the Team") organized by the Japan International Cooperation Agency headed by Mr. Shinsuke KATAKURA, Technical Officer, Construction Division, 1st Construction Department, Water Resources Development Corporation, visited the United Republic of Tanzania from 21st February, 1982 to 3rd March, 1982 for the purpose of working out the scope of works for the Feasibility Study on Mkomazi Valley Area Irrigation Development Project in the United Republic of Tanzania.

During its stay in the United Republic of Tanzania, the Team exchanged views and had a series of discussions with the Tanzanian Ministries and Authorities concerned in respect to necessary measures to be taken for the smooth implementation of the above-mentioned Feasibility Study.

As a result of the discussions, the Team and Kilimanjaro Regional Development Director agreed to recommend to their respective Governments the matters referred to in the scope of works attached hereto.

Moshi, Kilimanjaro Region,
Tanzania

3rd March, 1982



Shinsuke KATAKURA
Team Leader,
Japanese Scope of Works
Team for the Feasibility
Study on Mkomazi Valley
Area Irrigation Development
Project



J.A.T. MUWOWO
Regional Development
Director,
Kilimanjaro Region

SCOPE OF WORKS
FOR
THE FEASIBILITY STUDY
ON
MKOMAZI VALLEY AREA IRRIGATION DEVELOPMENT PROJECT
IN
THE UNITED REPUBLIC OF TANZANIA

I. INTRODUCTION

In response to the request of the Government of the United Republic of Tanzania (hereinafter referred to as "the Government") for the technical cooperation in conducting the Feasibility study on Mkomazi Valley Area Irrigation Development Project (hereinafter referred to as "the Project") which was taken up as the priority project in the Kilimanjaro Integrated Development Plan (KIDP) prepared by the Government of Japan in October, 1977, the Government of Japan has decided to provide the technical services for the Feasibility Study on Mkomazi Valley Area Irrigation Development Project as a part of the technical cooperation programme of the Government of Japan.

Japan International Cooperation Agency (JICA), the governmental agency responsible for the implementation of the technical cooperation programme, will be the executing agency and carry out the study under the cooperation with the Tanzanian Ministries and Authorities Concerned.

The present document sets forth the Scope of Works in regard to the above study and undertakings of both Japanese and Tanzanian Governments for the smooth execution of Works. All the conditions stated in this document are made based on the results of the preliminary survey on the Project and discussion on the draft scope of works made between Tanzanian Ministries and Authorities concerned and the Team in 3rd March, 1982.

II. OBJECTIVES OF THE STUDY

The objectives of the study will be;

- (1) to verify the technical and economic feasibility of the Project and
- (2) to undertake on-the-job training and transfer of knowledge to the Tanzanian counterparts in the course of the survey and the study.

III. OUTLINE OF THE STUDY

3.1 The Study Area

The Study Area covers about six thousand (6,000) hectares in gross, extending in South-eastern part of Same District which is one of the five districts of Kilimanjaro Region and elevation of the Area is about 500 to 900 meter from the sea level.

3.2 Scope of Works

The activities to be undertaken by the Team will be divided into the field works in the survey area and the home office works in Japan.

3.2.1 Field works in the study area

The field works will comprise the following:

(1) Topographic Maps

Preparation of the topographic maps for about six thousand (6,000) hectares on a scale of 1 to 5,000 with one (1) meter contour interval and for the water collecting area on a scale of 1 to 50,000 with fifteen (15) meter contour interval taking into consideration the maps prepared by the Government for the Project.

(2) Further collection and review of the data relevant to the Project in addition to the data collected through the previous studies such as;

- (a) Hydrology and Hydraulics,
- (b) Meteorology,
- (c) Geology,
- (d) Agriculture,
- (e) Regional and Agricultural Economy and Institution, and
- (f) Others, if necessary.

(3) Execution of the field investigation and survey including;

- a. Terrestrial survey
- b. Hydrological survey
- c. Soil survey with digging pits and laboratory analysis
- d. Geo-hydrological (ground-water) survey
- e. Irrigation and drainage survey

- f. Land use survey
- g. Agricultural survey
- h. Agro-economic survey
- i. Socio-economic survey
- j. Economic and institutional survey
- k. Construction material and cost survey
- l. Land reclamation survey
- m. Other surveys, if necessary

(4) Planning and study of the land use, irrigation, drainage facilities and farm road including their possible alternatives.

(5) On-the-job training of the Tanzanian counterparts in the course of the field works.

