Republic of Lebanon
Ministry of Agriculture

Climate Smart Agriculture: Enhancing Adaptive Capacity of the Rural Communities in Lebanon (AgriCAL) Project

Bidding Document

Issued on February 26, 2020

NCB N°: W7/2019

for

Rehabilitation of Abdeh Nursery for the Ministry of Agriculture

DO NOT COPY

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Invitation for Bids (IFB)

Date: February 26, 2020

Contract name: **Rehabilitation of Abdeh Nursery for the Ministry of Agriculture – Proc. Ref.: W7/2019**

1. The Republic of Lebanon represented by The **Ministry of Agriculture (MoA)** has received a grant from the **International Fund for Agricultural Development (IFAD)** towards the cost of the **Climate Smart Agriculture: Enhancing Adaptive Capacity of the Rural Communities in Lebanon (AgriCAL)** Project and intends to apply part of the funds to cover eligible payments under the Contract for: **Rehabilitation of Abdeh Nursery for the Ministry of Agriculture (Proc. Ref.: W7/2019).**

2. The *Project Coordination Unit (PCU)* invites sealed bids from interested and qualified bidders for the implementation of abovementioned civil works under the Contract: **Rehabilitation of Abdeh Nursery for the Ministry of Agriculture.**

Duration of Works: Three (3) months after beginning of the assignment.

3. Interested eligible Bidders may obtain detailed information and inspect the Bidding Documents by the address mentioned below, from Monday to Thursday 8:00 – 15:30 and Friday 8:00 – 13:00 Beirut local time

Project Name: **Climate Smart Agriculture: Enhancing Adaptive Capacity of the Rural Communities in Lebanon (AgriCAL) Project**
Procurement Officer: **Elias El Namroud**
Address: **Green Plan – First Floor**

Baltagi Building – Facing the General Directorate of the State security – Jnah

Beirut – Lebanon

Phone #: **00961 1 853 141 – 00961 9 638 436**

E-mail: **proc.agrical@gmail.com**

4. Interested Bidders may obtain the Bidding Documents in English by the Address mentioned below, no later than **Thursday 23rd of April 2020** at **11:00 a.m. Beirut local time Beirut local time**. Late bids will be rejected.

Attention: **Mr. Elias El Namroud**

Address: **Green Plan – First Floor**

Baltagi Building – Facing the General Directorate of the State security – Jnah

Beirut – Lebanon

Telephone: **00961 1 853 141 – 00961 9 638 436**

A site inspection and a pre-bid meeting will be organized together on Thursday 12th of February 2020 at 11:00 Beirut local time. Interested bidders should contact Mr. Elias El Namroud, AgriCAL Procurement Officer to confirm their presence before Tuesday 10th of February 2020 at 10:00 a.m. Beirut local time. The pre-bid meeting will take place on site during the site visit at the below address:

Abdeh Nursery

Abdeh – Near the Agricultural Technical School in Abdeh – facing Al Montazah Sweets Akkar – Lebanon

Location: Lat.: 34.522851

Long.: 35.992332

5. Minimum qualification requirements include:
a) Average annual financial amount of construction works performed for the last **five (5) years** makes: at least **US$ 300,000**;

b) Experience as prime contractor in the construction of at least 2 works contracts of a nature and complexity similar to the Works over the period of five (5) years;

6. Bids must be delivered to the address below at or before **Thursday 23rd of April 2020 at 11:00 a.m. Beirut local time**. Electronic bidding shall not be permitted. Late bids will be rejected and returned to the Bidders unopened. Bids will be opened physically in the presence of the bidders' representatives who choose to attend in person at the address below at **Thursday 23rd of April 2020 at 11:15 Beirut local time.**
Attention: **Mr. Elias El Namroud**

AgriCAL Office

Green Plan, First floor

Baltagi Building – Facing the General Directorate of State Security – Jnah

Beirut – Lebanon

Tel: 00961 1 853 141 – 00961 9 638 436

7. Bidding will be conducted through the National Competitive Bidding (NCB) procedures method set out in IFAD' Project Procurement Guidelines and Handbook – September 2010. Bidding is open to all bidders from Eligible Source Countries as defined in the Bidding Documents.

8. All bids shall be accompanied by a Bid Security of: **US$ 3,000 (Three Thousand US Dollars) or equivalent amount in Lebanese Liras based on official exchange rate from the Central Bank of Lebanon.**

Volume I. Bidding Document

Section 1. Instructions to Bidders (ITB)

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Section 1. Instructions to Bidders

A. General

1. Scope of Bid

1.1 The Project Coordination Unit (PCU) established by the Employer defined in the Bidding Data invites bids for the construction of Works, as described in the Contract Data and Bidding Data. The name and identification number of the Contract and number of lots (contracts) are provided in the Contract Data and Bidding Data.

1.2 The successful Bidder will be expected to complete the Works by the Intended Completion Date specified in the Contract Data.

1.3 Throughout these Bidding Documents:

(a) the term "in writing" means communicated in written form (e.g. by mail, e-mail) with proof of receipt;

(b) if the context so requires, "singular" means "plural" and vice versa; and

(c) "day" means calendar day

2. Source of Funds

2.1 The Borrower, as defined in section 2, Conditions of Contract and as specified in the Bidding Data, intends to apply part of the funds of a grant from the [insert name of the donor] (hereinafter called "the Financier'), as defined in the Bidding Data, towards the cost of the Project, as defined in the Bidding Data, to cover eligible payments under the Contract for the Works. Payments by the Financier will be made only at the request of the Borrower and upon approval by the Financier in accordance with the Grant Agreement, and will be subject in all respects to the terms and conditions of that Agreement. Except as the Financier may specifically otherwise agree, no party other than the Borrower shall derive any rights from the Grant Agreement or have any rights to the grant proceeds.

2.2 The grant agreement prohibits a withdrawal from the grant account for the purpose of any payment to persons or entities, or for any import of goods, if such payment or import, to the knowledge of the Financier, is prohibited by a decision of the United Nations Security Council, taken under Chapter VII of the Charter of the United Nations.

3. Eligible Bidders

3.1 All bidders shall provide in Section 3, Forms of Bid and Qualification Information, a statement that the Bidder (including all members of a joint venture and subcontractors) is not associated, nor has been associated in the past, directly or indirectly, with the consultant or any other entity that has prepared the design, specifications, and other documents for the Project or being proposed as Project Manager for the Contract. A firm that has been engaged by the Borrower to provide consulting services for the preparation or supervision of the Works, and any of its affiliates, shall not be eligible to bid.

3.2 Government-owned and majority public-owned enterprises from the Borrower country may only participate if they are (i) legally and financially autonomous, (ii) operate under commercial law and (iii) are not a dependent agency of the Borrower or Sub-Borrower.

3.3 A Bidder that has been sanctioned by the Financier, shall be ineligible to be awarded a contract financed by the Financier, or benefit from a contract financed by the financier, financially or otherwise, during such period of time as the Financier shall determine.

3.4 Bidders shall provide such evidence of their continued eligibility satisfactory to the Employer, as the Employer shall reasonably request.

3.5 All the above mentioned criteria shall apply to each member of a joint venture as well as all subcontractors and suppliers.

4. Qualification of the Bidder

4.1 All bidders shall provide in Section 3, Forms of Bid and Qualification Information, a preliminary description of the proposed work method and schedule, including drawings and charts, as necessary.

4.2 In the event that prequalification of potential bidders has been undertaken, only bids from prequalified bidders will be considered for award of Contract. These qualified bidders should submit with their bids any information updating their original prequalification applications or, alternatively, confirm in their bids that the originally-submitted prequalification information remains essentially correct as of the date of bid submission. The update or confirmation should be provided in Section 3.

4.3 If the Employer has not undertaken prequalification of potential bidders, all bidders shall include the following information and documents with their bids in Section 3, unless otherwise stated in the Bidding Data:

(a) copies of original documents defining the constitution or legal status, place of registration, and principal place of business; and an original copy of the power of attorney of the signatory empowering the person to sign the bid and all the related documents valid at least for the duration of bid validity;

(b) total monetary value of construction work performed for each of the last **five (5) years**;

(c) evidence of relevant experience in carrying out works of a similar nature and size and complexity to the works concerned by this bid during the last five years, and details of work under way or contractually committed; and clients who may be contacted for further information on those contracts and copies of certificates of final acceptance signed by the contracting authority of the projects concerned;

(d) major items of construction equipment proposed to carry out the Contract; the minimum requirements are listed in the Bidding Data;

(e) qualifications and experience of key site management and technical personnel proposed for the Contract. The minimum required staff are listed in the Bidding Data;

(f) reports on the financial standing of the Bidder, such as profit and loss statements and auditor's reports for the past three (3) years;

(g) information regarding any litigation, current or during the last three years, in which the Bidder is involved, the parties concerned, and disputed amount; and

(h) proposals for subcontracting components of the Works amounting to more than 10 percent of the Contract Price.

4.4 Bids submitted by a joint venture of two or more firms as partners shall comply with the following requirements, unless otherwise stated in the Bidding Data:

(a) the Bid shall include all the information listed in Sub-Clause 4.3 above for each joint venture partner;

(b) the Bid shall be signed so as to be legally binding on all partners;

(c) all partners shall be jointly and severally liable for the execution of the Contract in accordance with the Contract terms;

(d) one of the partners will be nominated as being in charge, authorized to incur liabilities, and receive instructions for and on behalf of any and all partners of the joint venture; and

(e) The execution of the entire Contract, including payment, shall be done exclusively with the partner in charge.

4.5 To qualify for award of the Contract, bidders shall meet the following minimum qualifying criteria:

(a) annual volume of construction work of at least the amount specified in the Bidding Data;

(b) experience as prime contractor in the construction of at least two contracts of a nature, size and complexity equivalent to the Works over the last 5 years (to comply with this requirement, works cited should be at least 70 percent complete) or as stated in the Bidding Data;

(c) proposals for the timely acquisition (own, lease, hire, etc.) of the essential equipment listed in the Bidding Data;

(d) a Contract Manager with a university degree with three years' experience in works of an equivalent nature and volume, including no less than one years as Manager; and

(e) liquid assets and/or credit facilities, net of other contractual commitments and exclusive of any advance payments which may be made under the Contract, of no less than the amount specified in the Bidding Data.

(f) A consistent history of litigation or arbitration awards against the Applicant or any partner of a Joint Venture may result in disqualification.

4.6 The figures for each of the partners of a joint venture shall be added together to determine the Bidder's compliance with the minimum qualifying criteria of Sub-Clause 4.5(a), (b) and (e); however, for a joint venture to qualify, all partners combined must meet all the qualification requirements under 4.5 and each of its partners must meet at least 25 percent and the partner in-charge at least 40 percent of the minimum requirement under 4.5(a), and for criteria 4.5 (b) at least one partner shall meet the requirement of at least one contract

of a nature, size and complexity equivalent to the Works over the last 5 years (to comply with this requirement, works cited should be at least 70 percent complete). Failure to comply with this requirement will result in rejection of the joint venture's Bid. Subcontractors' experience and resources will not be taken into account in determining the Bidder's compliance with the qualifying criteria, unless otherwise stated in the Bidding Data.

5. One Bid per Bidder

5.1 Each Bidder shall submit only one Bid, either individually or as a partner in a joint venture. A Bidder who submits or participates in more than one Bid (other than as a subcontractor or in cases of alternatives that have been permitted or requested) will cause all the proposals with the Bidder's participation to be disqualified.

6. Cost of Bidding

6.1 The Bidder shall bear all costs associated with the preparation and submission of his Bid, and the Employer will in no case be responsible or liable for those costs.

7. Site Visit

7.1 The Bidder, at the Bidder's own responsibility and risk, is encouraged to visit and examine the Site of Works and its surroundings and obtain all information that may be necessary for preparing the Bid and entering into a contract for construction of the Works. The costs of visiting the Site shall be at the Bidder's own expense.

B. Bidding Documents

8. Content of Bidding Documents

8.1 The set of bidding documents comprises the documents listed in the table below and addenda issued in accordance with Clause 10:

Volume 1

Section	1.	Instructions to Bidders
Section	2.	Conditions of Contract
Section	3.	Forms of Bid and Qualification
Section	4.	Forms of Securities

Volume 2

Section	5.	Bidding Data
Section	6.	Contract Data
Section	7.	Specifications
Section	8.	Drawings
Section	9.	Bill of Quantities or Activity Schedule for lump sum contracts

8.2 The number of copies to be completed and returned with the Bid is specified in the Bidding Data.

9. Clarification of Bidding Documents

9.1 A prospective Bidder requiring any clarification of the bidding documents may notify the PCU in writing at the PCU's email address indicated in the invitation to bid. The PCU will respond to any request for clarification received earlier than 21 days prior to the deadline for submission of bids. Copies of the PCU's response will be forwarded to all purchasers of the bidding documents, including a description of the inquiry, but without identifying its source.

10. Amendment of Bidding Documents

10.1 Before the deadline for submission of bids, the PCU may modify the bidding documents by issuing addenda.

10.2 Any addendum thus issued shall be part of the bidding documents and shall be communicated in writing to all purchasers of the bidding documents. Prospective bidders shall acknowledge receipt of each addendum in writing to the Employer.

10.3 To give prospective bidders reasonable time in which to take an addendum into account in preparing their bids, the Employer shall extend, as necessary, the deadline for submission of bids, in accordance with Sub-Clause 20.2 below.

C. Preparation of Bids

11. Language of Bid

11.1 All documents relating to the Bid shall be in the English language. All correspondence related to the bid exchanged between the Bidder and the PCU must be written in English. Where the supporting documents indicated in Clause 4 are not in English, a translation into English is required in order to facilitate the evaluation of the documents

12. Documents Comprising the Bid

12.1 The Bid submitted by the Bidder shall comprise the following:

(a) The Bid (in the format indicated in Section 3);

(b) Bid Security in accordance with Clause 16, if required;

(c) priced Bill of Quantities or priced Activity Schedule;

(d) Qualification Information Form and Documents required in clause 4 and as specified in the bidding data;

(e) Alternative offers where invited;

and any other materials required to be completed and submitted by bidders, as specified in the Bidding Data.

13. Bid Prices

13.1 The Contract shall be for the whole Works, as described in Sub-Clause 1.1, based on the priced Bill of Quantities / priced Activity Schedule for lump sum contracts submitted by the Bidder. The type of contract (Unit Price or Lump Sum) shall be specified in the Bidding Data.

13.2 The Bidder shall fill in rates and prices for all items of the Works described in the Bill of Quantities (for lump sum contracts, described in the drawings and specifications and listed in the Activity Schedule). Items for which no rate or price is entered by the Bidder will not be paid for by the Employer when executed and shall be deemed covered by the other rates and prices in the Bill of Quantities/Activity Schedule.

13.3 All duties, taxes, and other levies payable by the Contractor under the Contract, or for any other cause, as of the date 28 days prior to the deadline for submission of bids, shall be included in the rates, prices, and total Bid price submitted by the Bidder (for lump sum contracts, "the rates and prices" are not applicable).

13.4 The rates and prices (or the lump sum price, as appropriate) quoted by the Bidder shall be subject to adjustment during the performance of the Contract if provided for in the Bidding and Contract Data and the provisions of Clause 44 of the Conditions of Contract. The Bidder shall submit with the Bid all the information required under the Contract Data and Clause 44 of the Conditions of Contract.

13.5 All lots (contracts) and items must be listed and priced separately in the Price Schedules. If so specified in ITB 1.1, bids are invited for individual lots (contracts) or for any combination of lots (packages). Bidders are allowed to quote separate prices for one or more lot. Bidders wishing to offer discounts for the award of more than one Contract shall specify in their bid the price reductions applicable to each package, or alternatively, to individual Contracts within the package. Discounts shall be submitted in accordance with ITB 22.5, provided the bids for all lots (contracts) are opened at the same time.

14. Currency of Bid and Payment

14.1 The unit rates and prices (or the lump sum price for lump-sum contracts) shall be quoted in the Bill of Quantities (or activity Schedule \ for lump-sum contract) by the Bidder entirely in the currency of the Employer's country specified in the Bidding Data.

15. Bid Validity

15.1 Bids shall remain valid for the period specified in the Bidding Data.

15.2 In exceptional circumstances, the Employer may request that the bidders extend the period of validity for a specified additional period. The request and the bidders' responses shall be made in writing. A Bidder may refuse the request without forfeiting the Bid Security. A Bidder agreeing to the request will not be required or permitted to otherwise modify the Bid, but will be required to extend the validity of Bid Security for the period of the extension, and in compliance with Clause 16 in all respects.

16. Bid Security

16.1 The Bidder shall furnish, as part of the Bid, a Bid Security in original form as specified in the Bidding Data.

16.2 The Bid Security shall be in the amount specified in the Bidding Data and denominated in the currency of the Employer's country and, at the Bidder's option, be in the form of a bank guarantee from a local bank which has been determined by the Bidder to be acceptable to the Employer. The format of the Bid Security should be substantially in accordance with the forms of Bid Security (Bank Guarantee) included in Annex A in Section 4. The Bid Security shall be valid for 30 days beyond the validity of the Bid, as extended, if applicable, in accordance with Sub-Clause 15.2.

16.3 Any Bid not accompanied by a substantially responsive Bid Security shall be rejected by the Employer. The Bid Security of a joint venture must define a "bidder" as all joint venture partners and list them in the following manner: a joint venture consisting of "_____", "_____", and "_____.

16.4 The Bid Security of unsuccessful bidders will be returned within 28 days of the end of the Bid validity period specified in Sub-Clause 15.1.

16.5 The Bid Security of the successful Bidder will be discharged when the Bidder has signed the Agreement and furnished the required Performance Security.

16.6 The Bid Security may be forfeited

(a) if the Bidder withdraws the Bid after Bid opening during the period of Bid validity;

(b) if the Bidder does not accept the correction of the Bid price, pursuant to Clause 27; or

(c) in the case of a successful Bidder, if the Bidder fails within the specified time limit to

(i) sign the Agreement; or

(ii) furnish the required Performance Security.

16.7 If a bid security is not required in the Bidding Data, and

(a) if a Bidder withdraws its bid during the period of bid validity specified by the Bidder on the Letter of Bid Form, except as provided in ITB 15.2, or

(b) if the successful Bidder fails to: sign the Agreement in accordance with ITB 31; or furnish a performance security in accordance with ITB 32;

the Borrower may**,** if provided for in the Bidding Data**,** declare the Bidder disqualified to be awarded a contract by the Employer for a period of time as stated in the Bidding Data.

17. Alternative Proposals by Bidders

17.1 Alternatives shall not be considered, unless specifically allowed in the Bidding Data**.** If so allowed, Sub-Clauses 17.1 and 17.2 shall govern, and Bidding Data shall specify which of the following options shall be allowed:

(a) Option One. A bidder may submit alternative bids with the base bid and the Employer shall only consider the alternative bids offered by the Bidder whose bid for the base case was determined to be the lowest-evaluated bid, or

(b) Option Two. A bidder may submit an alternative bid with or without a bid for the base case. All bids received, for the base case, as well as alternative bids meeting the technical specifications and performance requirements pursuant to Section 7, shall be evaluated on their own merits.

17.2 Alternative bids shall provide all information necessary for a complete evaluation of the alternative by the Employer, including design calculations, technical specifications, breakdown of prices, proposed construction methods and other relevant details.

18. Format and Signing of Bid

18.1 The Bidder shall prepare one original of the documents comprising the Bid as described in Clause 12 of these Instructions to Bidders, bound with the volume containing the Form of Bid, and clearly marked "**ORIGINAL**". In addition, the Bidder shall submit copies of the Bid, in the number specified in the Bidding Data, clearly marked as "**COPIES**". In the event of discrepancy between them, the original shall prevail.