3.2.2 Home office works in Japan

The home office works in Japan will include the following.

- (1) Preparation of Topographic Maps
- (2) Preparation of the preliminary design of the irrigation and drainage facilities and farm road including the drawings and cost estimation
- (3) Economic and financial evaluation for the Project including the estimate of the project benefits
- (4) Preparation of the implementation schedule of the Project
- (5) Transfer of knowledge and technical know-how to the Tanzanian counterpart(s) in the course of the home office works.

IV. REPORTS

The following reports and products will be prepared and submitted to the Government.

4.1 Plan of Operation

Thirty (30) copies in English at the beginning of the Topographical survey and the field works in the dry season.

4.2 Field Report

Thirty (30) copies in English at the end of the field works in the dry season.

4.3 Interim Report

Thirty (30) copies in English at the beginning of the field works in the wet season.

4.4 Draft Final Report

Thirty (30) copies in English within three (3) months after the end of the field works in the wet season.

4.5 Final Report

Fifty (50) copies in English within two (2) months after receiving the comment of the Government on the Draft Final Report.

4.6 Topographic Survey Products

- (1) Two (2) sets of contact prints
- (2) Ten (10) sets of Topographic maps including index maps

V. UNDERTAKINGS OF THE GOVERNMENT OF THE UNITED REPUBLIC OF TANZANIA

In accordance with the laws and regulations in force in the United Republic of Tanzania, the Government of the United Republic of Tanzania will take necessary measures:

- (1) to provide the necessary entry and exit visas, residence and work permits, and travel permits for the Japanese Study Team if required for their stay in Tanzania.
- (2) to exempt the members of the Team from customs duties, internal taxes and other fiscal levies imposed in the United Republic of Tanzania with respect to the supply of the products and services necessary for the study,
- (3) to allow all data and materials concerned deemed to be necessary to be taken out of Tanzania and brought to Japan by the Team subject to Tanzania security regulations,
- (4) to facilitate prompt clearance through customs of any equipment, materials and supplies required for the services and of the personal effects of the Team.
- (5) to provide counterpart personnel to cooperate and assist the Team

during the survey and study without charging any cost to the Team while in the United Republic of Tanzania,

- (6) to arrange transport for the Team
- (7) to provide the permission to enter, dig and peg in the Project area, taking into account the Tanzanian regulations,
- (8) to arrange suitable office space, equipment and furniture for fifteen (15) Japanese Experts in maximum in the job site during the period of the field works,
- (9) to arrange the lodging facilities in Moshi and same to accommodate fifteen (15) Japanese Experts in maximum which will consist of fifteen (15) private rooms with beds, water, light and other necessary utilities,
- (10) to provide available documents such as drawings, maps, statistics, data and information relating to the study,
- (11) to arrange the geo-technical investigations for the sites of the regulating dams, head works and borrow pit,
- (12) to arrange the drilling machine for digging the observation wells,
- (13) to arrange the chemical analysis of soil and water samples taken from the Project area,
- (14) to arrange the mechanical analysis of scils,
- (15) to arrange any other available facilities that may be required for the execution of the field works,
- (16) to provide medical services for the Team during its stay in Tanzania when necessary, and,
- (17) to undertake to bear claims, if any arises, against the Japanese Study Team in the survey resulting from, occurring in the course of, or otherwise connected with the discharge of their official functions in Tanzania, except for those claims arising from the willful misconducts or gross negligence of the Japanese Study Team.

VI. UNDERTAKING OF THE GOVERNMENT OF JAPAN

For the purpose of the survey and study, the Government of Japan will assist to extent possible;

- (1) to send the Japanese Study Team to conduct the investigation and study,
- (2) to bring the equipment necessary for the purpose of the investigation and study,
- (3) to bear the charges of accomodation for the Team,
- (4) to bear the charges for vehicles required by the Team, and
- (5) to transfer the knowledge to the courterpart parsonnel during the period of the study, both in country and in Japan.

ATTACHMENT II

COUNTERPART PERSONNEL, SUPERVISORY TEAM MEMBERS
AND STUDY TEAM MEMBERS

A. Counterpart Personnel

- | | | |
|-----|----------------------|---|
| 1. | Mr. R. MALATA SHIO | District Irrigation Engineer |
| 2. | Mr. V. MARO | Regional Hydrologist |
| 3. | Mr. P. KILEWO | Irrigation Technician |
| 4. | Mr. P.L. MLAMBACHUMA | Irrigation Technician |
| 5. | Mr. C.K. LYIMO | Technician, Hydrologist |
| 6. | Mr. A.A. SWAI | Technician, Hydrologist |
| 7. | Mr. P. KIMARO | Technician, Hydrologist |
| 8. | Mr. E.A.S. MWENDE | Hydrogeologist |
| 9. | Mr. S.E. MBWAMBO | Agricultural Field Officer |
| 10. | Mr. E. NGOIYA | Agricultural Field Officer
(Agronomist) |
| 11. | Mr. E.M. MALLEKO | Agricultural Field Officer
(Horticulturist) |
| 12. | Mr. D. MASOPANGO | Drilling Technician |
| 13. | Mr. H.R. MGANYO | Agricultural Field Assistant |
| 14. | Mr. S.A. MALYA | Agricultural Field Assistant
(Land Planning) |
| 15. | Mr. F.O. MALLEKO | Agricultural Field Assistant
(Agriculture) |
| 16. | Mr. L. MAWANYA | Trainee (Agriculture) |
| 17. | Mr. V. EMANNUEL | Trainee (Planning Office) |

B. First Supervisory Team Members

- | | | |
|-------------------|------------|---|
| Mr. K. MIYAZOE | Leader | Section Chief
Regional Planning Div.
Regional Planning Dept.
Hokuriku Regional Agricultural
Administration Office, MAFF |
| Mr. K. KOBAYASHI | Irrigation | Section Chief
Design Division, Construction Dept.
Agricultural Structure Improvement
Bureau, MAFF |
| Mr. T. KUROYANAGI | Member | Officer
JICA |

C. Second Supervisory Team Members

Mr. T. MASE	Leader	Head Technical Affairs Division, Agriculture, Forestry & Fisheries, Planning & Survey Dept., JICA
Mr. Y. YAMAGUCHI	Hydrology & Ground Water	Deputy Director Land Development Div., Construction Dept., Agricultural Structure Improvement Bureau, MAFF
Mr. N. NIWA	Coordinator	Officer Technical Affairs Div., Agricultural, Forestry & Fisheries Planning & Survey Dept., JICA

D. Third Supervisory Team Members

Mr. S. KATAKURA	Leader	Technical Officer Construction Division 1st Construction Department Water Resources Development Cooperation
Mr. N. NIWA	Coordinator	Officer Technical Affairs Division Agricultural, Forestry and Fisheries Planning & Survey Dept., JICA

E. Study Team Members

1. Mr. S. YANO	Team Leader
2. Mr. T. KAWAKATSU	Co-Team Leader/Irrigation and Drainage Planning Engineer
3. Mr. F. SUGIHARA	Irrigation and Drainage Design Engineer
4. Mr. M. KODAMA	Hydrologist
5. Mr. H. TAKAHASHI	Hydrogeologist
6. Mr. N. SARUWATARI	Soil Mechanical and Foundation Engineer
7. Mr. S. HONMA/Mr. K. YAMADA	Pedologist/Agronomist
8. Mr. M. ISHIZUKA	Agro-Economist
9. MR. K. TSUZUKI	Dam Engineer
10. Mr. K. IRIE	Design and Survey Engineer
11. Mr. K. OKUWA	Design and Survey Engineer
12. Mr. T. HASHIGUCHI	Drilling Expert

F. Draft Final Report Explanation Team Members

1. Mr. Y. AKIYAMA Leader Director
Irrigation and Drainage Project
Office of West Kakogawa Area,
Kinki Regional Agricultural
Administration Office, MAFF
2. Mr. Y. YAMAGUCHI Deputy Director
Land Development Div.,
Construction Dept., Agricultural
Structure Improvement Bureau, MAFF
3. Mr. N. NIWA Officer
Technical Affairs Division
Agricultural, Forestry and Fisheries
Planning & Survey Dept., JICA
4. Mr. S. YANO F/S team, Leader
5. Mr. T. KAWAKATSU F/S team, Irrigation and Drainage
Planning Engineer

ATTACHMENT III

COMMENTS MADE BY THE GOVERNMENT OF TANZANIA ON THE DRAFT
FINAL REPORT AND THE EXPLANATION TO COMMENTS

- (1) Comments made by the government of Tanzania on the Draft
Final Report

TO: RESIDENT REPRESENTATIVE - JICA DSM

FROM : RDD KILIMANJARO

19, DEC, 1983.