18.2 The original and all copies of the Bid shall be typed or written in indelible ink and shall be signed by a person or persons duly authorized to sign on behalf of the Bidder, pursuant to Sub-Clauses 4.3(a) or 4.4(b), as the case may be. All pages of the Bid where entries or amendments have been made shall be initialed by the person or persons signing the Bid.

18.3 The Bid shall contain no alterations or additions, except those to comply with instructions issued by the Employer, or as necessary to correct errors made by the Bidder, in which case such corrections shall be initialed by the person or persons signing the Bid.

18.4 The Bidder shall furnish information as described in the Form of Bid on commissions or gratuities, if any, paid or to be paid to agents relating to this Bid, and to contract execution if the Bidder is awarded the contract.

D. Submission of Bids

19. Sealing and Marking of Bids

19.1 Bidders may submit their bids by mail or by hand. When so specified in the Bidding Data, bidders shall have the option of submitting their bids electronically. Bidders submitting bids electronically shall follow the procedures specified in the Bidding Data. The Bidder shall seal the original and all copies of the Bid in inner envelopes and one outer envelope, duly marking the inner envelopes as "**ORIGINAL**" and "**COPIES**".

19.2 The inner and outer envelopes shall

(a) be addressed to the Employer at the address provided in the Bidding Data;

(b) bear the name and identification number of the Contract as defined in the Bidding and Contract Data; and

(c) provide a warning not to open before the specified time and date for Bid opening as defined in the Bidding Data.

19.3 In addition to the identification required in Sub-Clause 19.2, the inner envelopes shall indicate the name and address of the Bidder to enable the Bid to be returned unopened in case it is declared late, pursuant to Clause 21.

19.4 If the outer envelope is not sealed and marked as above, the Employer will assume no responsibility for the misplacement or premature

opening of the Bid.

20. Deadline for Submission of Bids

20.1 Bids shall be delivered to the Employer at the address specified in Clause 19.2 (a) above no later than the time and date specified in the Bidding Data.

20.2 The PCU may extend the deadline for submission of bids by issuing an amendment in accordance with Clause 10, in which case all rights and obligations of the Employer and the bidders previously subject to the original deadline will then be subject to the new deadline.

21. Late Bids

21.1 Any Bid received by the Employer after the deadline prescribed in Clause 20 will be returned unopened to the Bidder.

22. Modification and Withdrawal of Bids

22.1 Bidders may modify or withdraw their bids by giving notice in writing before the deadline prescribed in Clause 20.

22.2 Each Bidder's modification or withdrawal notice shall be prepared, sealed, marked, and delivered in accordance with Clauses 18 and 19, with the outer and inner envelopes additionally marked "**MODIFICATION**" or "**WITHDRAWAL**", as appropriate.

22.3 No Bid may be modified after the deadline for submission of Bids.

22.4 Withdrawal of a Bid between the deadline for submission of bids and the expiration of the period of Bid validity specified in the Bidding Data or as extended pursuant to Sub-Clause 15.2 will result in the forfeiture of the Bid Security pursuant to Clause 16.

22.5 Bidders may only offer discounts to, or otherwise modify the prices of their bids by submitting Bid modifications in accordance with this clause, or included in the original Bid submission.

E. Bid Opening and Evaluation

23. Bid Opening

23.1 The Evaluation committee will open the bids, including modifications made pursuant to Clause 22, in the presence of the bidders' representatives who choose to attend at the time and in the place specified in the Bidding Data. Any specific opening procedures required if electronic bidding is permitted in accordance with Sub-Clause 19.1, shall be as specified in the Bidding Data.

23.2 The bidders' names, the Bid prices, the total amount of each Bid and of any alternative Bid (if alternatives have been requested or permitted), any discounts, Bid modifications and withdrawals, the presence or

absence of Bid Security, if required, and such other details as the Employer may consider appropriate, will be announced by the Employer at the opening.

23.3 The Evaluation committee will prepare minutes of the Bid opening, including the information disclosed to those present in accordance with Sub-Clause 23.2.

24. Process to Be Confidential

24.1 Information relating to the examination, clarification, evaluation, and comparison of bids and recommendations for the award of a contract shall not be disclosed to bidders or any other persons not officially concerned with such process until publication of the award to the successful Bidder has been announced.

25. Clarification of Bids and Contacting the Employer

25.1 To assist in the examination, evaluation, and comparison of bids, the Evaluation committee may, ask any Bidder for clarification of the Bidder's Bid, including breakdowns of unit rates (or the prices in the Activity Schedule for lump-sum contracts). The request for clarification and the response shall be in writing, but no change in the price or substance of the Bid shall be sought, offered, or permitted except as required to confirm the correction of arithmetic errors discovered by the Employer Evaluation Committee in the -evaluation of the bids in accordance with Clause 27.

25.2 From the time of bid opening until publication of contract award, if any bidder wishes to contact the Employer on any matter related to the bidding process, it should do so in writing to the same email address requiring clarification about the bid and as mentioned in the Bidding data.

25.3 Any effort by the Bidder to influence the Evaluation committee or the Employer in the process of bid evaluation, bid comparison or contract award decisions may result in the rejection of the Bidders' bid.

26. Examination of Bids

26.1 Prior to the detailed evaluation of bids, the Evaluation committee will determine whether each Bid (a) meets the eligibility criteria defined in Clause 3; (b) has been properly signed; (c) is accompanied by a substantially acceptable Bid Security as mentioned in Annex B section 4, if required; and (d) is substantially responsive to the requirements of the bidding documents.

26.2 A substantially responsive Bid is one which conforms to all the terms, conditions, and specifications of the bidding documents, without material deviation or reservation. A material deviation or reservation is one (a) which affects in any substantial way the scope, quality, or performance of the Works; (b) which limits in any substantial way, inconsistent with the bidding documents, the Employer's rights or the

Bidder's obligations under the Contract; or (c) whose rectification would affect unfairly the competitive position of other bidders presenting substantially responsive bids.

26.3 If a Bid is not substantially responsive, it will be rejected by the Evaluation committee, and may not subsequently be made responsive by correction or withdrawal of the nonconforming deviation or reservation.

27. Correction of Errors

27.1 Bids determined to be substantially responsive will be checked by the Evaluation committee for any arithmetic errors. Errors will be corrected by the Committee as follows:

(a) where there is a discrepancy between the amounts in figures and in words, the amount in words will govern; and

(b) where there is a discrepancy between the unit rate and the line item total resulting from multiplying the unit rate by the quantity, the unit rate as quoted will govern, unless in the opinion of the Employer there is an obviously gross misplacement of the decimal point in the unit rate, in which case the line item total as quoted will govern, and the unit rate will be corrected.

27.2 The amount stated in the Bid will be adjusted by the Employer in accordance with the above procedure for the correction of errors and, with the concurrence of the Bidder, shall be considered as binding upon the Bidder. If the Bidder does not accept the corrected amount, the Bid will be rejected, and the Bid Security may be forfeited in accordance with Sub-Clause 16.6(b).

28. Evaluation and Comparison of Bids

28.1 The Evaluation committee will evaluate and compare only the bids determined to be substantially responsive in accordance with Clause 26.

28.2 Bids will be evaluated lot by lot. In evaluating the bids, the Evaluation committee will determine for each Bid the evaluated Bid price by adjusting the Bid price as follows:

(a) making any correction for errors pursuant to Clause 27;

(b) excluding provisional sums and the provision, if any, for contingencies in the Bill of Quantities (or Activity Schedule for lump sum contracts), but including Day-work, where priced competitively;

(c) making an appropriate adjustment for any other acceptable

variations, deviations, or alternative offers submitted in accordance with Clause 17; and

(d) making appropriate adjustments to reflect discounts or other price modifications offered in accordance with Sub-Clause 22.5.

(e) If the Bidding Document allows Bidders to quote separate prices for different lots (contracts), the methodology to determine the lowest evaluated price of the contract combinations, including any discounts offered in the Letter of Bid is done as follows: Bids will be evaluated lot-wise, taking into account discounts offered, if any, for combined lots. The contract(s) will be awarded to the Bidder or Bidders offering the lowest evaluated cost to the Employer for combined lots, subject to the selected Bidder(s) meeting the required qualification criteria for lot or combination of lots as the case may be.

28.3 The Employer reserves the right to accept or reject any variation, deviation, or alternative offer. Variations, deviations, and alternative offers and other factors which are in excess of the requirements of the bidding documents or otherwise result in unsolicited benefits for the Employer will not be taken into account in Bid evaluation.

28.4 The estimated effect of any price adjustment conditions under Clause 46 of the Conditions of Contract, during the period of implementation of the Contract, will not be taken into account in Bid evaluation.

F. Award of Contract

29. Award Criteria

29.1 Subject to Clause 30, the Employer will award the Contract to the Bidder whose Bid has been determined to be substantially responsive to the bidding documents and who has offered the lowest evaluated Bid price, provided that such Bidder has been determined to be (a) eligible in accordance with the provisions of Clause 3, and (b) qualified in accordance with the provisions of Clause 4.
Each Lot will be awarded separately.

30. Employer's Right to accept any Bid and to reject any or all Bids

30.1 Notwithstanding Clause 29, the Employer reserves the right to accept or reject any Bid, and to cancel the bidding process and reject all bids, at any time prior to the award of Contract, without thereby incurring any liability to the affected Bidder or bidders or any obligation to inform the affected Bidder or bidders of the grounds for the Employer's action.

31. Notification of Award and Signing of Agreement

31.1 The Bidder whose Bid has been accepted will be notified of the award by the Employer prior to expiration of the Bid validity period in writing. The letter (hereinafter and in the Conditions of Contract called the "Letter of Acceptance") will state the sum that the Employer will pay the Contractor in consideration of the execution, completion, and maintenance of the Works by the Contractor as prescribed by the Contract (hereinafter and in the Contract called the "Contract Price").

31.2 The notification of award will constitute the formation of the Contract, subject to the Bidder furnishing the Performance Security in accordance with Clause 32 and signing the Agreement in accordance with Sub-Clause 31.3.

After the contract has been signed and the successful bidder has provided the performance guarantee in accordance with Clause 32, the Employer will promptly notify the other bidders that their bids have not been successful and release their tender guarantees.

31.3 The Agreement will incorporate all agreements between the Employer and the successful Bidder. It will be signed by the Employer and sent to the successful Bidder, within 28 days following the notification of award along with the Letter of Acceptance. Within 21 days of receipt, the successful Bidder will sign the Agreement and deliver it to the Employer.

31.4 The Employer shall publish in the national press the results identifying the bid and lot numbers and the following information: (i) name of each bidder who submitted a bid; (ii) bid prices as read out at bid opening; (iii) name and evaluated prices of each bid that was evaluated; (iv) name of bidders whose bids were rejected and the reasons for their rejection; and (v) name of the winning bidder, and the price it offered, as well as the duration and summary scope of the contract awarded. After publication of the award, unsuccessful bidders may request in writing to the Employer for a debriefing seeking explanations for the failure of their bids. The Employer shall promptly respond in writing to any unsuccessful Bidder who, after publication of contract award requests the Employer in writing to explain on which grounds its bid was not selected.

32. Performance Security

32.1 Within 21 days after receipt of the Letter of Acceptance the successful Bidder shall deliver to the Employer a Performance Security in the amount stipulated in the Contract Data and in the form stipulated in the Bidding Data.

32.2 If the Performance Security is provided by the successful Bidder in the form of a Bank Guarantee, it shall be issued by a local bank.

32.3 Failure of the successful Bidder to comply with the requirements of Sub-Clause 32.1 shall constitute sufficient grounds for cancellation of the award and forfeiture of the Bid Security.

33. Advance Payment and Security

33.1 The Employer will provide an Advance Payment on the Contract price as stipulated in the Conditions of Contract, subject to a maximum amount, as stated in the Bidding Data. The Advance Payment shall be guaranteed by a Security. Section 4 "Security Forms" provides a Bank Guarantee for Advance Payment form.

34. Payment Conditions

34.1 Payment shall be made in United States Dollars, no later than thirty (30) days following submission by the Consultant of invoices in duplicate to the Coordinator designated in paragraph 4. Payments shall be made to Contractor's bank account.

34.2 Payments of above US$ 10,000 equivalent may be paid directly by the International Fund for Agricultural Development (IFAD) (herein after called "the Financier") to the Contractor's bank account.

35. Adjudicator

35.1 Not Applicable.

36. Ethics clauses

36.1 The Contractor and its staff are obliged to maintain professional secrecy for the entire duration of the contract and after its completion. All reports and documents drawn up or received by the Contractor are confidential.

36.2 The Contractor must at all times act impartially and as a faithful adviser in accordance with the code of conduct of its profession. It must refrain from making public statements about the project or services without the Employer prior approval. It may not commit the Employer in any way without its prior written consent.

37. Fraud and Corruption

37.1 It is the Financier's policy to require that Borrowers (including beneficiaries of Financier grants), as well as bidders, suppliers, and contractors and their agents (whether declared or not), personnel, subcontractors, sub-consultants, service providers and suppliers, under Financier-financed contracts, observe the highest standard of ethics during the procurement and execution of such contracts[44].

In this regard, IFAD requires compliance with the "Revised IFAD Policy on Preventing Fraud and Corruption in its Activities and Operations" in regard to corrupt and fraudulent practices. Details

[44] In this context, any action taken by a bidder, supplier, contractor, or any of its personnel, agents, sub-consultants, sub-contractors, service providers, suppliers and/or their employees to influence the procurement process or contract execution for undue advantage is improper.

of this policy are found at the following link:

https://www.ifad.org/en/document-detail/asset/40189695

37.2 Furthermore, Bidders shall be aware of the provision stated in sub-clause 23.2 and sub-clause 61.1 of the Conditions of Contract.

38. Cancellation of the tender procedure

38.1 In the event of cancellation of a tender procedure, tenderers will be notified by the Employer if the tender procedure is cancelled before the tender opening session, the sealed envelopes will be returned, unopened, to the tenderers.

Cancellation may occur, for example, where:

(i) the tender procedure has been unsuccessful, namely where no qualitatively or financially worthwhile tender has been received or there has been no valid response at all;

(ii) the economic or technical parameters of the project have been fundamentally altered;

(iii) exceptional circumstances or force majeure render normal execution of the project impossible;

(iv) All technically compliant tenders exceed the financial resources available;

(v) there have been irregularities in the procedure, in particular where these have prevented fair competition;

Section 2. Conditions of Contract

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Section 2. Conditions of Contract

A. General

1. Definitions

1.1 Terms that are defined in the Contract Data are not also defined in the Conditions of Contract but keep their defined meanings. Boldface type is used to identify defined terms.

Bill of Quantities means the priced and completed Bill of Quantities forming part of the Bid.

Certificate of Completion is the certificate issued by the Project Manager upon completion of the Works, as provided for in Clause 52 hereunder.

Compensation Events are those defined in Clause 42 hereunder.

The **Completion Date** is the date of completion of the Works as certified by the Project Manager, in accordance with Sub-Clause 52.1.

The **Contract** is the Contract between the Employer and the Contractor to execute, complete, and maintain the Works. It consists of the documents listed in Clause 2.1 below.

The **Contractor** is a person or corporate body whose Bid to carry out the Works has been accepted by the Employer.

The **Contractor's Bid** is the completed bidding document submitted by the Contractor to the Employer.

The **Contract Price** is the price stated in the Letter of Acceptance and thereafter as adjusted in accordance with the provisions of the Contract.

Days are calendar days; **months** are calendar months.

Day-works are varied work inputs subject to payment on a time basis for the Contractor's employees and Equipment, in addition to payments for associated Materials and Plant.

A **Defect** is any part of the Works not completed in accordance with the Contract.

The **Defects Liability Period** is the period named in the Contract

Data and calculated from the Completion Date.

Drawings include calculations and other information provided or approved by the Project Manager for the execution of the Contract.

The **Employer** is the party who employs the Contractor to carry out the Works.

Equipment is the Contractor's machinery and vehicles brought temporarily to the Site to construct the Works.

The **Initial Contract Price** is the Contract Price listed in the Employer's Letter of Acceptance.

The **Intended Completion Date** is the date on which it is intended that the Contractor shall complete the Works. The Intended Completion Date is specified in the Contract Data. The Intended Completion Date may be revised only by the Project Manager by issuing an extension of time or an acceleration order.

Materials are all supplies, including consumable, used by the Contractor for incorporation in the Works.

Plant is any integral part of the Works that shall have a mechanical, electrical, chemical, or biological function.

The **Project Manager** is the person named in the Contract Data (or any other competent person appointed by the Employer and notified to the Contractor, to act in replacement of the Project Manager) who is responsible for supervising the execution of the Works and administering the Contract.

The **Site** is the area defined as such in the Contract Data.

Site Investigation Reports are those that were included in the bidding documents and are factual and interpretative reports about the surface and subsurface conditions at the Site.

Specification means the Specification of the Works included in the Contract and any modification or addition made or approved by the Project Manager.

The **Start Date** is given in the Contract Data. It is the latest date when the Contractor shall commence execution of the Works. It does not necessarily coincide with any of the Site Possession Dates.

A **Subcontractor** is a person or corporate body who has a Contract with the Contractor to carry out a part of the work in the Contract, which includes work on the Site.

Temporary Works are works designed, constructed, installed, and removed by the Contractor that are needed for construction or installation of the Works.

A **Variation** is an instruction given by the Project Manager which varies the Works.

The **Works** are what the Contract requires the Contractor to construct, install, and turn over to the Employer, as defined in the Contract Data.

2. Interpretation

2.1 The documents forming the Contract shall be interpreted in the following order of priority:

(1) Agreement,
(2) Letter of Acceptance,
(3) Contractor's Bid,
(4) Contract Data,
(5) Conditions of Contract,
(6) Specifications,
(7) Drawings,
(8) Bill of Quantities or Activity Schedule and
(9) any other document listed in the Contract Data as forming part of the Contract.

3. Language and Law

3.1 The language of the Contract and the law governing the Contract are stated in the Contract Data.

4. Project Manager's Decisions

4.1 Except where otherwise specifically stated, the Project Manager will decide contractual matters between the Employer and the Contractor in the role representing the Employer.

4.2 The Project Manager shall obtain the specific approval of the Employer before instructing a Variation that would increase the Initial Contract value in excess of 15%. Any increase in price, including the net cumulative value of successive variations, cannot exceed 50 % of the initial contract value.

4.3 An Addendum must be issued and signed by both parties when the changes entail an increase or reduction of the total value of the works in excess of 15 % of the initial contract price.

4.4 Modifications to contract amounts may entail changes for the financial guarantees linked to the contract.

5. Delegation

5.1 The Project Manager may delegate any of his duties and responsibilities to other people, except to the Adjudicator, after notifying the Contractor, and may cancel any delegation after notifying the Contractor.

6.Communications

6.1 Communications between parties that are referred to in the Conditions shall be effective only when in writing. A notice shall be effective only when it is delivered.

7. Sub-contracting

7.1 The Contractor may subcontract with the approval of the Project Manager, but may not assign the Contract without the approval of the Employer in writing. Subcontracting shall not alter the Contractor's obligations.

8. Other Contractors

8.1 The Contractor shall cooperate and share the Site with other contractors, public authorities, utilities, and the Employer between the dates given in the Schedule of Other Contractors, as referred to in the Contract Data. The Contractor shall also provide facilities and services for them as described in the Schedule. The Employer may modify the Schedule of Other Contractors, and shall notify the Contractor of any such modification.

9. Personnel

9.1 The Contractor shall employ the key personnel named in the Schedule of Key Personnel, as referred to in the Contract Data, to carry out the functions stated in the Schedule or other personnel approved by the Project Manager. The Project Manager will approve any proposed replacement of key personnel only if their relevant qualifications and abilities are substantially equal to or better than those of the personnel listed in the Schedule.

9.2 If the Project Manager asks the Contractor to remove a person who is a member of the Contractor's staff or work force, stating the reasons, the Contractor shall ensure that the person leaves the Site within seven days and has no further connection with the work in the Contract.

10. Employer's and Con-tractor's Risks

10.1 The Employer carries the risks which this Contract states are Employer's risks, and the Contractor carries the risks which this Contract states are Contractor's risks.

11. Employer's Risks

11.1 From the Start Date until the Defects Liability Certificate has been issued, the following are Employer's risks:

(a) The risk of personal injury, death, or loss of or damage to

property (excluding the Works, Plant, Materials, and Equipment), which are due to

(i) use or occupation of the Site by the Works or for the purpose of the Works, which is the unavoidable result of the Works or

(ii) negligence, breach of statutory duty, or interference with any legal right by the Employer or by any person employed by or contracted to him except the Contractor.

(b) The risk of damage to the Works, Plant, Materials, and Equipment to the extent that it is due to a fault of the Employer or in the Employer's design, or due to war or radioactive contamination directly affecting the country where the Works are to be executed.

11.2 From the Completion Date until the Defects Liability Certificate has been issued, the risk of loss of or damage to the Works, Plant, and Materials is an Employer's risk except loss or damage due to

(a) a Defect which existed on the Completion Date,

(b) an event occurring before the Completion Date, which was not itself an Employer's risk, or

(c) the activities of the Contractor on the Site after the Completion Date.

12. Contractor's Risks

12.1 From the Start Date until the Defects Liability Certificate has been issued, the risks of personal injury, death, and loss of or damage to property (including, without limitation, the Works, Plant, Materials, and Equipment) which are not Employer's risks are Contractor's risks.

13. Insurance

13.1 The Contractor shall provide, in the joint names of the Employer and the Contractor, insurance cover from the Start Date to the end of the Defects Liability Period, in the amounts and deductibles stated in the Contract Data for the following events which are due to the Contractor's risks:

(a) loss of or damage to the Works, Plant, and Materials;

(b) loss of or damage to Equipment;

(c) loss of or damage to property (except the Works, Plant,

Materials, and Equipment) in connection with the Contract; and

(d) personal injury or death.

13.2 Policies and certificates for insurance shall be delivered by the Contractor to the Project Manager for the Project Manager's approval before the Start Date. All such insurance shall provide for compensation to be payable in the types and proportions of currencies required to rectify the loss or damage incurred.

13.3 If the Contractor does not provide any of the policies and certificates required, the Employer may effect the insurance which the Contractor should have provided and recover the premiums the Employer has paid from payments otherwise due to the Contractor or, if no payment is due, the payment of the premiums shall be a debt due.

13.4 Alterations to the terms of an insurance shall not be made without the approval of the Project Manager.

13.5 Both parties shall comply with any conditions of the insurance policies.

14. Site Investigation Reports

14.1 The Contractor, in preparing the Bid, shall rely on any Site Investigation Reports referred to in the Contract Data, supplemented by any information available to the Bidder.

15. Queries about the Contract Data

15.1 The Project Manager will clarify queries on the Contract Data.

16. Contractor to Construct the Works

16.1 The Contractor shall construct and install the Works in accordance with the Specifications and Drawings.

17. The Works to Be Completed by the Intended Completion Date

17.1 The Contractor may commence execution of the Works on the Start Date and shall carry out the Works in accordance with the Program submitted by the Contractor, as updated with the approval of the Project Manager, and complete them by the Intended Completion Date.

18. Approval by the Project Manager

18.1 The Contractor shall submit Specifications and Drawings showing the proposed Temporary Works to the Project Manager, who is to approve them if they comply with the Specifications and Drawings.

18.2 The Contractor shall be responsible for design of Temporary Works.

18.3 The Project Manager's approval shall not alter the Contractor's responsibility for design of the Temporary Works.

18.4 The Contractor shall obtain approval of third parties to the design of the Temporary Works, where required.

18.5 All Drawings prepared by the Contractor for the execution of the temporary or permanent Works, are subject to prior approval by the Project Manager before this use.

19. Safety

19.1 The Contractor shall be responsible for the safety of all activities on the Site.

20. Discoveries

20.1 Anything of historical or other interest or of significant value unexpectedly discovered on the Site shall be the property of the Employer. The Contractor shall notify the Project Manager of such discoveries and carry out the Project Manager's instructions for dealing with them.

21. Possession of the Site

21.1 The Employer shall give possession of all parts of the Site to the Contractor. If possession of a part is not given by the date stated in the Contract Data, the Employer will be deemed to have delayed the start of the relevant activities, and this will be a Compensation Event.

22. Access to the Site

22.1 The Contractor shall allow the Project Manager and any person authorized by the Project Manager access to the Site and to any place where work in connection with the Contract is being carried out or is intended to be carried out.

23. Instructions, Inspections and Audits

23.1 The Contractor shall carry out all instructions of the Project Manager which comply with the applicable laws where the Site is located.

23.2 The Contractor shall permit, and shall cause its Subcontractors and sub-consultants to permit, the Financier and/or persons appointed by the Financier to inspect the Site and all accounts and records relating to the performance of the Contract and the submission of the bid, and to have such accounts and records audited by auditors appointed by the Financier if requested by the Financier. The Contractor's and its Subcontractors' and sub-consultants' attention is drawn to Sub-Clause 61.1[Corrupt or Fraudulent Practices] which provides, inter alia, that acts intended to materially impede the exercise of the Financier's inspection and audit rights provided for under Sub-Clause 23.2 constitute a prohibited practice subject to contract termination (as well as to a determination of ineligibility pursuant to the Financier's prevailing sanctions procedures).

24. Disputes

24.1 If the Contractor believes that a decision taken by the Project Manager was either outside the authority given to the Project Manager by the Contract or that the decision was wrongly taken, the decision shall be referred to the competent court in the Republic of Lebanon within 14 days of the notification of the Project Manager's decision.

25. Procedure for Disputes

25.1 Any dispute arising out of or in connection with this Contract shall be settled by means of negotiations between the parties. In case if the parties didn't come to an agreement for the disputed issue then any party may apply to the competent court in the Republic of Lebanon. In that case the final regulation of the disputed issue will be the resolution of court entered into force

26. Replacement of Adjudicator

26.1 Not applicable.

B. Time Control

27. Program

27.1 Within the time stated in the Contract Data, the Contractor shall submit to the Project Manager for approval a Program showing the general methods, arrangements, order, and timing for all the activities in the Works.

27.2 An update of the Program shall be a program showing the actual progress achieved on each activity and the effect of the progress achieved on the timing of the remaining work, including any changes to the sequence of the activities.

27.3 The Contractor shall submit to the Project Manager for approval an updated Program at intervals no longer than the period stated in the Contract Data. If the Contractor does not submit an updated Program within this period, the Project Manager may withhold the amount stated in the Contract Data from the next payment certificate and continue to withhold this amount until the next payment after the date on which the overdue Program has been submitted.

27.4 The Project Manager's approval of the Program shall not alter the Contractor's obligations. The Contractor may revise the Program and submit it to the Project Manager again at any time. A revised Program shall show the effect of Variations and Compensation Events.

28. Extension of the Intended

28.1 The Project Manager shall extend the Intended Completion Date if a Compensation Event occurs or a Variation is issued which makes it

Completion Date

impossible for Completion to be achieved by the Intended Completion Date without the Contractor taking steps to accelerate the remaining work, which would cause the Contractor to incur additional cost.

28.2 The Project Manager shall decide whether and by how much to extend the Intended Completion Date within 21 days of the Contractor asking the Project Manager for a decision upon the effect of a Compensation Event or Variation and submitting full supporting information. If the Contractor has failed to give early warning of a delay or has failed to cooperate in dealing with a delay, the delay by this failure shall not be considered in assessing the new Intended Completion Date.

29. Acceleration

29.1 When the Employer wants the Contractor to finish before the Intended Completion Date, the Project Manager will obtain priced proposals for achieving the necessary acceleration from the Contractor. If the Employer accepts these proposals, the Intended Completion Date will be adjusted accordingly and confirmed by both the Employer and the Contractor.

29.2 If the Contractor's priced proposals for an acceleration are accepted by the Employer, they are incorporated in the Contract Price and treated as a Variation.

30. Delays Ordered by the Project Manager

30.1 The Project Manager may instruct the Contractor to delay the start or progress of any activity within the Works.

31. Early Warning

31.1 The Contractor shall warn the Project Manager at the earliest opportunity of specific likely future events or circumstances that may adversely affect the quality of the work, increase the Contract Price or delay the execution of the Works. The Project Manager may require the Contractor to provide an estimate of the expected effect of the future event or circumstance on the Contract Price and Completion Date. The estimate shall be provided by the Contractor as soon as reasonably possible.

31.2 The Contractor shall cooperate with the Project Manager in making and considering proposals for how the effect of such an event or circumstance can be avoided or reduced by anyone involved in the work and in carrying out any resulting instruction of the Project Manager.

C. Quality Control

32. Identifying Defects

32.1 The Project Manager shall check the Contractor's work and notify the Contractor of any Defects that are found. Such checking shall not affect the Contractor's responsibilities. The Project Manager may instruct the Contractor to search for a Defect and to uncover and test any work that the Project Manager considers may have a Defect.

33. Tests

33.1 If the Project Manager instructs the Contractor to carry out a test not specified in the Specification to check whether any work has a Defect and the test shows that it does, the Contractor shall pay for the test and any samples. If there is no Defect, the test shall be a Compensation Event.

34. Correction of Defects

34.1 The Project Manager shall give notice to the Contractor of any Defects before the end of the Defects Liability Period, which begins at Completion, and is defined in the Contract Data. The Defects Liability Period shall be extended for as long as Defects remain to be corrected.

34.2 Every time notice of a Defect is given, the Contractor shall correct the notified Defect within the length of time specified by the Project Manager's notice.

35. Uncorrected Defects

35.1 If the Contractor has not corrected a Defect within the time specified in the Project Manager's notice, the Project Manager will assess the cost of having the Defect corrected, and the Contractor will pay this amount.

D. Cost Control

36. Bill of Quantities

36.1 The Bill of Quantities (for lump sum contracts entire Clause 36 shall be replaced with a new Clause as indicated in Contract Data) shall contain items for the construction, installation, testing, and commissioning work to be done by the Contractor.

36.2 The Bill of Quantities is used to calculate the Contract Price. The Contractor is paid for the quantity of the work done at the rate in the Bill of Quantities for each item.

37. Changes in the Quantities

37.1 If the final quantity of the work done differs from the quantity in the Bill of Quantities for the particular item by more than 25 percent, provided the change exceeds 1 percent of the Initial Contract Price, the

Project Manager shall adjust the rate to allow for the change. (For lump-sum contracts, this clause shall be substituted by a new clause as indicated in Contract Data).

37.2 The Project Manager shall not adjust rates from changes in quantities if thereby the Initial Contract Price is exceeded by more than 15 percent, except with the prior approval of the Employer.

37.3 If requested by the Project Manager, the Contractor shall provide the Project Manager with a detailed cost breakdown of any rate in the Bill of Quantities.

38. Variations

38.1 All Variations shall be included in updated Programs or Activity Schedules produced by the Contractor.

39. Payments for Variations

39.1 The Contractor shall provide the Project Manager with a quotation for carrying out the Variation when requested to do so by the Project Manager. The Project Manager shall assess the quotation, which shall be given within seven days of the request or within any longer period stated by the Project Manager and before the Variation is ordered.

39.2 If the work in the Variation corresponds with an item description in the Bill of Quantities and if, in the opinion of the Project Manager, the quantity of work above the limit stated in Sub-Clause 37.1 or the timing of its execution do not cause the cost per unit of quantity to change, the rate in the Bill of Quantities shall be used to calculate the value of the Variation. If the cost per unit of quantity changes, or if the nature or timing of the work in the Variation does not correspond with items in the Bill of Quantities, the quotation by the Contractor shall be in the form of new rates for the relevant items of work. (For lump sum contracts, this Sub-clause shall be deleted as indicated in Contract Data).

39.3 If the Contractor's quotation is unreasonable, the Project Manager may order the Variation and make a change to the Contract Price, which shall be based on the Project Manager's own forecast of the effects of the Variation on the Contractor's costs.

39.4 If the Project Manager decides that the urgency of varying the work would prevent a quotation being given and considered without delaying the work, no quotation shall be given and the Variation shall be treated as a Compensation Event.

39.5 The Contractor shall not be entitled to additional payment for costs that could have been avoided by giving early warning.

40. Payment Certificates

40.1 The Contractor shall submit to the Project Manager monthly statements of the estimated value of the work executed less the cumulative amount certified previously.

40.2 The Project Manager shall check the Contractor's monthly statement and certify the amount to be paid to the Contractor.

40.3 The value of work executed shall be determined by the Project Manager.

40.4 The value of work executed shall comprise the value of the quantities of the items in the Bill of Quantities completed. (For lump sum contracts, this Sub-clause shall be substituted by a new Sub-clause as indicated in the Contract Data).

40.5 The value of work executed shall include the valuation of Variations and Compensation Events.

40.6 The Project Manager may exclude any item certified in a previous certificate or reduce the proportion of any item previously certified in any certificate in the light of later information.

41. Payments

41.1 Payments shall be adjusted for deductions for advance payments and retention. The Employer shall pay the Contractor the amounts certified by the Project Manager within 28 days of the date of each certificate. If the Employer makes a late payment, the Contractor shall be paid interest on the late payment in the next payment. Interest shall be calculated from the date by which the payment should have been made up to the date when the late payment is made at the prevailing rate of interest for commercial borrowing for each of the currencies in which payments are made.

41.2 If an amount certified is increased in a later certificate or as a result of the decision of the competent court in the Republic of Lebanon, the Contractor shall be paid interest upon the delayed payment as set out in this clause. Interest shall be calculated from the date upon which the increased amount would have been certified in the absence of dispute.

41.3 Unless otherwise stated, all payments and deductions will be paid or charged in the proportions of currencies comprising the Contract Price.

41.4 Items of the Works for which no rate or price has been entered in will

not be paid for by the Employer and shall be deemed covered by other rates and prices in the Contract.

42. Compensation Events

42.1 The following shall be Compensation Events:

(a) The Employer does not give access to a part of the Site by the Site Possession Date stated in the Contract Data.

(b) The Employer modifies the Schedule of Other Contractors in a way that affects the work of the Contractor under the Contract.

(c) The Project Manager orders a delay or does not issue Drawings, Specifications, or instructions required for execution of the Works on time.

(d) The Project Manager instructs the Contractor to uncover or to carry out additional tests upon work, which is then found to have no Defects.

(e) The Project Manager unreasonably does not approve a subcontract to be let.

(f) Ground conditions are substantially more adverse than could reasonably have been assumed before issuance of the Letter of Acceptance from the information issued to bidders (including the Site Investigation Reports), from information available publicly and from a visual inspection of the Site.

(g) The Project Manager gives an instruction for dealing with an unforeseen condition, caused by the Employer, or additional work required for safety or other reasons.

(h) Other contractors, public authorities, utilities, or the Employer does not work within the dates and other constraints stated in the Contract, and they cause delay or extra cost to the Contractor.

(i) The advance payment is delayed.

(j) The effects on the Contractor of any of the Employer's Risks.

(k) The Project Manager unreasonably delays issuing a Certificate of Completion.

(l) Other Compensation Events described in the Contract Data or determined by the Project Manager shall apply.

42.2 If a Compensation Event would cause additional cost or would prevent the work being completed before the Intended Completion Date, the Contract Price shall be increased and/or the Intended Completion Date shall be extended. The Project Manager shall decide whether and by how much the Contract Price shall be increased and whether and by how much the Intended Completion Date shall be extended.

42.3 As soon as information demonstrating the effect of each Compensation Event upon the Contractor's forecast cost has been provided by the Contractor, it shall be assessed by the Project Manager, and the Contract Price shall be adjusted accordingly. If the Contractor's forecast is deemed unreasonable, the Project Manager shall adjust the Contract Price based on the Project Manager's own forecast. The Project Manager will assume that the Contractor will react competently and promptly to the event.

42.4 The Contractor shall not be entitled to compensation to the extent that the Employer's interests are adversely affected by the Contractor's not having given early warning or not having cooperated with the Project Manager.

43. Taxes

43.1 The Project Manager shall adjust the Contract Price if taxes, duties, and other levies are changed between the date 28 days before the submission of bids for the Contract and the date of the last Certificate of Completion. The adjustment shall be the change in the amount of tax payable by the Contractor, provided such changes are not already reflected in the Contract Price or are a result of Clause 44.

44. Price Adjustment

44.1 Prices shall be adjusted for fluctuations in the cost of inputs only if provided for in the Contract Data. If so provided, the amounts certified in each payment certificate, after deducting for Advance Payment, shall be adjusted by applying the respective price adjustment factor to the payment amounts. A formula of the type indicated below applies:

$$P = A + B * Imc / Ioc$$

Where
P is the adjustment factor for the portion of the Contract Price.
A and **B** are coefficients specified in the Contract Data,

representing the nonadjustable and adjustable portions, respectively, of the Contract Price; and

Imc is the index prevailing at the end of the month being invoiced and **Ioc** is the index prevailing 28 days before Bid opening for inputs payable.

Note: The sum of the two coefficients A and B should be 1 (one) in the formula.

44.2 If the value of the index is changed after it has been used in a calculation, the calculation shall be corrected and an adjustment made in the next payment certificate. The index value shall be deemed to take account of all changes in cost due to fluctuations in costs.

45. Retention

45.1 The Employer shall retain from each payment due to the Contractor the proportion stated in the Contract Data until Completion of the whole of the Works.

45.2 On Completion of the whole of the Works, half the total amount retained shall be repaid to the Contractor and half when the Defects Liability Period has passed and the Project Manager has certified that all Defects notified by the Project Manager to the Contractor before the end of this period have been corrected.

45.3 On completion of the whole Works, the Contractor may substitute retention money with an "on demand" Bank guarantee.

46. Liquidated Damages

46.1 The Contractor shall pay liquidated damages to the Employer at the rate per day stated in the Contract Data for each day that the Completion Date is later than the Intended Completion Date. The total amount of liquidated damages shall not exceed the amount defined in the Contract Data. The Employer may deduct liquidated damages from payments due to the Contractor. Payment of liquidated damages shall not affect the Contractor's liabilities.

46.2 If the Intended Completion Date is extended after liquidated damages have been paid, the Project Manager shall correct any overpayment of liquidated damages by the Contractor by adjusting the next payment certificate. The Contractor shall be paid interest on the overpayment, calculated from the date of payment to the date of repayment, at the rates specified in Sub-Clause 41.1.

47. Bonus

47.1 The Contractor shall be paid a Bonus calculated at the rate per calendar day stated in the Contract Data for each day (less any days

for which the Contractor is paid for acceleration) that the Completion is earlier than the Intended Completion Date. The Project Manager shall certify that the Works are complete, although they may not be due to be complete.

48. Advance Payment

48.1 The Employer shall make advance payment to the Contractor of the amounts stated in the Contract Data by the date stated in the Contract Data, against provision by the Contractor of an Unconditional Bank Guarantee in a form and by a bank acceptable to the Employer in amounts and currencies equal to the advance payment. The Guarantee shall remain effective until the advance payment has been repaid, but the amount of the Guarantee shall be progressively reduced by the amounts repaid by the Contractor. Interest will not be charged on the advance payment.