RE: COMMENTS FOR FINAL DRAFT REPORT ON MKOMAZI VALLEY IRRIGATION
PROJECT.

AA: FOLLOWING ARE BRIEF COMMENTS ON THE ABOVE MENTIONED REPORT.

COMMENTS FROM ANNEX C THROUGH F
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1. THE SOIL INTENSITY SURVEYS ARE INADEQUATE. AT LEAST ONE
PROFILE PER TWO HECTARES SURVEY SHOULD HAVE BEEN DONE.
2. DE-SALINATION OF IRRIGATION WATER THEREAFTER HAS BEEN
ENVISAGED. CONCRETE PRECAUTIONARY RECOMMENDATIONS ARE NEEDED,
INCLUDING FUTURE OPERATIONAL COSTS.
3. THE TEST SRESULTS OF SALINITY AND ALKALINITY OF THREE
SOIL SAMPLES TAKEN TO TOKYO SHOULD BE INCLUDED IN THE REPORT.
COMMENTS FROM ANNEX A,B,F, F AND G.
4. THE FOMULARS USED TO DETERMINE THE BASIN RAINFALL HAS NO
ORIGINALITY, STATISTICAL ANALYSIS IS PREFERRABLY SUITABLE.
5. PART 3.2.2. IT SHOULD READ '... THE RATING CURVE OF KISIWANI,
NJIRO AND NDUGU RIVERS..'
6. IN ESTIMATING DISCHARGES, EQUATION $Q = A (H + C)$ LACKS
ORIGINALITY PARTICULARLY COEFFICIENT C.
7. JUSTIFICATION FOR USING NATIONAL METHOD IN PREDICTING FLOOD
DISCHARGE IN LARGE AREA IS NEEDED.
OPTIMIZATION STUDY
8. THE EFFECTIVE STORAGE OF IGOMA DAM OF $34.9 \times 10^6 M^3$ SHOULD
FRESHLY BE SCRUITINIZED TO SEE THE EFFECT AT THE WORST CONDITION
POTENTIAL EVAPOTRANSPIRATION
9. ELABORATION ON THE ESTIMATION OF THE IRRIGATION WATER
REQUIREMENTS BY USING MODIFIED PENNON METHOD IS NEEDED.
SOIL MECHANICS AND FOUNMDATION ENGINEERING
10. DETERMINATION OF SHEAR MODULUS IS INEVITABLE FOR SETTLEMENT
CALCULATIONS.
11. DEEP FOUNDATION TESTS ARE NEEDED TO ESTABLISH NEGATIVE FRICTION
EFFECT OF PILE FOUNDATION.
DAM DEVELOPMENT
12. SEDMENT TRANSPORT LOAD STUDY SHOULD GO ON. VALUE $100M^3/
KM^2/YEAR$ IS FAIRLY LOW.
13. THE LEACHING COMPONENT IN ESTIMATING IRRIGATION WATER
REQUIREMENT SHOULD BE CONSIDERED.
14. THERE ARE MORE VITAL COMPONENTS TO BE CONSIDERED IN ESTIMATING
THE DRAINAGE COEFFICIENT.
15. DESIRABLE WAZTER TABLE LEVEL AND CROP SALINITY TOLERANCE
LEVEL SHOULD DISTINCTLY BE DEFINED IN DESIGNING CRITERIAL.
CRITERIA OF DESIGNING
16. WHAT PROBABILITY DENSITY FUNCTION WAS USED TO ESTIMATE THE
DESIGN FLOOD FOR SPILLWAY.
PROJECT EVALUATION
17. INCLUSION OF SUMARY FOR ECONOMIC EVALUATION AND FINANCIAL
ANALYSIS IS NECESSARY WITH INDICATION OF THE INTEREST RATE USED.
18. ALL BENEFIT IN MONETARY TERMS DERIVED FROM THE PROJECT HAVE
TO BE CONSIDERED IN ECONOMIC EVALUATION IN THE FINAL REPORT.
19. THE CURRENT OFFICIAL PRICES OF MAJOR FOOD PRODUCTS AND
CONSTRUCTION MATERIALS E.G. (CEMENT PRICE REVIEW) ARE TO
BE TAKEN INTO ACCOUNT ON FINANCIAL EVALUATION IN THE FINAL
REPORT.