48.2 The Contractor is to use the advance payment only to pay for Equipment, Plant, Materials, and mobilization expenses required specifically for execution of the Contract. The Contractor shall demonstrate that advance payment has been used in this way by supplying copies of invoices or other documents to the Project Manager.

48.3 The advance payment shall be repaid by deducting proportionate amounts from payments otherwise due to the Contractor, following the schedule of completed percentages of the Works on a payment basis. No account shall be taken of the advance payment or its repayment in assessing valuations of work done, Variations, Compensation Events, Bonuses, or Liquidated Damages.

49. Securities

49.1 The Performance Security shall be provided to the Employer no later than the date specified in the Letter of Acceptance and shall be issued in an amount and form specified in the Contract Data and by a bank or surety acceptable to the Employer. The Performance Security shall be valid until the end of the Defects Liability Period.

50. Day-works

50.1 If applicable, the Day-works rates in the Contractor's Bid shall be used for small additional amounts of work only when the Project Manager has given written instructions in advance for additional work to be paid for in that way.

50.2 All work to be paid for as Day-works shall be recorded by the Contractor on forms approved by the Project Manager. Each completed form shall be verified and signed by the Project Manager within two days of the work being done.

50.3 The Contractor shall be paid for Day-works subject to obtaining signed Day-works forms.

51. Cost of Repairs

51.1 Loss or damage to the Works or Materials to be incorporated in the Works between the Start Date and the end of the Defects Liability Period shall be remedied by the Contractor at the Contractor's cost if the loss or damage arises from the Contractor's acts or omissions.

E. Finishing the Contract

52. Completion

52.1 The Contractor shall request the Project Manager to issue a Certificate of Completion of the Works, and the Project Manager will do so upon deciding that the work is completed.

53. Taking Over

53.1 The Employer shall take over the Site and the Works within seven days of the Project Manager's issuing the Certificate of Completion.

54. Final Account

54.1 The Contractor shall supply the Project Manager with a detailed account of the total amount that the Contractor considers payable under the Contract before the end of the Defects Liability Period. The Project Manager shall issue a Defects Liability Certificate and certify any final payment that is due to the Contractor within 56 days of receiving the Contractor's account if it is correct and complete. If it is not, the Project Manager shall issue within 56 days a schedule that states the scope of the corrections or additions that are necessary. If the Final Account is still unsatisfactory after it has been resubmitted, the Project Manager shall decide on the amount payable to the Contractor and issue a payment certificate.

55. Operating and Maintenance Manuals

55.1 If "as built" Drawings and/or operating and maintenance manuals are required, the Contractor shall supply them by the dates stated in the Contract Data.

55.2 If the Contractor does not supply the Drawings and/or manuals by the dates stated in the Contract Data, or they do not receive the Project Manager's approval, the Project Manager shall withhold the amount stated in the Contract Data from payments due to the Contractor.

56. Termination

56.1 The Employer or the Contractor may terminate the Contract if the other party causes a fundamental breach of the Contract.

56.2 Fundamental breaches of Contract shall include, but shall not be limited to, the following:

(a) the Contractor stops work for 28 days when no stoppage of work

is shown on the current Program and the stoppage has not been authorized by the Project Manager;

(b) the Project Manager instructs the Contractor to delay the progress of the Works, and the instruction is not withdrawn within 28 days;

(c) the Employer or the Contractor is made bankrupt or goes into liquidation other than for a reconstruction or amalgamation;

(d) a payment certified by the Project Manager is not paid by the Employer to the Contractor within 84 days of the date of the Project Manager's certificate;

(e) the Project Manager gives Notice that failure to correct a particular Defect is a fundamental breach of Contract and the Contractor fails to correct it within a reasonable period of time determined by the Project Manager;

(f) the Contractor does not maintain a Security, which is required; and

(g) the Contractor has delayed the completion of the Works by the number of days for which the maximum amount of liquidated damages can be paid, as defined in the Contract Data.

56.3 When either party to the Contract gives notice of a breach of Contract to the Project Manager for a cause other than those listed under Sub-Clause 56.2 above or Sub-Clause 61.1 below, the Project Manager shall decide whether the breach is fundamental or not.

56.4 Notwithstanding the above, the Employer may terminate the Contract for convenience.

56.5 If the Contract is terminated, the Contractor shall stop work immediately, make the Site safe and secure, and leave the Site as soon as reasonably possible.

57. Payment upon Termination

57.1 If the Contract is terminated because of a fundamental breach of Contract by the Contractor, the Project Manager shall issue a certificate for the value of the work done and Materials ordered less advance payments received up to the date of the issue of the certificate and less the percentage to apply to the value of the work not completed, as indicated in the Contract Data. Additional Liquidated Damages shall not apply. If the total amount due to the Employer exceeds any payment due to the Contractor, the difference shall be a debt payable to

the Employer.

57.2 If the Contract is terminated for the Employer's convenience or because of a fundamental breach of Contract by the Employer, the Project Manager shall issue a certificate for the value of the work done, Materials ordered, the reasonable cost of removal of Equipment, repatriation of the Contractor's personnel employed solely on the Works, and the Contractor's costs of protecting and securing the Works, and less advance payments received up to the date of the certificate.

58. Property

58.1 All Materials on the Site, Plant, Temporary Works, and Works shall be deemed to be the property of the Employer if the Contract is terminated because of the Contractor's default.

59. Release from Performance

59.1 If the Contract is frustrated by the outbreak of war or by any other event entirely outside the control of either the Employer or the Contractor, the Project Manager shall certify that the Contract has been frustrated. The Contractor shall make the Site safe and stop work as quickly as possible after receiving this certificate and shall be paid for all work carried out before receiving it and for any work carried out afterwards to which a commitment was made.

60. Suspension of Financier Grant or Credit

60.1 In the event that the Financier suspends the Grant or Credit to the Employer from which part of the payments to the Contractor are being made:

(a) The Employer is obliged to notify the Contractor of such suspension within 7 days of having received the Financier's suspension notice.

(b) If the Contractor has not received sums due it upon the expiration of the 28 days for payment provided for in Sub clause 41.1, the Contractor may immediately issue a 14-day termination notice.

61. Corrupt or Fraudulent Practices

61.1 If the Employer determines that the Contractor and/or any of its personnel, or its agents, or its Subcontractors, sub-consultants, services providers, suppliers and/or their employees has engaged in corrupt, fraudulent, collusive, coercive or obstructive practices, in competing for or in executing the Contract, then the Employer may, after giving 14 days' notice to the Contractor, terminate the Contractor's employment under the Contract and expel him from the Site, and the provisions of Clause 56.5 shall apply.

61.2 Should any employee of the Contractor be determined to have engaged

in corrupt, fraudulent, collusive, coercive, or obstructive practice during the execution of the Works, then that employee shall be removed in accordance with Clause 9 [Personnel].

61.3 For the purposes of this Sub-Clause the definitions are adopted as follows:

(i) **"coercive practice"** is impairing or harming, or threatening to impair or harm, directly or indirectly, any party or the property of any party, to improperly influence the actions of that or another party;

(ii) **"collusive practice"** is an arrangement between two or more parties designed to achieve an improper purpose, including improperly influencing the actions of another party;

(iii) **"corrupt practice"** is the offering, giving, receiving, or soliciting, directly or indirectly, of anything of value in order to improperly influence the actions of another party;

(iv) **"fraudulent practice"** is any act or omission, including a misrepresentation, that knowingly or recklessly misleads, or attempts to mislead, a party in order to obtain a financial or other benefit or to avoid an obligation;

(v) **"obstructive practice"** is

(i) deliberate destroying, falsifying, altering or concealing evidence that may be material to an investigation by IFAD or making false statements to investigators in order to materially impede an investigation by IFAD (ii) threatening, harassing or intimidating any party in order to prevent that party from disclosing its knowledge of matters relevant to an investigation by IFAD or from pursuing such an investigation; and/or (iii) the commission of any act intended to materially impede the exercise of IFAD's contractual rights of audit, inspection and access to information.

Section 3. Forms of Bid and Qualification Information and Letter of Acceptance

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Standard Form: Contractor's Bid

Date:

To: **The Ministry of Agriculture**

Project Coordination Unit

Climate Smart Agriculture: Enhancing Adaptive Capacity of the Rural Communities in Lebanon (AgriCAL) Project

Facing Henri Chehab Barrack, Bir Hassan District, Beirut, Lebanon

Tel: 01 849 618

(a) We offer to execute the ……. *[name and procurement reference]* in accordance with the Conditions of Contract accompanying this Bid.

(b) The total price of our Bid, excluding any discounts offered in item (c) below is:

Total price of the Bid ***[insert the total price of the bid in words and figures, indicating the various amounts and the respective currencies]*;**

(c) The discounts offered and the methodology for their application are:

(i) The discounts offered are: ***[Specify in detail each discount offered.]***

(ii) The exact method of calculations to determine the net price after application of discounts is shown below*: [**Specify in detail the method that shall be used to apply the discounts**];*

(d) This Bid and your written acceptance of it shall constitute a binding Contract between us. We understand that you are not bound to accept the lowest or any Bid you receive.

(e) Commissions or gratuities, if any, paid or to be paid by us to agents relating to this Bid, and to contract execution if we are awarded the contract, are listed below:

Name and address of the agent (If none, state "none")	**Amount and Currency**	**Purpose of Commission / gratuity**

(f) We hereby confirm that this Bid complies with the Bid validity and, if required, Bid Security as required by the bidding documents and specified in the Bidding Data.

(g) We, including any subcontractors or suppliers for any part of the Contract, have nationalities from eligible countries in accordance with ITB Sub-Clause 2.2;

(h) We have no conflict of interest in accordance with ITB Sub-Clause 3.1;

(i) Our firm, its affiliates or subsidiaries—including any subcontractors or suppliers for any part of the contract—has not been declared ineligible by the [insert name of the donor], or under the Employer's country laws or official regulations, in accordance with ITB Sub-Clause 3.3.

Authorized Signature: ……

Name and Title of Signatory: ……

Name of Bidder: ……

Address: ……

Standard Form: Qualification Information

1. Individual Bidders or Individual Members of Joint Ventures

1.1 Constitution or legal status of Bidder *[attach copy]*

Date and Place of registration: _____

Principal place of business: _____

Power of attorney of signatory of Bid *[attach]*

1.2 Total annual volume of construction work performed in the last five (5) years, in local currency

2015	
2016	
2017	
2018	
2019	

1.3 Work performed on works of a similar nature and complexity comparable to the works of this bid over the last Five (5) years. The values should be indicated in the same currency used for Item 1.2 above.

Project name and country	Name of client and contact person	Type of work performed and year of completion	Value of contract

1.4 Major items of Contractor's Equipment proposed for carrying out the Works. List all information requested below. Refer also to Sub-Clause 4.3(d) of the Instructions to Bidders.

Item of equipment	Description, make, and age (years)	Condition (new, good, poor) and number available	Owned, leased (from whom?), or to be purchased (from whom?)

1.5 Qualifications and experience of key personnel proposed for administration and execution of the Contract. Attach biographical data. Refer also to Sub-Clause 4.3(e) of the Instructions to Bidders and Sub-Clause 9.1 of the Conditions of Contract.

Position	**Name**	**Years of experience (general)**	**Years of experience in proposed position**

1.6 Proposed subcontracts and firms involved. Refer to Clause 7 of Conditions of Contract.

Sections of the Works	Value of subcontract	Subcontractor (name and address)	Experience in similar work

1.7 Financial reports for the last three years: balance sheets, profit and loss statements, auditors' reports, etc. List below and attach copies.

_____

_____

_____

1.8 Information regarding any litigation, current or during the last three years, in which the Bidder is involved, the parties concerned, and disputed amount.

_____

_____

_____

1.9 Information on current litigation in which the Bidder is involved.

Other party(ies)	Cause of dispute	Amount involved

1.10 Proposed Program (work method and schedule). Descriptions, drawings, and charts, as necessary, to comply with the requirements of the bidding documents. The schedule must detail the temporary and permanent works to be constructed taking into consideration the weather conditions. The work method will show the methods by which the bidder proposes to carry out the works.

2. Joint Ventures

2.1 The information listed in 1.1 - 1.10 above shall be provided for each partner of the joint venture.

2.2 The information in 1.11 above shall be provided for the joint venture.

2.3 Attach the power of attorney of the signatory (ies) of the Bid authorizing signature of the Bid on behalf of the joint venture.

2.4 Attach the Agreement among all partners of the joint venture (and which is legally binding on all partners), which shows that

(a) all partners shall be jointly and severally liable for the execution of the Contract in accordance with the Contract terms;

(b) one of the partners will be nominated as being in charge, authorized to incur liabilities, and receive instructions for and on behalf of any and all partners of the joint venture; and

(c) the execution of the entire Contract, including payment, shall be done exclusively with the partner in charge.

3. Additional Requirements

3.1 Bidders should provide any additional information required in the Bidding Data or to fulfill the requirements of Sub-Clause 4.1.

Standard Form: Letter of Acceptance

[letterhead paper of the Employer]

_____ *[date]*

To: _____
[name of the Contractor]

_____
[address of the Contractor]

This is to notify you that your Bid dated _____ for execution of the _____ *[name of the Contract and identification number, as given in the Contract Data]* for the Contract Price of *[if the Employer has allowed the bidders to state their foreign currency requirements add* "the equivalent of"*]*_____ (_____) *[amount in numbers and words]* _____ *[name of currency]*, as corrected and modified in accordance with the Instructions to Bidders is hereby accepted by our Agency.

You are hereby instructed to:

(a) proceed with the execution of the said Works in accordance with the Contract documents;
(b) sign and return the attached Contract Documents, and
(c) forward the performance security pursuant to ITB Sub-Clause 32.1, i.e., within 21 days after receipt of this Letter of Acceptance.

Authorized Signature: _____
Name and Title of Signatory: _____
Name of Agency: _____

Attachment: Agreement

Standard Form: Agreement

AGREEMENT

This Agreement, made the _____ day of _____

20_____, between _____*[name and address of Employer]*

(hereinafter called "the Employer") and _____

_____ *[name and address of Contractor]* (hereinafter called "the Contractor") of the other part.

Whereas the Employer is desirous that the Contractor execute _____

_____ *[name and identification number of Contract]* (hereinafter called "the Works") and the Employer has accepted the Bid by the Contractor for the execution and completion of such Works and the remedying of any defects therein.

Now this Agreement Witnesseth as follows:

1. In this Agreement, words and expressions shall have the same meanings as are respectively assigned to them in the Conditions of Contract hereinafter referred to, and they shall be deemed to form and be read and construed as part of this Agreement.
2. In consideration of the payments to be made by the Employer to the Contractor as hereinafter mentioned, the Contractor hereby covenants with the Employer to execute and complete the Works and remedy any defects therein in conformity in all respects with the provisions of the Contract.
3. The Employer hereby covenants to pay the Contractor in consideration of the execution and completion of the Works and the remedying of defects wherein the Contract Price or such other sum as may become payable under the provisions of the Contract at the times and in the manner prescribed by the Contract.

In Witness whereof the parties thereto have caused this Agreement to be executed the day and year first before written.

Binding Signature of Employer _____

The Common Seal of Employer _____

Binding Signature of Contractor _____

The Common Seal of Contractor _____

Section 4. Security Forms

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Annex A Form:
Bid Security (Bank Guarantee)

*[If required, the **Bank/Bidder** shall fill in this Bank Guarantee form in accordance with the instructions indicated in brackets]*

_____

[Bank's Name, and Address of Issuing Branch or Office]

To: Ministry of Agriculture

Climate Smart Agriculture: Enhancing Adaptive Capacity of the Rural Communities in Lebanon (AgriCAL) Project

The Project Coordination Unit

Facing to Henri Chehab Barrack, Bir Hassan District, Beirut, Lebanon

Telefax: 01 849 618

Date: _____

BID GUARANTEE No.: _____

We have been informed that *[name of the Bidder]* (hereinafter called "the Bidder") has submitted to you its bid dated (hereinafter called "the Bid") for the execution of *[name of contract]* under Invitation for Bids No. *[IFB number]* ("the IFB").

Furthermore, we understand that, according to your conditions, bids must be supported by a bid guarantee.

At the request of the Bidder, we *[name of Bank]* hereby irrevocably undertake to pay you any sum or sums not exceeding in total an amount of *[amount in figures]* (*[amount in words]*)[45] upon receipt by us of your first demand in writing accompanied by a written statement stating that the Bidder is in breach of its obligation(s) under the bid conditions, because the Bidder:

(a) has withdrawn its Bid during the period of bid validity specified by the Bidder in the Form of Bid; or

(b) having been notified of the acceptance of its Bid by the Employer during the period of bid validity, (i) fails or refuses to execute the Form of Agreement, if required, (ii) fails or refuses to furnish the performance security, in accordance with the Instructions to Bidders (ITB), or (iii) does not accept the correction of the Bid Price pursuant to ITB Clause 27.

[45] The amount of the Guarantee shall be denominated in the currency of the Employer's country. This figure should be the same as shown in Clause 16.2 of the Instructions to Bidders.

This guarantee will expire: (a) if the Bidder is the successful bidder, upon our receipt of copies of the contract signed by the Bidder and the performance security issued to you upon the instruction of the Bidder; or (b) if the Bidder is not the successful bidder, upon the earlier of (i) our receipt of a copy of your notification to the Bidder of the name of the successful bidder; or (ii) twenty-eight days after the expiration of the Bidder's Bid.

Consequently, any demand for payment under this guarantee must be received by us at the office on or before that date.

This guarantee is subject to the Uniform Rules for Demand Guarantees, ICC Publication No. 758.

_____

[signature (s)]

Annex B Form:
Performance Bank Guarantee (Unconditional)

*[The **bank/successful Bidder** providing the Guarantee shall fill in this form in accordance with the instructions indicated in brackets, if the Employer requires this type of security.]*

[insert bank's name, and address of issuing branch or office]

Beneficiary: *[insert name and address of Employer]*

Date: *[insert date]*

PERFORMANCE GUARANTEE No.: *[insert Performance Guarantee number]*

We have been informed that *[insert name of Contractor]* (hereinafter called "the Contractor") has entered into Contract No. *[insert reference number of the Contract]* dated *[insert signature date]* with you, for the execution of *[insert name of Contract and brief description of Works]* (hereinafter called "the Contract").

Furthermore, we understand that, according to the conditions of the Contract, a performance guarantee is required.

At the request of the Contractor, we *[insert name of Bank]* hereby irrevocably undertake to pay you any sum or sums not exceeding in total an amount of *[insert amount in figures]* (*[insert amount in words])*,[46] such sum being payable in the types and proportions of currencies in which the Contract Price is payable, upon receipt by us of your first demand in writing accompanied by a written statement stating that the Contractor is in breach of its obligation(s) under the Contract, without your needing to prove or to show grounds for your demand or the sum specified therein.

This guarantee shall expire at the end of the Defects Liability Period, or on the [*insert number* day of *[insert month], [insert year]*,[47] whichever occurs first. Consequently, any demand for payment under this guarantee must be received by us at this office on or before that date.

This guarantee is subject to the Uniform Rules for Demand Guarantees (URDG) 2010 Revision, ICC Publication No. 758, except that the supporting statement under Article 15(a) is hereby excluded.

[signature(s) of an authorized representative(s) of the Bank]

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[46] *The Guarantor (bank) shall insert an amount representing the percentage of the Contract Price specified in the Contract and denominated in the currency of the Employer's country.*

[47] *Insert the date of the end of the Defect Liability Period. The Employer should note that in the event of an extension of the Defect Liability Period Date, the Employer would need to request an extension of this Guarantee from the Guarantor. Such request must be in writing and must be made prior to the expiration date established in the Guarantee. In preparing this Guarantee, the Employer might consider adding the following text to the form, at the end of the penultimate paragraph: "The Guarantor agrees to a one-time extension of this Guarantee for a period not to exceed **one year,** in response to the Employer's written request for such extension, such request to be presented to the Guarantor before the expiry of the Guarantee."*

Annex C Form:
Bank Guarantee for Advance Payment

*[The **bank/successful bidder** providing the Guarantee shall fill in this form in accordance with the instructions indicated in brackets, if an Advance Payment is to be provided under the Contract]*

[insert Bank's name, and address of issuing branch or office]

Beneficiary: *[insert name and address of Employer]*

Date: *[insert date]*

ADVANCE PAYMENT GUARANTEE No.: *[insert number]*

We have been informed that *[insert name of Contractor]* (hereinafter called "the Contractor") has entered into Contract No. *[insert reference number of the contract]* dated *[insert date]* with you, for the execution of *[insert name of contract and brief description of Works]* (hereinafter called "the Contract").

Furthermore, we understand that, according to the conditions of the Contract, an advance payment is to be made against an advance payment guarantee in the sum or sums indicated below.

At the request of the Contractor, we *[insert name of Bank]* hereby irrevocably undertake to pay you any sum or sums not exceeding in total an amount of *[insert amount in figures]* (*[insert amount in words]*[48]) upon receipt by us of your first demand in writing accompanied by a written statement stating that the Contractor is in breach of its obligation under the Contract because the Contractor used the Advance Payment for purposes other than the costs of mobilization in respect of the Works.

It is a condition for any claim and payment under this guarantee to be made that the Advance Payment referred to above must have been received by the Contractor on its account number *[insert account number]* at *[insert name and address of Bank]*.

The maximum amount of this guarantee shall be progressively reduced by the amount of the Advance Payment repaid by the Contractor as indicated in copies of interim statements or payment certificates which shall be presented to us. This guarantee shall expire, at the latest, upon our receipt of a copy of the Interim Payment Certificate indicating that eighty (80) percent

[48] *The Guarantor shall insert an amount representing the amount of the Advance Payment and denominated in the currency of the Advance Payment as specified in the Contract.*

of the Contract Price has been certified for payment, or on the *[insert number]* day of *[insert month], [insert year]*,[49] whichever is earlier. Consequently, any demand for payment under this guarantee must be received by us at this office on or before that date.

This guarantee is subject to the Uniform Rules for Demand Guarantees, ICC Publication No. 758.

_____

[insert signature(s)) of authorized representative(s) of bank]

[49] *Insert the Intended Completion Date. The Employer should note that in the event of an extension of the Completion Date, the Employer would need to request an extension of this guarantee from the Guarantor. Such request must be in writing and must be made prior to the expiration date established in the guarantee. In preparing this guarantee, the Employer might consider adding the following text to the form, at the end of the penultimate paragraph: "We agree to a one-time extension of this guarantee for a period not to exceed* ***one year****, in response to the Employer's written request for such extension, such request to be presented to us before the expiry of the guarantee."*

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Section 5. Bidding Data

Instructions to Bidders
Clause Reference

(1.1)	The Employer is: **The Ministry of Agriculture – Government of Lebanon**
(1.1)	The name and identification number of the NCB is: **Rehabilitation of Abdeh Nursery for the Ministry of Agriculture – Proc. Ref. W7/2019**
(2.1)	The Borrower is: **The Ministry of Agriculture**
(2.1)	The Fund means: *The Grant* received from **International Fund for Agricultural Development (IFAD)** which, has been approved by IFAD as of the date of issue of the bidding documents.
(2.1)	The Project is: **Climate Smart Agriculture: Enhancing Adaptive Capacity of the Rural Communities in Lebanon (AgriCAL) Project**
(2.2)	All Goods purchased under this Contract shall have their origin in the countries and territories eligible under Chapter VII of the Charter of the United Nations also. The Goods should not have their origin in Israel and from countries under embargo from Lebanon, the European Union or the United States. The origin of Goods and non-consulting Services is distinct from the nationality of the Supplier. In addition Bidders from Israeli nationality cannot bid for this bidding exercise.
(4.3)	In addition to the information listed in ITB 4.3, the following documents are required: - Copy of certificate of registration of the firm issued by the Ministry of Finance. - NSSF clearance. - VAT registration (if applicable); if not applicable, a self-declaration to this effect. - Copy of the Commercial Registration certificate in the Lebanese Ministry of Justice
(4.3 d)	- جرّافة عدد 1 - محدلة عدد 1 - بيك أب عدد 2 - كميون عدد 1 - ونش عدد1 - بوب كات عدد 1
(4.4)	The qualification data required from Bidders pursuant to ITB Sub-Clause 4.4 is modified as follows: **None**
(4.5 a)	The minimum required average annual volume of construction work for the successful Bidder over the period of last **five (5) years**: at least **USD 300,000**

(4.5 b)	The qualification data required from Bidders pursuant to ITB Sub-Clause 4.5 b is modified as follows: Experience in the successful construction of at least two (2) works of a nature and complexity similar to the Works required over the past five (5) years irrespective of lots awarded;
(4.5c)	The essential equipment to be made available for the Rehabilitation of Abdeh Nursery by the successful Bidder shall be : - جرّافة عدد 1 - محدلة عدد 1 - بيك أب عدد 2 - كميون عدد 1 - ونش عدد 1 - بوب كات عدد 1
(4.5e)	The minimum amount of liquid assets and/or credit facilities net of other contractual commitments of the successful Bidder shall be: **Not Applicable**
(4.6)	Subcontractors' experience and resources will not be taken into account.

(12.1)	The additional materials required to be completed and submitted by the bidder are as follows: **Not Applicable**
(13.1)	This shall be a "Unit price Contract based on the priced Bill of Quantities".
(13.4)	The Contract is not subject to price adjustment in accordance with clause 44 of the Conditions of Contract.
(14.1)	The currency of Bid shall be: **United States Dollars or Lebanese pounds. "Bid price should not include VAT".**
(15.1)	The period of Bid validity shall be **ninety (90) days** after the deadline for Bid Opening specified in the Bidding Data.
(16.1)	Bid shall include a Bid Security issued by a bank using the form for bid security (bank guarantee) included in Section 4 "Security Forms."
(16.2)	The amount of bid Security shall be: **US$ 3,000 (Three Thousand US Dollars) or equivalent amount in Lebanese Liras based on official exchange rate from the Central Bank of Lebanon.**
(17.1)	Alternative proposals to the requirements of the bidding documents will not be permitted.
(18.1)	The number of copies of the Bid to be completed and returned shall be: Two (2) copies along with the Original copy of the Bid in addition to a soft copy of the Bid.
(19.1)	Bidders may submit their Bids electronically: **Not applicable**
(19.2)	The Employer's address for the purpose of Bid submission is: **Green Plan – First Floor** **Attention: Mr. Elias El Namroud** **Baltagi Building – Facing the General Directorate of the State Security – Jnah** **Beirut – Lebanon** **Tel: 961 1 853 141**
(20.1)	The deadline for submission of bids is: **Thursday 23rd of April 2020 at 11:00 a.m.**
(23.1)	Time, Date and Place of Bid Opening are: **Thursday 23rd of April 2020 at 11:15 a.m. at the address mentioned in 19.2**
(32.1)	The Standard Form of Performance Security acceptable to the Employer shall be of Unconditional Bank Guarantee type as presented in Section 4 of the Bidding Documents.
(33.1)	The Advance Payment shall be limited to 10% percent of the Contract Price.
Any dispute arising out of or in connection with this Contract shall be settled by means of negotiations between the parties. In case if the parties didn't come to an agreement for the disputed issue then any party may apply to Republic of Lebanon. In that case the final regulation of the disputed issue will be the resolution of court entered into force.	

Section 6. Contract Data

Serial No.		Contract Clause Reference
1.	The following documents also make part of the Contract:	
	Schedule of Operation and maintenance manuals	[55]
	The Schedule of Key Personnel	[9]
2.	The Borrower is: **Government of Lebanon**	[1.1]
3.	The Employer is: **Ministry of Agriculture** Address: **Facing to Henri Chehab Barrack, Bir Hassan District, Beirut, Lebanon** Name of Authorized Representative: **Mr. Raymond Khoury**	[1.1]
4.	The Project Manager is: Name: **Ms. Maya Mhanna** Address: **Ministry of Agriculture – First Floor** **Facing to Henri Chehab Barrack, Bir Hassan District, Beirut, Lebanon**	[1.1]
5.	Contract name and Identification number: **Rehabilitation of Abdeh Nursery for MoA – Proc. Ref. W7/2019**	[1.1]
6.	The Works consist of: **Rehabilitation of Abdeh Nursery** The planned Start Date: **Upon Contract's Signature**	[1.1]
7.	The Site is located at: **Abdeh – Near the Agricultural Technical School in Abdeh – Facing Al Montazah Sweets – Akkar – Lebanon**	[1.1]
8.	The Start Date shall be: **The site possession date.**	[1.1]
9.	The Intended Completion Date for the whole of the works shall be: **Within Three (3) months from the start date**	[1.1]
10.	Sectional Completions are: **Not Applicable**	[1.1]
11.	The following documents also form part of the Contract: N/A	[2.1]
12.	The language of the Contract document is English. The Law applying to the Contract is the Law of the Republic of Lebanon	[3.1]
13.	The minimum insurance amounts shall be: (a) for loss of or damage to the Works, Plant and Materials: **110% of Contract value** (b) for loss or damage to Equipment: **20% of contract value**	[13.1]

	(c) for loss or damage to property (except the Works, Plant, Materials, and Equipment) in connection with Contract: 50% of contract value. (d) for personal injury or death: (i) of the Contractor's employees: USD 100,000 per accident with numbers of accidents unlimited (ii) of other people: USD 100,000 per accident with numbers of accidents unlimited	
14.	The Site Possession Date shall be: **To be advised upon contract signature but no later than 1 month from contract signature.**	[21.1, 42.1]
15.	The contractor shall submit a program for the works within 10 days of delivery of the Letter of Acceptance.	[27.1]
16.	The period between the program updates is 30 days	[27.3]
17.	The amount to be withheld for the late submission of an updated program is: **30% of the value of the invoice.**	[27.3]
18.	The Defects Liability Period is**: 12 months for the whole project (plus additional warranty for special items as per Specifications)**	[34.1]
19.	The following events also be Compensation Events: N/A	[42.1]
20.	The Contract is not subject to price adjustment in accordance with clause 44 of the Conditions of Contract.	[44]
21.	The amount to be retained from each payment due the Contractor is **10%.**	[45.1]
22.	CC 46.1 Clause is amended to read as follows: The liquidated damages for the sections of the works are: 0.05 % of the Contract price per day of total contract amount.	[46.1]
23.	CC 46.1 Clause is amended to read as follows: The maximum amount of liquidated damages for the sections of the Works is 10% of the total value of the contract	[46.1]
24.	The advanced payment is **10%** of Contract price shall be paid to the Contractor against an Advance Payment Bank Guarantee for the same amount, not later than 14 days from the submission of the Unconditional Bank Guarantee described in GCC 48.1.	[48.1]
25.	The advance payment will be returned in accordance with the following schedule: **completed works%** — **returned advanced payment%** 20 — 20 50 — 65 85 — 100	[48.1]
26.	The Performance Security shall be for the following minimum amount equivalent as a percentage of the Contract price: Performance Bank Guarantee: in amount of **10 %** of the Contract price.	[49.1]

27.	The standard form of Performance Security acceptable to the Employer shall be of the "Unconditional Bank Guarantee" type as presented in the Section 4 of the Bidding Documents.	[49.1]
28.	The date by which operating and maintenance manuals are required is: **Within five (5) days from completion of works and before issuance of Certificate of Completion.**	[55.1]
29.	The dates by which "as built" drawings are required is: Within 5 days from the date of issuing the Completion Certificate.	[55.1]
30.	The amount to be withheld for failing to produce "as built" drawings and/or operating and maintenance manuals: **USD 10,000 for as-built drawings and USD 15,000 for operating and/or maintenance manuals**	[55.2]
31.	The percentage to apply to the value of the work not completed, representing the Employer's additional cost for completing the Works, is: **30%.**	[57.1]

Section 7. Specifications

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List of Abbreviations and Acronyms

%	Percent
A	Ampere
AC	Alternative current
API	American Petroleum Institute
ASME	American society of Mechanical Engineers
ASTM	Standard Specification for Concrete Aggregates
AWWA	American Water Works Association
BEP	Best Efficiency point
BS	British Standards
cm	centimeter
dB (A)	A-weighted Decibels
DC	Direct current
DIN	German institute for Standardization
EN	European Standard
EPR	Ethylene Propylene Rubber
FF	Fill Factor
FRP	Fibre-reinforced plastic
HDPE	High density polyethylene
HP	Horse power
IEC	The International Electro-technical Commission
Im	Current at maximum power point
IP	Ingress Protection
ISO	International Standards Organization
I-V curve	Current voltage characteristic curve
Kg	Kilogram
Kg/cm^2	Kilogram per square centimeter

Kg/m^3	Kilogram per cubic meter
Km	Kilometer
Km/hr	Kilometer per hour
kPa	Kilo Pascal
kV	Kilovolt
kVA	Kilovolt-ampere
kWp	Kilowatts-peak
L	Liter
l/h	Liter per hour
l/min	Liter per minute
l/s	Liter per second
LCD	Light crystal display
LCEC	Lebanese Center for Energy Conservation
LDPE	Low density polyethylene
LED	Light-emitting diode
m	Meter
m^2	Square meter
m^3/h	Cubic meter per hour
MCB	Miniature circuit breaker
mlc	Meter of liquid column
mm	millimeter
MPA	Mega Pascal
MPPT	Maximum Power Point Tracker
N/m^2	Newton per square meter
NPSH	Net Positive Suction Head
NPT	National pipe thread
NPTF	National pipe thread female
PE code	Material designation code

PE pipe	Polyethylene pipe
PN	Nominal Pressure
PP	Polypropylene
psi	Pounds per square inch
PTFE	Polytetrafluoroethylene
PV	Photo Voltaic
PVC	Polyvinyl chloride
r/m	Round per minute
RS	Recommended Standard
SPV	Solar Photo Voltaic
SSD	Surface Saturated Dry
STC	Small Scale Renewable Energy certificates
USGPM	United States Gallon per minute
UV	Ultra Violet
Vm	Voltage at maximum power point
VOC	Open Circuit Voltage Test
VSD	Variable Speed Drive
Wp	Watt-peak

Technical Specifications

The specification document is for the Abdeh nursery in Akkar. The nursery consists of planting beds for growing forest trees and medicinal plants. The planting beds are irrigated using a nozzle spray head system, connected to a head unit and water reservoir and the water source is from 85 m artesian well from which water is pumped to the water reservoir.

Moreover, there are four (4) greenhouses that will be moved from their original place to a new location in the nursery.

The nursery needs rehabilitation work detailed in the following sections.

I- General Description of the needed work

The nursery shall be cleaned and leveled as follow:

1- Clean and remove all weeds, trees, and debris within the planting beds, roads, and paths between planting beds. (From bed 1 to bed 24 and from bed 31 to bed 38. Total area: 4500 m^2)
2- Clean and remove all weeds, trees, and debris from the greenhouse area
3- There is around 5000 m^2 area in the nursery which consists of 14 planting beds (which have to be removed) in addition to an unused area.
4- These 5000 m^2 need to be completely cleaned using a bobcat or similar.
5- Level the whole zone.
6- Cover the whole zone with 30 cm thickness base course layer that has to be compacted. In the place of the 14 removed planting beds, 10 planting beds have to be installed again according to the detailed drawings and BOQ.
7- Clean all weeds and debris in all other parts of the nursery which are outside the zones described in points 1 and 2 of this section, and conserve trees in these places, unless the supervision committee decided to remove some trees for the necessity. (remaining part of the nursery around 6,000 m^2) The contractor shall prune and clean all remaining trees.

II- Infrastructure

The infrastructure work includes:

- Construction and rehabilitation of planting beds
- Construction and rehabilitation of the nursery fence

- Greenhouse displacement, installation, rehabilitation and equipment
- Shading tent rehabilitation
- Pumping room rehabilitation

1. Specifications of concrete to be used in the Goods installation and connection

In this section, we will describe the specifications of concrete that will be used in all infrastructure work.

The ingredients to be used in the manufacture of standard concrete shall consist solely of a standard type Portland cement, clean sand, natural coarse aggregate and clean water.

1.1 Cement works related to the Goods installation and connection

Unless otherwise specified or called for by the Purchaser's representative, cement shall be ordinary Portland cement in fifty (50) kg bags.

Only one (1) type of cement shall be used in any one structural member. Mixing of types of cement within the same structure shall not be permitted. The cement to be used should be type PAL 42.5 for all concrete structures related to goods installation according to the Lebanese norm; labeled bags only. Cement delivered in bulk shall not be used unless authorized by the Purchaser's representative.

Upon arrival on-site, a sample of fresh concrete shall be tested with a slump test again, but the temperature shall be checked with the calibrated thermometer beforehand. Three cubes or cylinders of samples shall be taken for compressive strength tests (the tests will be at 7 days and then at 28 days); these will be the samples from the site.

All costs incidental to such tests shall be at the Supplier's expenses and these tests shall be done in an approved laboratory. The results must be submitted to the Purchaser's representative for approval.

1.2 Aggregates used in the Installation related works

"Aggregate" in general designates both fine and coarse inert materials used in the manufacture of concrete related to goods installation.

1.2.1 Coarse & Medium Aggregates

Shall meet the following requirements:

-Specific gravity at SSD (surface saturated dry) shall not be less than 2.62

- Absorption capacity (AC) shall not exceed 1.7%

-Shall meet the requirements of Section 11 (deleterious substances and soundness) of ASTM C33 –97. Testing shall be performed according to ASTM C88 and the testing lab shall indicate whether sodium sulfates or magnesium sulfates were used.

- Los Angeles Test abrasion value shall not exceed 20% as per ASTM C-131

- There shall be no indications of potential alkali-aggregate reactivity as per ASTM C289-94

1.2.2 Natural and Crushed Sand

Shall meet the following requirements:

-Shall meet the requirements of Section 7 & 8 (deleterious substances and soundness) of ASTM C33 –97. Testing shall be performed according to ASTM C88 and the testing lab shall indicate whether sodium sulfates or magnesium sulfates were used. This test does not need to be performed on the crushed sand if from the same source as the coarse aggregates.

-Shall contain very little or no organic impurities as per ASTM C-40. The test is only required for natural sand.

-The minimum sand equivalent as determined by ASTM D-2419 shall exceed

75%. The test is only required for natural sand used in concrete mixed on site.

-There shall be no indications of potential alkali-aggregate reactivity as per ASTM C289-94. This test doesn't need to be performed on the crushed sand if from the same source than the coarse & medium aggregates.

1.2.3 Combined aggregates

Combined aggregates are composed of a mixture of coarse aggregates and fine aggregates. They shall be used only in proportions with the prior approval of the Purchaser's representative. In no case shall materials passing no. 200 (0.075 mm) sieve exceed 3% by weight of the combined aggregates.

As far as possible, preference shall be given to machine broken and graded aggregate. All fine and coarse aggregates proposed for use in the related works to goods installation shall be subject to the Purchaser's representative's approval. After specific materials have been accepted, the source of supply of such materials shall not be changed without prior approval of the Purchaser's representative.

The grading of aggregates shall be such as to produce a dense concrete of specified strength and consistency that will work readily into position without segregation and shall be based on the "mix design" and preliminary test on concrete specified herein-after.