MPIZA J.J.M.
RDD - KILIMANJARO

(2) Explanation to comments

1. The soil observation at test pits was made at about one pit per 100 ha on an average, although it was planned to make at the density of one pit per 300 ha in the "Plan of Operation for F/S on the Mkomazi Valley Area Irrigation Development Project" which was already submitted to RDD, Kilimanjaro Region in October, 1982. Besides, the survey was also made through interpretation of aerial photograph on the scale of 1/25,000. Consequently, it is considered that the conducted intensity is sanctioned for the feasibility study.

2. The irrigable area classified into the land suitability class of I to III in accordance with the land classification standard defined by the U.S. Bureau of Reclamation is taken into the project. The land of class IV is also considered as potential arable land. However, a large capital investment is required for improvement of such constraints as extremely strong salinity of soil, poor drainage or seasonal flooding due to depressed topography. It is rather difficult, at present, to expect profitable land utilization for crop production. Accordingly, the land in this class is excluded from the project design. (Ref. C-22 in ANNEX C)
Thus, as for the attainment of anticipated crop yield mentioned in Section 2.7, ANNEX E, it is considered that special soil improvement is not necessary.

3. Meaning of "three soil samples" is indistinctness. During the phase I study, 15 soil samples for the chemical analysis and 6 samples for soil mechanical test were sent to Tokyo the result of chemical analysis are shown in Table C-2, ANNEX C and Table B-2, ANNEX B. In addition to this, 2 soil samples in three cases were sent to Tokyo during the phase II study for the mechanical tests for embankment materials and the results are shown in Table B-2, ANNEX B.

4. Long term daily rainfall data observed continuously are available at only 3 stations, Tia dam site, Gonja estate, Kalimawe meteorological station. Since these 3 stations are located in the middle part of the Mkomazi river basin, neither Thiessen method nor weighted mean method is not applicable to estimate of the basin rainfall. Thus, it is necessary that the area represented by one rainfall station is determined by empirical procedure considering the climatic and topographic conditions in the basin. Since Tia dam site is located in the Middle of the South Pare Mountains and its altitude is 1,670 m, it is considered that it represents the precipitation of the area which is higher than 1,400 m in altitude. As Gonja estate (EL. 548 m) is located at the foot of eastern slope of the South Pare Mountains, it is considered to be a representative station of the area from 1,400 m to 600 m in altitude. Kalimawe station (EL. 508 m) is located lowland which extends far and wide in the basin, thus, it is considered to be a representative station of the area lower than 600 m in altitude. The area represented by each station is measured by planimeter and weighting factor for precipitation at that station is obtained dividing by the total area of the basin.
5. It is corrected that "the rating curve of Kisiwani, Njiro and Ndungu stations
6. The rating curves described in the Draft Final Report are developed by the statistical analysis, however, a parabolic equation is more practicable from the standpoint of natural phenomenon. Thus, the rating curves are modified as shown in ANNEX A. There is no considerable difference between the daily discharge calculated by modified rating curve and that by the rating curve described in the Draft Final Report.
7. Since there is no sufficient flood record nor hourly rainfall record in the Mkomazi river basin, more effective methods such as Unit Hydrograph, Storage Function and Characteristic Curve than Rational formula are not applicable for the study.

8. The water level of Igoma dam is lowered to the lowest water level in 1974. Withdrawal from the reservoir is limited to 70 percent of irrigation requirement from 1974 to 1977.
9. A detailed calculation sheet is attached at the end of this paper.
10. The shear modulus is used for calculation of elastic settlement, however, the elastic settlement is small and can be neglected in the feasibility study level.
11. No pile foundation structure is designed in the project. Besides, the foundation layer of the structure is classified into sand, thus the consolidation settlement is negligible small.
12. As sediment records is not available in the Mkomazi river basin, the sedimentation is necessarily settled referring the data obtained in Japan. The annual sedimentation in Japan widely varies from 10 to 10,000 m³/km²/year. The annual rainfall in the mountain is more than 2,000 mm in Japan and 1,400 mm in the South Pare Mountains. The volcanic rocks widely developed in Japan is more erosive than gneisses of the Pre-Cambrian age in the Mkomazi river basin. Topography is remarkably steep in Japan and is rather gentle in the Mkomazi river basin. Comparing the physical conditions in the Mkomazi river basin with that in Japan, it is considered that the sediment in the Mkomazi river basin is lower than average of that in Japan. The sediment load amount for the dam plan is estimated for the duration of 100 years. In order to assume the more reliable design value, it is recommendable to investigate sediment transport not only during the flood but also for a long term.
13. The leaching water is not necessary to be considered in the same reason described in item 2 in this paper.