All costs incidental to such tests shall be at the Supplier's expenses and these tests shall be done in an approved laboratory. The results must be submitted to the Purchaser's representative for approval.

Screening and Washing: Crushed rock shall be screened and/or washed for the removal of dirt or dust coating if so demanded by Purchaser's representative.

1.3 Water

Water used for both mixing shall be clean and free from injurious amounts of deleterious materials; oils, acids, alkalis, salts, sugar, organic materials or other substances that may be deleterious to concrete or steel. Potable water is generally satisfactory for mixing and curing concrete. In case of doubt, the suitability of water for making concrete shall be tested. The sample of water taken for testing shall be typical of the water proposed to be used for concrete. The samples shall not receive any treatment before testing other than that envisaged in the regular supply of water proposed for use in concrete. The sample shall be stored in a clean container previously rinsed out with similar water.

All sources of water to be used with cement whether for mixing or curing of concrete shall be approved by the Purchaser's representative.

2- Specifications of ready Mix concrete

It can be applied to all infrastructure work in the nursery.

2.1 General

This Section applies to ready mix concrete supplied by an independent supplier or concrete produced on site by a concrete production plant. The "Ready mix supplier" referred to in this Section shall apply to independent suppliers as well as to on-site batching plant.

Ready mix concrete shall be supplied by a reputable firm with established experience and adequate facilities to be able to fully comply with the Specs.

The ready mix supplier shall submit the detailed mix designs of the different classes of concrete, tests and technical information requested hereafter, and any comments he may have regarding the Specs to the Engineer before finalizing its offer with the Contractor. Once work has started, it shall be understood that the ready mix supplier has agreed to fully comply with the Specs.

The ready mix shall be supplied in accordance with ASTM C94 standards and the

Specs. Whenever conflicting information between the two documents appears, the Specs shall rule.

2.2 Performance and Design Requirements

Concrete constituents shall conform to Section 1 and be proportioned to meet the following requirements:

Mix Design A-30:

- Elements:..... All reinforced concrete elements.
- Minimum strength @ 28 days:..... 30MPA
- Minimum Cement Content:..... 350 Kg/m³
- Maximum Water-Cement Ratio:..... 0.45
- Maximum Nominal Aggregate Size:..... 25mm
- Maximum Slump:..... 18cm
- Special Requirement:..... Concrete shall be air-entrained so that total air content is equal to 5 ± 1 percent per volume.

3. Concrete works related to goods installation

This will include all work for infrastructure in the nursery, including pumping room, shading tent, soil work for planting beds and greenhouses…

Cement Storage: Cement in bags shall be stored and stacked in a shed, which should be dry, leak-proof and moisture-proof as far as possible in such a manner that the oldest should be used first. Damaged or reclaimed or partly set cement will not be permitted to be used and shall be removed from the site. The Supplier shall not store cement in areas subject to flooding.

Storage of aggregates: All coarse and fine aggregates shall be stacked separately in stockpiles under a cover, near the project site in bins properly constructed to avoid intermixing of different aggregates. Contamination with foreign materials and earth during storage and while heaping the materials shall be avoided.

Screening and Washing of fine aggregates: Sand shall be prepared for use by such screening or washing or both, as necessary, to remove all objectionable foreign matter while separating the sand grains to the required size fractions.

Screening and Washing of course aggregate: Crushed rock shall be screened and/or washed for the removal of dirt or dust coating if so demanded by the Purchaser's representative.

Storage of reinforcement steel: Reinforcing steel shall be protected at all times from damage. Reinforcing steel shall be stored above the ground on platforms, skids, or other supports. It shall be stored in such a manner and adequately marked to facilitate inspection and checking. When placed in the project site, the reinforcing steel shall be free from dirt, detrimental scale, paint, oil or other foreign substance.

Mix Design: This is to investigate the grading of aggregates, water cement ratio, workability and the quantity of cement required to give works cubes of the characteristic strength specified. The proportion of the mix shall be determined by weight. Adjustment of aggregate proportions due to moisture present in the aggregate shall be made.

Concrete structure dimensions specified in the detailed designs can be subject to minor modifications depending on the site conditions and the type and the sizes of equipment and fittings that will be delivered or used by the Supplier.

4. Transportation, Placement, Compaction & Curing of Concrete

4.1 Transportation: Mixed concrete shall be transported from the place of mixing to the place of final deposit as rapidly as practicable by methods which will prevent the segregation or loss of the ingredients. Concrete shall be deposited as near as practicable to its final position to avoid re-handling.

4.2 Placing: The concrete shall be placed before the setting has commenced and shall not be subsequently disturbed. Concrete shall be so placed as to avoid segregation of the materials and displacement of reinforcement. To achieve this, concrete should be lowered vertically in the forms and horizontal movement of concrete inside the forms should as far as practicable be brought to a minimum. In wall forms drop chutes attached to hoppers at the top should preferably be used to lower concrete to the bottom of the form. Under no circumstances, concrete shall be dropped freely from a height of more than 1.5 meters.

4.3 Compaction: No concrete shall be allowed without vibration. Concrete shall be thoroughly compacted and fully worked around the reinforcement, around embedded fixtures and into corners of the formwork.

4.4 Curing of Concrete: All concrete shall be cured by keeping it continuously damp for the time required for complete hydration and hardening to take place. Preference shall be given to the use of continuous sprays or ponded water, continuously saturated covering of sacking, canvas, hessian or other absorbent materials, or approved effective curing compounds applied with spraying equipment capable of producing a smooth, even-textured coat.

4.5 Cleaning and Treatment of Forms: All rubbish particularly chippings, shavings, and sawdust shall be removed from the interior of the forms before the concrete is placed and the formwork in contact with the concrete shall be cleaned and thoroughly wetted or treated with an approved release agent. Care shall be

taken that such approved release agent should be kept out of contact with the reinforcement.

4.6 Stripping Time: Forms shall not be struck until the concrete has reached strength at least twice the stress to which the concrete may be subjected at the time of removal of formwork. The strength referred to shall be that of concrete using the same cement and aggregates, with the same propositions and cured under conditions of temperature and moisture similar to those existing on the project site.

5. Description of the planting beds

In the nursery 48 existing planting beds that need rehabilitation.
14 out of these 48, has to be completely removed and replaced with 10 new planting beds. Each planting bed has to be leveled and covered with base-course.

5.1 Concrete protection wall

A concrete protection wall has to be constructed for the planting beds which are made out of concrete block work (As per drawings and BOQ)

5.2 Rehabilitation of planters

The remaining 34 planting beds need rehabilitation, by replacing the broken concrete block works with new ones (Refer to the BOQ for quantities).

5.3 Concrete layer for protection wall

All protection walls of all planting beds have to be covered with a concrete layer on their top of 20 cm width and not less than 3 cm height. (Refer to BOQ for quantities)

5.4 Pathways

Planting path shall be made in the middle of each planting bed, by installing 1 row of 20*40 cm thickness 15 cm concrete block works.

5.5 Weed block membrane

Weed block membrane shall be covering all planting beds. Weed block fabric shall be delivered in rolls and shall be placed under the planting beds, should allow water and air penetration. Weed block fabric should be made from high UV and puncture resistance with a minimum life guarantee of 10 years.
In addition to the above mentioned planting beds, 12 planting beds have to be

installed under 3 greenhouses that will be detailed further in this document. These planting beds have to be constructed according to the same specifications mentioned in this section, and according to the dimensions detailed in the drawings.

6. Fence

In the nursery, there is an existing fence. One part of the fence has to be removed a new concrete wall shall be constructed. Another part needs only rehabilitation.

Concrete wall (As per drawings)

100 m of the deteriorated fence, will be removed and replaced with a concrete block wall of 1.5 m height and length 100 m. (150 m^2 of concrete stone wall)

6.1Supply and install concrete stones for the wall (20 cm * 40 cm * 20 cm) (as per drawings and BOQ)

6.2Concrete column at an interval of 2 m between concrete block works shall be constructed: thickness 40 cm and height of each column is 2 m (as per drawings and BOQ)

6.3Reinforced concrete layer of 40 cm thickness and 20 cm width shall be constructed at the base of the concrete block works wall. (As per drawings and BOQ)

6.4 Reinforced Concrete layer at the top of the stone concrete wall thickness 10 cm. (as per drawings and BOQ)

6.5 Barbed wire

At the top of the concrete wall galvanized barbed wire shall be installed at a height of 0.5 m. (as per drawings and BOQ)

Galvanized barbed wire specifications shall be as follow:

Galvanized single strand barbed wire size:

- Made of l line wire with 4 spikes, spaced at a distance of 70 mm - 120 mm.
- Horizontal line wire diameter 2.8 mm.
- Barbwire diameter 2.0 mm.
- Number of spikes 4.
- Packed in coils: 25-45 kg/coil, or 100 m, 500 m/coil.

6.6 galvanized iron gate

Within the concrete wall, a 2 door galvanized iron gate shall be installed as specified and approved by the engineer. Dimensions and quantities shall be according to the drawings and BOQ.

6.7 Brass lock

Provide brass lock minimum 2.5 inch durable finish standard, finely polished, perfect strength.

7. Fence part that needs rehabilitation

7.1 250 m of the fence needs rehabilitation according to the detailed drawing.

The mesh is made from hard steel wire with simple torsion. The steel wires shall be galvanized. The mesh has a diamond pattern (50*50 mm). Wire diameter between 2 and 3 mm. Edges are folded and hooked into each other. Galvanized iron poles are used as wire holders. The distance between each pole is 3.5 m with height 2m.

8. Green-Houses

8.1 Remove and reinstallation of greenhouses

In the nursery three (3) connected greenhouses and one (1) individual, those greenhouses shall be removed to the new location indicated in the drawings.

8.1.1 These greenhouses are fixed in the ground with a 20*20*20 cm reinforced

concrete so they shall be cut, removed and reinstalled in the new location as indicated by the engineer or as indicated by the supervision committee after excavation in the new location at the base of each column of a hole of 20*20*20 cm.

8.1.2 Fill with reinforced concrete the excavated holes (20*20*20 cm)

The size of the greenhouses:

1) 34*9 m
2) 38*7 m
3) 38*7 m
4) 40*7 m

8.2 Shade cloth fabric for greenhouse:

The greenhouses shall be covered with a shade cloth fabric.

Shade cover fabric shall meet ASTM-D 3887 standard and shall be delivered in rolls and shall cover the whole shading structure. The contractor shall tie down the shade cloth with ropes and metal stakes. The green shade cover fabric should be made from high density of 100 % UV stabilized ultra-violet (U.V) polyethylene HDPE

-It is used for shade protection from the Sun, keeps the soil cool and reduces moisture loss through evaporation in excessive heat.

-The shade level has to be between 50 and 60 %

- Burst Strength (kg/cm^2) between 3.7 and 4.3

- Diffuse Light Transmission between 65% and 55%.

-Rolls dimension: 3m (width) x 35m (length) = (total 26 Rolls)

-Durability: 5 years

8.3 Table and trays in the individual greenhouse

8.3.1 Galvanized iron structures shall be provided to the individual greenhouse

Specs of galvanized iron structures:

Dimensions: 88 cm (width) * 390 cm (length) * 3.5 cm (height)

Diameter: 2mm

8.3.2 Galvanized iron columns

The galvanized iron structures shall rely on galvanized iron angular (90 degrees angle) columns. Size (3.5- 3.5 cm) and height 1 m, thickness 2 mm.

8.3.3 Iron galvanized trays

Inside these structures, iron galvanized trays shall be provided.

Specs of the galvanized trays:

Dimensions: 86.5 cm (width) * 388 cm (length) * 7 cm height

Thickness: 1 mm

8.3.4 Hole in galvanized trays

A hole shall be made in the galvanized trays from 2 sides of the tray. At the entrance of the tray, the hole shall be at the top of the tray, and at the outlet of the tray the hole shall be at the base of the tray. The hole shall be of ¾ inch diameter and from the whole a 5 cm galvanized iron pipe shall be molded to the tray.

8.3.5 Galvanized iron pipe

Galvanized iron pipe of 0.05 m shall be molded to every tray

8.3.6 Metal wire mesh

The base of these trays shall be covered with **metal wire mesh**.

Specs of galvanized wire:

1- Material: galvanized wire

2- Diameter: 2 mm

3- Aperture (distance between 2 parallel wires): 3 cm

4- Dimensions: 86*3.85 cm

8.3.7 Rigid Polystyrene boxes

This individual greenhouse shall be provided with rigid polystyrene boxes for the germination of aromatic plants. These trays shall be perforated at the bottom base. Dimensions: 40 cm * 28 cm * 7 cm.

The total number of rigid polystyrene boxes to be provided is 800.

8.3.8 72 cell plug tray

72 cell plug trays shall be provided for transplanting aromatic plant seedlings.

Material: Plastic

Dimensions: 54 * 28 cm

CELL SIZE: 4 cm * 4 cm * 7 cm deep

9. Shading tent

In the nursery an existing open shading tent needs rehabilitation having the following dimensions: (15.9*13.9*3.90 m).

First, the base of the shading tent being earth, a concrete slab shall be constructed.

Second, it has to be closed with metal wire mesh and provided with a gate.

Preparation of the floor and construction of the Concrete slab

9.1 Cleaning the soil from debris and weeds and leveling the soil.

The base/sub-base shall be dry at the time of concreting unless hot weather conditions prevail in which case light sprinkling without ponding shall be allowed to cool the base.

Vapor barriers shall be used only if there is a presence of moisture below the slab

on grade. The vapor barrier (heavy polyethylene sheet typically) shall have a 0.2 mm minimum thickness and the sheets shall overlap at least 20 cm at the seams.

9.2 Base course

The base course shall consist of select finely graded crushed stones free of clay particles and their grading shall be such a level and well compacted can be obtained. The nominal maximum aggregate on the surface shall not exceed 5 mm. Compaction can be done by a hand-operated compaction plant. Surface flatness of the base shall be such no gaps greater than 20 mm are detected under a 3 m straight edge.

9.3 Reinforced concrete slab

If the bearing soil is more than 50 cm lower than the slab on grade, a sub-base compacted in layers 15 to 25 cm thick to achieve a minimum of 90% of the maximum dry density obtainable by the modified proctor (ASTM D1557) shall be used. The selection of the subgrade and method of compaction and verification in the field shall be performed by an expert geotechnical engineer or as indicated in the soil investigation report if applicable.

9.4 Reinforced steel poles

Reinforced Steel poles shall be of 12 mm diameter as follow:

80T12 L=7 m
70T12 L= 7 m
80T12 L = 8 m
70T12 L = 10 m
Which equals to 1500 Tons.

9.5 Shading structures

Some of the **shading structures** at the top of the shading tent are removed. Similar structures exist at the edge of the tent, which can be removed and replaced at the top of the tent to cover the tent.

9.6 Iron bridges

Two of the **iron bridges** at the top of the tent shall be removed and replaced by new ones. (Dimensions) length 4 m and thickness 0.03 m. (each)

9.7 Metal wire mesh

Metal wire mesh shall be installed and fixed on the structure of the shading tent. Specifications of the metal wire shall be as follow:

- PVC coated welded wire mesh. 5 mm diameter.
- Mesh size between (75*75 mm)
- Weld strength shall be 75 % of the minimum tensile strength of the wire (Tensile range 540-690 N/m2)
- Height 4 m, length 2 m
- Total number of mesh wire (15) for an area of 120 m^2

9.8 Gate of the shading tent.

A gate shall be installed for the shading tent dimensions (3.75 * 3.90 m). The frame of the gate shall be galvanized iron (3 cm thickness) and the same metal wire mesh shall be installed inside the frame of the gate. It has to be a 2 door gate.

9.9 Door

The door shall be provided with a minimum 2 inch brass lock durable finish standard finely polished, perfect strength.

10. Concrete pumping room

The existing pumping room shall be renovated (Dimension 4.5 m * 6.5 m * 2.70 m height).

10.1 Preparations

Observe manufacturer's recommendations regarding the preparation of surfaces to receive paint and the application of the paint itself. Procedures shall include, but not necessarily be limited to, the following:

1. Cleaning – Pressure clean and remove oil, grease and lose foreign matter, including, mold mildew, dirt and corrosion products, in a manner which causes neither undue damage to the substrate nor damage to, or contamination of, the surroundings or the paint system to be applied;
2. Glossy Surfaces - Adequately scuff and/or solvent or chemically etch as appropriate to provide satisfactory adhesion for subsequent paint coats;
3. Filling - Fill cracks and holes with fillers, sealers or grouting cement as appropriate for the finishing system and substrate, and sand smooth, to ensure all coats finish smooth;
4. Drying - Unless otherwise specified, ensure that surfaces are cured and dry before applying additional coats of paint;
5. Generally - Remove weld spatter, slag, burrs, or any other objectionable surface irregularities. Remove any rust and apply rust primer;
6. Apply an oil-based primer to any bare timber surfaces

10.2 Paint Application

1. Apply paint (enamel paint sealing with white spirit) and related material with an undercoat plus two coats of selected finish color (Preferably grey color) or with the number of coats specified in accordance with the manufacturer's recommendations. Allow each coat to harden for the drying time (or time between coats) recommended by the manufacturer.
2. Finish - Ensure each coat of paint is uniform in color, gloss, thickness and texture and free of runs, sags, blisters, or other discontinuities.

3. Wet Paint Warning - Place notices and do not remove until paint is dry.

10.3 Walls

Walls shall be cleaned and covered with necessary cement rendering from inside and outside the room and according to the dimensions specified in the BOQ and painted (outdoor)

10.4 Ceiling

Ceiling shall be cleaned and covered with necessary cement (plastering) and painted

10.5 Roof

The roof shall also be repainted with waterproof paint.

10.6 Floor

The floor shall be cleaned and covered with a vinyl layer.

- All painted surfaces are to present a clean and even appearance with no evidence of poor workmanship. Finished paint surfaces shall be free from sags, wrinkles, drips and other defects or imperfections. Do not paint over dirt, dust, scale, grease, moisture or conditions detrimental to the formation of a durable and acceptable finish.
- All holes, cracks, and marks should be repaired with fillers, sealant, putties or grouting cement as appropriate for the finishing system and substrate, and treat to achieve the required finish in accordance with industry standards before painting. Tint the filler to match the substrate if the finish is transparent. Walls should be wiped down as necessary before painting.

10.7 Windows

The existing windows (3 windows) shall be removed and replaced with new Aluminum windows with 6 mm glass. Dimensions as specified in the BOQ.

Windows shall be fabricated with high quality raw material

- Material: aluminum alloy and glass
- Tempered glass
- Horizontal opening pattern
- Two or three tracks sliding windows
- 6mm tempered glazing for greater energy savings, sound reduction and safety.

  Neat and clean appearance
- Lockable hardware
- Integrated insect and security screening options

10.8 Electrical equipment

All electrical equipment shall be provided to the room, (switches and lighting)

10.9 Connection to the main power supply

The room shall be connected to the main power supply of the nursery.

10.10 Door maintenance

Maintenance shall be provided to the existing door of the room it shall be provided with all the necessary anti-rust coat and paints with a secure lock.

III – Irrigation System

Irrigation of the nursery is based on pumping water from an artesian well to water reservoirs through transmission pipes. Then water is pumped from the irrigation reservoir to the distribution network which is connected to a sprayer system irrigating the planters.

1. Specifications of the water reservoirs

1.1 Iron door for existing water reservoir

An existing concrete water reservoir having a dimension of 7.5 m * 4.5 m with a height of 1.5 m (total volume 50 m^3) needs a galvanized iron door of a dimension of 60 * 60 cm and a thickness of 3 mm.

1.2 Polyethylene water tank

Two Polyethylene triple layer water storage tank of a capacity of 10,000 L each one, shall be provided and installed as indicated in the drawings or as specified by the supervision committee.

The diameter of each tank shall be 2.4 m with a height of 2.6 - 2.8 m. With a 2 inch connector.

These polyethylene tanks will be connected to one of the head units that will be described later in these specifications.

The material used shall be virgin polyethylene resin as compounded and certified by the manufacturer.

All polyethylene resin material shall contain a minimum of a U.V. 8 stabilizer as compounded by the resin manufacturer.

Pigments may be added at the purchaser's request, but shall not exceed 0.25% (dry blended) of the total weight.

The minimum required wall thickness of the tank must be sufficient to support its weight in an upright position without any external support.

The top head must be integrally molded with the tank wall. The minimum thickness of the top head shall be equal to the top of the straight wall.

1.3 Connection of water tanks

The polyethylene tanks shall be connected to the artesian well.

2. Specifications of the Polyethylene PE Pressure Pipe for Irrigation

1- Pipes and fittings with 63 mm diameter and smaller shall be according to AWWA C901 or DIN 8074/8075. Pipe shall be supplied in rolls. The ends of each pipe shall be plain and suitable for heat fusion. Pipe and fittings minimum class shall be 10 kg/cm^2.

2- Materials used shall have a standard PE code designation 3408 and a minimum hydrostatic design basis of 1600 psi according to AWWA C906 and AWWA C901. LDPE pipes shall contain a minimum of 2% carbon black well dispersed and shall be constructed with UV stabilizer material according to ASTM D2239.

3- Manufacturers shall provide certification that stress regression testing has been performed on the pipe products. Materials shall also meet elevated temperature requirements as given in AWWA C906 and AWWA C901.

3. Pipe fittings and accessories

1- Fittings shall be according to AWWA C906, extruded or injection molded suitable for the class of pipe required.

2- Joints for pipes and fittings shall be by heat fusion and in strict accordance with pipe manufactures recommendations. Joints shall have a tensile strength equal to that of the pipe. Fusion temperature, interface pressure, alignment and cooling time, shall be according to manufactures recommendation.

3- For irrigation pipes with diameters equal or larger than 50 mm the following joints shall be used:

- For size to size PE pipes joining use PE Butt-Weld fittings to ASTM D3261,

- For dissimilar pipes sizes use PE Socket fittings joined by electrical heating with the appropriate pipe clamps according to ASTM D2683.

- For irrigation pipes with diameters less than 50 mm use PVC/PP Compression fittings conforming to BS 5114 with minimum 16 kg/cm^2 nominal pressure.

4. Excavation and Irrigation Pipe Cover

Provide minimum cover over top of underground irrigation main piping (63 mm) piping: 600 mm. All other diameter provide a cover of minimum 400 mm.

Excavated material is generally satisfactory for backfill. Backfill shall be free from rubbish, vegetal matter, and stones larger than 5 mm and from sharp objects that may damage the pipe.

5. PIPEWORK TESTING

5.1 Field Testing: Generally

- Provision of Test Equipment: All items for test have to be provided on site before the test i.e. pressure gauges, instruments, water etc...

- The Contractor shall carry out tests in the presence of the Engineer.

- Fittings and Joints: The Contractor shall permanently anchor fittings before testing and leave all joints exposed for checking.

- Test Sections: The Contractor shall limit test sections to not more than 250 m.

- Test Sections: The Contractor shall test pressure lines between valve boxes whenever possible.

- Closed Valve: The Contractor shall not test against a closed valve unless there is no acceptable alternative.

- The Contractor shall apply pressure by manually operated test pump.

- The Contractor shall examine exposed joints and repair visible leaks.
- Failure: Should a test fail, the Contractor shall locate the leak and replace or make good defective pipe or replace and make good faulty joint. The Contractor shall retest main.

5.2 Hydrostatic Testing of Pressure Pipelines

-The pipeline shall be filled slowly with water from the lowest point. After filling with water, absorbent pipes shall be allowed to stand for at least 24 hours before testing to allow for complete absorption.

-Entrapped air shall be bled and pressurizing shall then proceed until the specified test pressure is reached in the lowest part of the pipeline section under test. Further quantities of entrapped air shall be bled while the pressure is being raised.

-Unless otherwise specified, the test pressure shall be equal to 1.5 times the maximum working pressure of the pipeline but shall in no case exceed 75% of the factory hydrostatic test pressure.

-The test pressure shall be maintained for one hour by pumping using a separate test pump. Pumping shall then be stopped for 2 hours, at the end of which time the line shall be re-pressurized to the original test pressure and the volume of water pumped into the line recorded.

-The pipeline shall be deemed to have failed the test if visible leaks are detected (regardless of leakage being within the allowable specified limit) or if the volume of water pumped to restore original test pressure after the period when pumping was stopped exceeds 0.1 litre/day per km of pipe per mm of pipe diameter for each 3 kg/ cm^2 of applied pressure for other pipe material.

5.3 Flushing of Irrigation Pipes

Flushing: The contractor shall flush dirt and debris from irrigation piping before installing irrigators and other devices.

-Equipment: The contractor shall provide equipment, gauges and temporary connections needed for flushing and arrange with employer to draw water from existing sources.

6. Irrigation design of the planters

Refer to the detail drawing to see the installation of the irrigation system within the planting beds.

Irrigation system is already installed in part of the nursery and needs maintenance.

New irrigation system needs to be installed as specified in the drawings and BOQ in the 22 new constructed planters.

The irrigators within planters are nozzles fixed on a galvanized riser as shown in the drawings.

There are two sizes of riser: 1.5 m height and 1 m height.

6.1 All 1.5 m height risers shall be cut to be 1 m height, and reinstalled and nozzles shall be fixed on as shown on the drawing. (quantities according to the BOQ)

6.2 New threaded iron risers (1m height, ½ inch) shall be provided and fixed wherever there are broken or missing risers and in the new planters (as shown in the drawings, quantities according to the BOQ).

6.3 New Iron pole (12 mm diameter, 1 m height) has to be installed where needed (Quantities according to BOQ)

6.4 All Iron risers shall be fixed with galvanized iron ring (metal rigid clamp) to the iron pole.

6.5 All nozzles (spray heads) shall be replaced with low angle nozzles. Number as

shown in the BOQ. Specifications as follow:

- Two sizes of spray heads are requested. Spray heads shall be of a radius of 2.4 m @ 2 bars and 4.5 m @ 2 bars. They have to be of two types: Half circle and Quarter circle. Type: Low angle nozzles. The half and quarter circle spray heads shall have adjustable arc coverage from 25° to 360°. The sprinkler shall have a built in check valve and pressure regulated stem.
- Material: The nozzle and screen shall be constructed of heavy duty, ultra-violet resistant plastic.
- Performance shall meet the requirements of discharge, radius and rotation angle as specified on the Drawings for the given nozzle pressure. The sprinkler shall have an adjusting screw capable of regulating the radius and the flow.
- Tests: The Contractor shall provide test results carried out at factory substantiating required performance (discharge and radius of throw at prescribed operating pressure and height above ground) and giving actual precipitation rate and its uniformity as obtained for uniformity test carried out using catch cans.

6.6 All Head adaptor shall be replaced with brass adaptor ½ inch female NPT; 5/8 inch -28 NPT F out).

6.7 In addition to the sprayer, the planter can be manually irrigated with tap and hose. Tap and hose are already installed at one side of the planters, however new tape and hose according to the drawing and BOQ will be installed in the other side of the planter.

Specifications of the Tap

Tap shall be made from solid metal or brass. The hose connection is to be from same manufacturer to ensure compatibility of the connection.

Water tap shall be installed on a rigid galvanized iron riser as shown on the detail drawings. Installation shall be carried out in a workmanlike manner with all operating devices easily accessible by hand.

The irrigation of the planters will be divided into two zones:

Zone1: from planter 1 to 20 and planter 31 to 34 will be irrigated from the new installed irrigation pump.

Zone 2 from planter 21 to 30 and 35 to 44 as well as the 4 greenhouses will be irrigated from the already installed pumping system

All necessary electrical connection and pipe connection shall be made. The 2 pump stations shall be connected to the main power source of the nursery.

6.8 Plastic Valve Boxes

- Type: The Valve box shall be light in weight, with increased break resistance, and nonconductive type.
- Material: The valve box shall be made of structural foam HDPE resin that is resistant to UV light, weather, moisture, and chemical action of soils. Valve box covers shall be securely fastened with stainless steel bolt.
- Installation: The Valve box shall be used for the encasement of ball valves. Its size shall be sufficient to permit ready removal of the valve inner assemblies without removing the box from the ground.
- Sizes: plastic box shall be of two sizes:
    1) 12 inch x 18 inch x 12 inch deep rectangular
    2) Large valve box (10 inch round)

6.9 Ball Valves

Ball valves 2 inch and under shall be full port of 2-piece construction, lever operated with bronze body and stem, chrome-plated brass ball, replaceable PTFE seats and packing, plastic coated steel handle, threaded end connection.

The pressure rating of the valve shall be 1.5 times the system operating pressure but not less than 10 bars for water supply systems.

6.10 Mini plastic valve

Mini plastic valve (25 mm*3/4 inch threaded) will be needed to irrigate the trays inside the greenhouse. Irrigation of the trays within the greenhouse is detailed below

Irrigation of the greenhouse with tray.

Water will be provided to this greenhouse through a 63 mm transmission pipe from the newly installed pump station to the greenhouse. A 32 mm pipe will be connected to a 25 mm pipe that is connected to each tray alone, and each tray is equipped, at the inlet, with a mini plastic valve to allow water to flow within these trays. At the outlet of each tray another mini plastic valve allows to evacuate water through a 25 mm pipe connected to a collecting 32 mm pipe that will evacuate water outside the greenhouse.

7- Head unit and Irrigation Pump

The new irrigation system will include 2 head units:

7.1. The existing pump

- The existing pump with head unit shall be reinstalled as shown in the drawing. This head unit will be connected to the already existing reservoir.
- The head unit comprises: 3 HP centrifugal pump, 2 inch strainer, 2 inch check valve pressure switch, pressure gauge 2 inch gate valve, 2 inch disk filter, and 1 inch fertilizer injector assembly.
- All electrical breakers and dry contact including al electrical installation (wiring and conduits between the panel board and the pumps) shall be delivered and installed.

Connect to irrigation tank al necessary piping and fittings.

7.2 New irrigation pump and Head unit

New head unit with pump shall be installed and connected to the newly installed plastic tanks.

The specifications of the head unit are as follow and number are mentioned in the attached BOQ:

General Description of Head Unit

The Contractor shall provide a pump system that will provide the required flows at the required pressure, optimizing as much as possible within the high efficiency range of the pump motor.

Duty conditions for the pumps shall be as mentioned in the B.O.Q. All pumps shall have a rubber flexible connection to the piping.

It is the Contractor's duty to verify and to price pumps that will have the correct flow rates head and power.

7.2.1 Centrifugal pump 5.5 HP

A main centrifugal pump shall be supplied with a 5.5 HP, flow rate between 180 and 250 l/min, head between 51 m and 55 m.

7.2.2 Centrifugal pump 1.5 HP

A back up centrifugal pump shall be supplied, with 1.5 HP, flow rate between 30 and 60 l/h and head between 45 m and 60 m.

Specification of the centrifugal pumps shall be as follow:

General

The Manufacturer shall take overall responsibility for the design, manufacturing and testing of all the equipment on order, inclusive of his sub-ordered equipment and services.

The combined performance of the machine and its driver under all operating conditions shall be the responsibility of the Manufacturer.

The combined unit shall perform substantially as well in its permanent location as

it did on the Manufacturer's test stand.

The Manufacturer shall ensure that equipment can be properly integrated into the whole installation meeting the applicable specifications.

DESIGN AND CONSTRUCTION

Pumps

The pumps shall be designed in accordance with the requirements of API 610 Tenth Edition.

Where more than one duty pump is specified the pumps shall, unless otherwise indicated, be deemed to operate in parallel configuration.

Pumps shall be suitable for uncovered, outdoor installation (without roof), and continuous operation.

All single stage and two-stage pumps shall be suitable for instantaneous start-up from ambient to full operating temperature.

Pump Drivers

The Manufacturer shall be responsible for the supply and installation of the pump motor drivers.

PUMP CHARACTERISTICS

The pumps shall exhibit a stable, continuously rising characteristic between the duty point and closed valve. Head rise from duty point to closed valve shall be at least 10% but shall not exceed 20% of the duty head.

The specified duty point shall fall in the range 80% and 110% of the flow at the best efficiency point (BEP) for the selected pump design.

The minimum continuous flow (MCF) of the pump shall not exceed 30% of the flow at the duty point.

The pumps shall be capable of sustained operation at any point between the

minimum continuous flow and 115% of the duty flow.

The "available" Net Positive Suction Head (NPSHA) shall exceed the "required" Net Positive Suction Head (NPSHR) by at least 3.3 feet (1 m) throughout the entire operating range, from the minimum continuous stable flow up to and including the rated capacity. The use of inducers in the pump suction to increase NPSH margins is not acceptable.

Suction specific speed of the pump with the maximum diameter impeller at its BEP shall not be higher than 10,991 (USGPM, feet (Liquid Column), r/min) [6,730 (l/s, mlc, r/min)].

The sound pressure level of pump and driver shall not exceed 85 dB(A) for all operating conditions in the work area, i.e. any position accessible to personnel not less than 3 feet (1 m) from equipment surfaces.

PERFORMANCE

The pump shall be capable of continuous operation i.e. suitable for uninterrupted operation for a period of at least 25,000 hours at any operating point within the performance map.

The pump shall also be suitable for intermittent operation i.e. an operation that includes intentional starts and stops.

PUMP CASINGS

The pump casings, suction and discharge nozzles, seal chambers and all other pressure containment parts shall be designed in accordance with the requirements of API 610.

The pump suction and discharge flanges and pump case holding down arrangement shall be designed such that excessive stresses and/or misalignment will not result from normal external loads imposed from the station piping.

Pump casing design shall permit removal of the complete rotating element without the need to disturb the pump suction and delivery piping.

Studs and heavy duty nuts shall be used on all main casing joints instead of cap screws.

All auxiliary connections to the pressure casing shall be fitted with flanged stubs, full penetration welded to the casing. Socket welded connections shall not be used. Integral flanges may be used.

IMPELLERS AND WEAR RINGS

Impellers shall be of a solid hub, closed design, of one-piece construction and shall be both statically and dynamically balanced. Fabricated impellers are not acceptable.

The method of locating the impellers shall prevent axial movement or loosening under all conditions that may occur in service. Split type thrust collars shall not be used.

Renewable casing and impeller wear rings shall be provided. Wear rings shall have a shrink fit and shall be locked by minimum of three set screws. Tack welding, as a method of securing wear rings, will not be acceptable.

PUMP SHAFTS

The Manufacturer shall provide calculations to demonstrate that the first dry bending critical speed of the pump shaft is not less than 120% of the continuous operating speed of the pump.

Shaft sleeves and inter-stage bushing shall be mandatory.

Shaft sleeves shall be hard faced where frictional contact is possible

MECHANICAL SEALS

Pumps shall be fitted with an un-pressurized tandem seal arrangement comprising a single hydraulically balanced inboard mechanical seal with an outboard, dry-running back-up seal for enhanced safety. The seal assembly shall be of the cartridge type for ease of replacement. The materials of construction shall be compatible with the product.

Seal chambers shall be integral with the pump casing and shall be designed to permit ease of maintenance.

Seals shall be selected and designed to obtain at least 3 years of uninterrupted operation. Positive pressure shall be maintained in the pump seal chambers under all operating conditions.

The seal design shall be based on the maximum dynamic sealing pressure and temperature. All components, including the seal system, shall withstand the maximum discharge pressure in the static condition.

The Seal Manufacturer shall recommend alternative mechanical seal materials where he considers the specified combination unsuitable. In all cases the Seal Manufacturer shall indicate type, grade and manufacturer of the materials.

A seal leakage detection system for each hydrant and hydrant jockey pump set shall be provided. The leak detection system shall comprise a stainless steel leakage collection vessel with stainless steel float type level switch Type 3.

FLANGES

Suction and discharge flanges shall be in accordance with ASME Standard B16.5.

COUPLINGS

The pump-to-motor couplings shall be of laminated, non-lubricated, flexible spacer type, Meta-stream TSKS or equal and approved.

The coupling halves shall be keyed to their shafts and shall have a tapered fit to facilitate ease of removal.

AUXILIARY PROCESS PIPING

Pump sets shall be supplied complete with all necessary auxiliary piping systems, including:

Casing vent and drain piping

Seal flush circulation piping

Drain piping from mechanical seals including a leakage detection system

Instrumentation piping

Pump casing connections generally shall be of socket-weld construction. The minimum size shall be ¾ inch. Vent and drain connections shall be equipped with ball type isolating valves in carbon steel. Drain connections shall be piped to the base plate edge.

Isolating valves shall be equipped with locking plates to permit valves to be secured in the open or closed position.

BASEPLATES

Each pump together with its motor shall be mounted on common fabricated steel.

Baseplates shall be provided with a machined reference surface and levelling screws to permit ready levelling on installation. The Manufacturer shall provide foundation/holding down bolts and a variety of shims in adequate quantities for setting up the baseplate on the foundations.

MATERIALS OF CONSTRUCTION

Pump materials shall be in accordance with API 610, Appendix 'H', Class S6. All metal parts in contact with the pumped liquid shall be free from zinc, copper, cadmium and their alloys

ELECTRIC MOTOR DRIVES

Motors shall be rated in accordance with the requirements of API Standard 610.

DOCUMENTATION

Material Certificates

Datasheets

PACKAGING AND PROTECTION

All items shall be provided with adequate protection against corrosion, mechanical damage and deterioration until they are unpacked at the site. The manufacturer shall ensure that all packing and protection supplied for the materials are adequate to maintain the material guarantees. The Manufacturer shall advise the Engineer of

the intended packing controls.

7.2.3 Check Valves

1- Check valves shall be to BS EN 12334 [28], swing, straight, for horizontal use.
2- Material of Component Parts: Ductile iron from basic materials listed in BS EN 12334.
3- Special Requirements: Seating or facing rings are to be renewable. An arrow showing the direction of flow is to be visible from outside and cast integral with the valve housing.
4- End Connections: Either flanged to BS EN 1092-2, or screw ended to BS 21 to suit joints specified for adjoining pipes.
5- Factory Protection: Casting surfaces are to be given an initial coat of protective paint immediately after shot blasting and a second coat on assembly. A protective coating is to be hot applied coal tar or bitumen to BS 4164 or BS 3416 respectively. The minimum thickness of coating shall be 250 microns.
6- Pressure Rating: The pressure rating of the valve shall be 1.5 times the system operating pressure but not less than 10 bars for water supply systems.

7.2.4 Pressure relief valve

Deliver ad install $1^{1/4}$ inch brass pressure relief valve to automatically reduce higher inlet pressure, to steady lower downstream pressure regardless of changing flow rate and/or varying inlet pressure. Valves are to be high pressure rating piston type and hydraulic pilot operated type. Internal coating of epoxy to a thickness of

250 microns and external coating of epoxy and nickel plating to a thickness of 250 microns shall be provided at factory. Pressure Rating: The pressure rating of the valve shall be 1.5 times the system operating pressure but not less than 10 bars for water supply systems.

7.2.5 Pressure switch

7.2.6 Pressure Gauge

Gauges shall be direct reading, glycerine filled, and 2.5 inch diameter with ranges of up to 0-10 kg / cm.