14. The meaning of the comment particularly "Drainage Coefficient" is incomprehensive. However, it is presumed that flood discharge calculation is not described in dam development study. Generally, the design flood of the dam spillway is determined on a flood discharge of 200-year probable occurrence plus 20% allowance or on a probable maximum flood. The former is applied in the project because no sufficient data is available in order to estimate the probable maximum flood. The calculation procedure of 200-year probable flood is described in ANNEX A.
15. The land class IV which might have salinity problem are excluded from the project. Besides, paddy cultivation is proposed, thus no salinity problem may be caused.
16. The probable rainfall is estimated by the Third type of Pearson's formula described in ANNEX A.
- 17., 18. and 19. The contents of the report is revised following the comment.

CALCULATION OF POTENTIAL EVAPOTRANSPIRATION

Modified Penman Method

1. Data	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
(1) Mean Temperature, Tmean (°C)	27.2	27.9	27.9	26.5	24.8	23.6	22.7	22.6	24.0	25.7	27.1	27.0
(2) Mean Relative Humidity, RHmean (%)	57	57	58	60	62	58	58	58	56	55	58	59
(3) Wind Speed, U (km/day)	138	134	120	138	184	197	187	145	118	121	129	143
(4) Sunshine Duration, n/N	0.7	0.7	0.6	0.5	0.5	0.4	0.5	0.5	0.5	0.7	0.7	0.7
2. Calculation												
(1) Vapour Pressure												
i) ea at Tmean (mbar)	36.1	37.6	37.6	34.7	31.3	29.1	27.6	27.4	29.8	33.0	35.9	35.7
ii) ed = ea x RH mean/100 (mbar)	20.6	21.4	21.8	20.8	19.4	16.9	16.0	15.9	16.7	18.2	20.8	21.1
iii) (ea - ed) (mbar)	15.5	16.2	15.8	13.9	11.9	12.2	11.6	11.5	13.1	14.8	15.1	14.6
(2) Wind Function, f(u) = 0.27 (1 + U/100)												
(3) Weighting Factor												
1) W at Tmean	0.77	0.78	0.78	0.77	0.75	0.74	0.73	0.73	0.74	0.76	0.77	0.77
ii) (1-W)	0.23	0.22	0.22	0.23	0.25	0.26	0.27	0.27	0.26	0.24	0.23	0.23
(4) Net Radiation												
i) Extra Terrestrial Radiation, Ra (mm/day)	15.5	15.8	15.6	14.9	13.8	13.2	13.4	14.3	15.1	15.6	15.5	15.4
ii) Solar Radiation, Rs = (0.25 + 0.5.n/N).Ra (mm/day)	9.3	9.5	8.6	7.5	6.9	5.9	6.7	7.2	7.6	9.4	9.3	9.2
iii) Net Short Wave Radiation, Rns = 0.75.Rs (mm/day)	7.0	7.1	6.5	5.6	5.2	4.4	5.0	5.4	5.7	7.1	7.0	6.9
iv) f(Tmean)	16.1	16.3	16.3	16.0	15.6	15.3	15.1	15.1	15.4	15.8	16.1	16.1
v) f(ed)	0.14	0.13	0.13	0.14	0.14	0.16	0.16	0.16	0.16	0.15	0.14	0.13
vi) f(n/N)	0.73	0.73	0.64	0.55	0.55	0.46	0.55	0.55	0.55	0.73	0.73	0.73
vii) Net Long Wave Radiation, Rnl = f(Tmean).f(ed).f(n/N) (mm/day)	1.6	1.5	1.4	1.2	1.2	1.1	1.1	1.3	1.4	1.7	1.6	1.5
viii) Net Radiation, Rn = Rns - Rnl (mm/day)	5.4	5.6	5.1	4.4	4.0	3.3	3.9	4.1	4.3	5.4	5.4	5.4
(5) Adjustment Factor, C	1.03	1.03	1.03	1.00	0.95	0.95	0.94	0.98	1.02	1.03	1.05	1.04
(6) Potential Evapotranspiration, ETo = c.[W.Rn + (1-W).f(u).f(ea-ed)] (mm/day)												
	6.6	6.8	6.2	5.4	5.0	4.7	4.9	4.9	5.3	6.4	6.6	6.6

Note: Crop Water Requirements, FAO Irrigation & Drainage Paper No. 24

JICA