Gauges shall have glass or Plexiglas face and shall be drip-proof with bottom connection ¼ inch NPT and complete with shut off cocks fabricated from cast brass. Gauges shall record inlet and discharge pressures.

7.2.7 Gate valve

- Size 50 mm and smaller to BS 5154 (or latest version when available) inside screw, solid wedge, rising stem and screwed bonnet.
- Material of component parts from basic or alternative materials listed in BS 5163-1. (Or latest version when available)
- End Connections: Size 50 mm and smaller screwed end to BS 21. (Or latest version when available)
- Opening: The valve operating nut or wheel shall have an arrow cast in valve indicating the direction of opening.
- Factory Protection: Casting surfaces are to be given an initial coat of protective paint immediately after shot blasting and a second coat on assembly. A protective coating is to be hot applied coal tar or bitumen Thickness of coat id to be 250 microns.

7.2.8 Filters

An in-line disk filter, mesh size number 150, with auto-backwash shall be installed. The filter casing and associated components shall be plastic materials.

The size of the filter shall be sufficient to ensure pressure loss less than 0.3bar at the maximum designed flow. Flushing shall be controlled by the controller and shall normally occur at the end of every irrigation cycle.

7.2.9 Fertilizer injector

1 inch fertilizer injector assembly shall be provided.

- Body: polypropylene for resistance to acids and other chemicals.
- Maximum working pressure 785 kPa
- Minimum working pressure on pressurized system 785 kPa.
- When using bypass pressure differential between the inlet and outlet must be at least 70 kPa.
- Venture should always be placed level plain

Distribution pipes

All manifolds and interconnecting pipe work and fittings shall be heavy duty cast iron. Piping and fittings shall be painted with protective corrosion resistance paint as approved by the Engineer.

Pipes and accessories

All pipework shall be pressure tested for a minimum of 3 hours. The pressure variation over the test period shall not exceed 5 %

Test pressures shall be as follows:

Main lines, pipework 20 kg/cm^2

Lateral pipework and all other PE pipework 20 kg/ cm^2

All mainline fittings shall be left exposed for the purpose of this test and shall be inspected for evidence of leakage. Any major break in the mainline requiring shut-down of the test shall cause the test to be re-run entirely. The Engineer shall govern the re-scheduling of the test

7.3 Submersible pump

- The existing submersible pump in the well shall be removed and replaced with a new one according to the following specifications:
- The submersible pump shall be non-clog, centrifugal, submersible with guide rails quick disconnect type and suitable for raw water and designed to permit quick and easy ground level removal of pump from wet well for service or inspection without disconnecting or disturbing discharge piping, disconnecting fasteners and electrical connection.
- The pump shall not overload the motors for any point on the maximum pump speed performance characteristic curve and the pump operating range as recommended by the manufacturer to prevent surging, cavitation and vibration.
- The complete pump unit when operating shall be cavitation, vibration, noise and oil or water leaks over the rage of operation.
- For the performance curve of the selected pump impeller, the head shall continuously increase as flow rate decreases throughout the entire curve from run-out to shutoff head.

- The contractor shall ensure that the submersible pump shall be supplied and tested by the pump manufacturer, who shall supply full certification for the proper function of the entire pumping system.
- The pump shall be supplied complete with the following :
- Close-coupled submersible vertical electric motor.
- Required length of durable multi-conductor waterproof electric cable.
- Special quick disconnect flange elbow with integral bracket for floor mounting and lower guide rail holder.
- Required length of stainless steel guide rails.
- Upper guide rail bracket.
- Rail guided lifting assembly.
- Lifting yoke and stainless steel chain for raising and lowering pump.
- Submersible pump and motor unit shall be designed and constructed to satisfactorily operate and perform within the designated design conditions and the requirements of these specifications. They shall be designed for a working life of 100,000 hours with overhauls at not greater than 20,000 hours intervals.
- Bearing shall be anti-friction type designed for L10 life at least 50,000 operating hours in accordance with BS ISO 281.
- Pumps shall be designed to pass all suspended solids up to 50 mm, 75 mm and 100 m diameter without shocking.
- Vibration levels shall not exceed the levels given in BS ISO 2954 and BS ISO 10816-1 for Class II machines, quality bands A and B.
- The contractor shall ensure that the pump manufacturer provides certification which guarantees the following: flow rate, total head, power input, and efficiency.
- Pump shall be capable of handling raw and highly corrosive ground water.

- Submersible pump impellers shall be fabricated in accordance with the following requirements: non clog type statically and dynamically balanced and keyed to the shaft. Shall be provided with pump-out vanes to prevent material from getting behind the impeller and into mechanical seal area, provided with wear ring as necessary to assure efficient sealing between volute and impeller.
- Bearings shall be as follows: bearings shall be capable of taking the static weight of the rotating parts at any thrust generated by the operation of the pump. The upper bearings shall be of the grease lubricated sealed for life type, the lower bearings shall be lubricated by the internal oil supply, and the bottom bearing shall be of the angular contact ball bearing type in combination with roller bearings.
- Pumps shall be manufactured of the following materials as a minimum: volute casing shall be cast iron, BS EN 1561 Grade 220 or 250. Impellers shall be Ni-resist cast iron to BS EN 13835, stainless steel to the manufacturers approved stainless steel grade, duplex stainless.
- Impellers wear rings shall be stainless steel BS EN 10250-4, Grade 307 S15 or to the approved manufacturer's standard.
- Bends shall be cast iron, BS EN 1561 Grade 250.
- Shafts shall be of such diameter that they will not deflect more than 0.05 measured at the mechanical seal, whilst operating at full driver output.
- Shafts shall be stainless steel BS EN 10250-4.
- Fasteners, studs, nuts and screws shall be stainless steel Grade 316 S31 to BS EN 10250-4.
- Submersible cable shall be EPR insulated Niplas sheathed, flexible 450/750 volts grade, oil and grease resistant with tinned annealed copper conductors in accordance with BS EN 50525-1, BS EN 50525-2-41, and

BS EN 50525-2-42. The cable shall be brought directly out of the submersible motor without joints and shall be of sufficient length to reach the control panel inside the pumping room.

- The contractor shall ensure that the pump's manufacturer provides al spares and special tools required during the commissioning and maintenance period
- The contractor shall secure from the pump manufacturer certification that the following inspections and tests have been conducted to the pumps at the factory: impeller, motor rating and electrical connections checked for compliance with these specifications, motor and cable insulation tested for moisture content or insulation defects.
- The pump shall be tested at the factory for performance according to BS EN ISO 5198 including: flow rate, inlet pressure, outlet pressure, motor power, torque efficiency NPSH.
- Characteristics of the pump shall be as follow:
    - Max H= 45 m depth
    - Max Q= 10 m^3/hr.
    - 2 h
    - 220 volt
    - 2 inch outlet size
    - Float switch
- Reconnect Electrical Breakers and dry contact including all the electrical installation (wiring and conduits between the main electrical source, the panel board and the centrifugal pumps)
- Underground mainline conduit between the well and the water reservoirs (H.D.P.E 63 mm PN 10)

IV – Solar pumping plants

The Solar Pumping Plants without battery will be installed for Abdeh Nursery. As the Nursery has daily needs for water but the pumped water will be stored into a major tank, Solar System combined with a Solar Drive Inverter to action the pumps.

The shadow free area required for installation of solar plant is approximately 100 m^2. The Solar panels may be installed on a structure directly on the floor. Sufficient area shall be available for servicing the system. The minimum clearance required from the parapet wall & in between row of panels is minimum 60 cm for cleaning the panels & servicing. In between the row of solar panels sufficient gap needs to be provided to avoid falling of shadow of the previous row on the next row.

The Drive shall be placed indoor or IP65 Enclosure in a safe and easily accessible place.

The details on how to decide the capacity of the solar system required for the particular solution is enclosed as Annexure –I.

Description of the Existing components:

2 pumps 5.5HP, 3*25A, 10.8 to 15 m^3/h

Genset 30 kVA

The detailed Technical Specifications, Standards & suggested Tender Eligibility Criteria are enclosed as Annexure IIA, and IIB respectively.

ANNEXURE I

Solar Pumping consists of following main components:

1. Solar Photo Voltaic (SPV) Array
2. Solar Drive - Variable Speed Drive (VSD)

The SPV array & VSD may be sized to suit the needs expressed here below:

1- Solar pump inverter or conventional VSD with external or internal possibility to realize MPP tracking.

2- String combiner box, if required by the solar pump inverter.

3- Diode for each string.

4- Control Panel

5- Array with PV modules.

6- Support structure for the PV modules.

7- DC and AC wiring.

8- Switch control or VSD which allows to feed in DC solar power directly into the DC intermediate circuit for option.

9- Flow Meter

Location of the Nursery: 34°31'23.3"N 35°59'32.5"E

1. Obligations by the bidders:

(ii) To design, supply, and install the solar system for the mentioned borehole.

(ii) To provide a Plot Plan for the site with distribution of panels, location of VSD. And distance between strings.

(ii) The offer should include the required area on the floor and distribution of the solar panels the tilt angle of the solar panels, and the cable sizes DC and AC, between the inverter and the existing control panel.

(ii) The design should announce the maximum water during the year.

(ii) The life span of the project should be at least 10 years so the degradation of the solar panels should be considered in the design.

(ii) The bidder should submit the recommended regular maintenance.

(ii) To fill the tables and datasheet of the inverter and solar panels.

ANNEXURE-IIA

Technical specification for Solar Pumping

Solar PV Array (kWp) minimum 10 kWp

VSD (kVA) for 2 pumps 5.5 HP

Definition

A Solar Pumping power plant consists of SPV array, Module Mounting Structure, Solar Drive (VSD) connected with a Genset as backup.

Maximum Power Point Tracker (MPPT), Inverter, Controls & Protections, interconnect cables and switches. PV Array is mounted on a suitable structure. The VSD system is without battery and should be designed with necessary features to supplement energy to the pumps during daytime.

Components and parts used in the SPV power plants including the PV modules, metallic structures, cables, junction boxes, switches, etc., should conform to the IEC or international specifications, wherever such specifications are available and applicable.

1. Technical Specifications of Major Components of Solar PV Power Plant

1.1 Solar PV modules and array

1.2 Module mounting structure

1.3 Junction Boxes

1.4 Power Conditioning Unit

1.5 DC & AC Switches

1.6 Cables and installation accessories

1.7 Earthing and lightning protection

1.8 Operation and maintenance manual

1.1 SOLAR PV MODULES AND ARRAY

(i) Only indigenous modules shall be used in the project. Solar module shall be Crystalline (Mono/Poly) with 17% efficiency. The peak power output of the PV Module shall be minimum 335Wp under STC. Module Voc shall be minimum of 37.5V. The total array capacity shall not be less than 10 kWp and this shall be operating at the DC voltage of 1000V. The power output of the PV module must be reported under standard test conditions

(ii) I_V curve at STC of the sample module should be submitted.

(iii) The mechanical structure shall withstand gusts of wind up to 130 km/hr from backside of the panel.

(iv) The offered modules must conform to the latest Bloomberg list as top tier1

(v) In addition, the modules must conform to IEC 61730

(vi) Protective devices against surges at the PV module shall be provided. Low voltage drop bypass diodes shall be provided.

(vii) Module Junction box (weather proof), where the module terminals shall be interconnected and output taken, shall be designed for long life outdoor operation in harsh environment and protected against surges. It should have a provision for "Opening" for replacing the cable if required.

(viii) PV modules used in solar power plants must be warranted for output wattage, which should not be less than 90% at the end of 10 years and

(ix) 80% at the end of 25 years.

(x) Each PV module must use an identification tag, which must contain the following information:

- Name of the manufacturer of PV Module
- Name of the manufacturer of Solar cells

- Unique Serial Number & Model Number of the module
- Month and year of the manufacture (separately for Solar cells and
- module)
- Country of origin (separately for solar cells and module)
- I-V curve for the module
- Peak Wattage of the module, Im, Vm and FF for the module
- Date and year of obtaining IEC PV module qualification certificate
- Name of the test lab issuing IEC certificate
- Other relevant information on traceability of solar cells and module as per ISO 9000 series

1.2 ORIENTATION AND TILT OF PV MODULES

Modules shall be installed in a way to get the maximum benefit out of the solution.

1.2.1 MOUNTING STRUCTURES

The PV modules will be mounted on fixed metallic structures of adequate strength and appropriate design, which can withstand load of modules and high velocities up to 130 km per hour. The support structure used in the power plants will be hot dip Galvanized Iron (G.I).

The "Mounting Structure" should have the following features:

- The modules support structure shall be Mild Steel /hot dipped Galvanized (at least 120 micron) Iron for holding the PV modules. The size of angle iron should not be less than 50x50x5 mm.
- Each panel frame structure shall be so fabricated as to be grouted on roof on its legs. The legs of the structure shall be fixed and grouted with foundation cement concrete.
- All nuts and bolts should be made of Stainless Steel.
- The structure should be designed to allow easy replacement of any module.
- The array structure shall be so designed that it will occupy minimum space without sacrificing the output from the SPV panels.
- The minimum clearance of the lowest part of the module structure and the developed ground level shall not be less than 500 mm.
- The minimum clearance required from the parapet wall of the roof & in between row of panels is min 60 cm for cleaning the panels & servicing.
- The bidder shall specify installation details of the PV modules and the support structures with appropriate diagrams and drawings. The work shall be carried out as per the designs approved by the procuring entity.

1.3 JUNCTION BOXES

The junction boxes shall be dustproof, vermin and waterproof and made of FRP / Thermo Plastic. The terminals shall be connected to copper bus bar arrangement of proper sizes. The junction boxes shall have suitable cable entry points fitted with cable glands of appropriate sizes for both incoming and outgoing cables. Suitable markings shall be provided on the bus bar for easy identification and cable ferrules shall be fitted at the cable termination points for identification. Each main junction

box shall be fitted with an appropriate rating blocking diode. The junction boxes shall be of reputed make.

1.4 Power Conditioning unit - Solar Drive – Variable Speed Drive (VSD)

As SPV array produces direct current electricity, it is necessary to convert this direct current into alternating current and adjust the voltage levels to match the pump's specifications. Conversion shall be achieved using a VSD and the associated control and protection devices. All these components of the system are termed the "Variable speed drive".

DETAILED SPECIFICATION

1)	Nominal DC Array Input Voltage	To be filled up based on the capacity of PV plant DC Voltage of the PV array shall be suitable for the MPPT range of PCU
2)	DC Array Input Operating Voltage	-20% to +15% of the DC Array input voltage in Sl. Number 1 and above
3)	Type of Solar Controller	MPPT Based Solar Controller
4)	Continuous drive Output Rating	Equal to capacity for 1 pump 5.5HP. To be mentioned in KVA
5)	Output Wave Form	Pure Sine Wave Output
6)	Cooling	Forced Air cooling, with temperature controlled cooling fan
7)	Operating temperature	0 – 50 °C
8)	LED/LCD Display: Indications	Display shall indicate system functional parameters and protection functional indicator

9)	Data monitor and display controls	RS485, Ethernet or RS232 connectivity
10)	Protection	1. Input overvoltage 2. Low/high frequency 3. Short circuit 4. Under/over 5. Over Temperature 6. DC disconnect device 7. DC reverse polarity
11)	Enclosure Protection	IP 21(for indoor)
12)	Safety	1. IEC 62103 2. IEC 62109 Part 1 & 2 3. Galvanic Isolation at input & output through transformer

1.5 DC & AC Switches

a. DC SIDE

(i) MCB of suitable rating shall be provided for connection and disconnection of array & VSD for maintenance purposes.

(ii) Switches and Circuit Breakers on DC side shall be DC rated or they shall be sufficiently de-rated, if AC rated switches are used.

b. AC SIDE

(i) MCB of suitable rating shall be provided for connection and disconnection of VSD to the load

1.6 Cables and accessories

All the cables shall be supplied conforming to IEC 60227 & IEC 60502 shall be of 1.1 kV grade as per requirement. Only PVC copper cables shall be used. The size

of the cables between array interconnections, array to junction boxes, and junction box to VSD, VSD to AC Distribution Box etc. shall be so selected to keep the voltage drop and losses to the minimum. Permissible Wire Drop on DC side shall be <=1%

The bidder shall supply installation accessories, which are required to install and successfully commission the power plant.

1.7 Earthing and Lightning Protection:

Earthing: The array structure of the PV yard shall be grounded properly using adequate number of earthing kits. All metal casing or shielding of the installation shall be thoroughly grounded to ensure safety of the solar pumping system.

Lightning: The VSD shall be provided with lightning & over voltage protection. The main aim in this protection shall be to reduce the over voltage to a tolerable value before it reaches the PV or other sub system components. The source of over voltage can be lightning, atmosphere disturbances etc.

1.8 OPERATION AND MAINTENANCE MANUAL

An Operation and Maintenance Manual, in English and Arabic, should be provided with the system.

The following minimum details must be provided in the Manual:

(a) About Photo Voltaic & PV Module
(b) Clear instructions about mounting of PV module.
(c) About electronics used in
(d) DO's and DONT's,
(e) Clear instructions on regular maintenance and Trouble Shooting of the system.
(f) Name & address of the person or Centre to be contacted in case of failure or complaint.

ANNEXURE- IIB

MINIMAL TECHNICAL REQUIREMENTS / STANDARDS

1. PV MODULES:

a. The PV modules must conform to the latest edition of any of the following IEC for PV module design qualification and type approval: Crystalline Silicon Terrestrial PV Modules IEC 61215
b. In addition, the modules must conform to IEC 61730
c. PV modules to be used in a highly corrosive atmosphere (coastal areas, etc.) must qualify Salt Mist Corrosion Testing as per IEC 61701
d. IDENTIFICATION AND TRACEABILITY

Each PV module must use an identification tag, which must contain the following information:

i. Name of the manufacturer of PV Module
ii. Name of the Manufacturer of Solar cells
iii. Month and year of the manufacture (separately for solar cells and module)
iv. Country of origin (separately for solar cells and module)
v. I-V curve for the module
vi. Peak Wattage, Im, Vm and FF for the module
vii. Unique Serial number and Model number of the module
viii. Date and year of obtaining IEC PV module qualification certificate
ix. Name of the test lab issuing IEC certificate
x. Other relevant information on traceability of solar cells and module as per ISO 9000 series.

e. WARRANTY

PV modules used in solar power plants/ systems must be warranted for their output peak watt capacity, which should not be less than 90% at the end of 10 years and 80% at the end of 25 years

Cables	General Test and Measuring Method PVC insulated cables for working voltage up to and including 1100 V and UV resistant for outdoor installation	IEC 60227 IEC 60502
Switches/Circuit Breakers / Connectors	General Requirements Connectors –safety A.C. / D.C.	IEC 60947 part I,II, III / IS 60947 Part I,II,III EN 50521
Junction Boxes / Enclosures for Inverters / Charge Controllers** / Luminaries	General Requirements	IP 54(for outdoor)/ IP 21(for indoor) as per IEC 529

**In case if the Charge controller is in-built in the inverter, no separate IEC 62093 test is required and must additionally conform to the relevant national/international Electrical Safety Standards wherever applicable

2. AUTHORIZED TESTING LABORATORIES/ CENTERS

Accredited Testing Laboratories or LCEC approved test centers.

3. WARRANTY

The mechanical structures, electrical works including power conditioners / inverters / charge controllers maximum power point tracker units/distribution boards/digital meters/switchgear, etc. and overall workmanship of the solar pumping system must be warranted against any manufacturing/ design/ installation defects for a minimum period of 5 years.

Section 8. Drawings

(See attached Drawings)

Section 9. Bill of Quantities

(See attached Bill of Quantities)