## **Detailed feasibility study survey form – Solar irrigation pump**

Version 3, 13 February 2023

**Disclaimer:** This site survey form for solar water pumping systems is for irrigation applications only.

**Note to surveyor:** Please take as many photographs, GPS location tagging and videos of the project location specific to the sections in the survey below (for example, solar array location, controller location, water source, surrounding areas, community, irrigation land extension, etc.)



= take photos = record the GPS point(s)

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| **Tools required during the survey** | **Checklist** |
| GPS/Abney level |  |
| Measuring tape (>50 meters) |  |
| Camera, calculator, stopwatch |  |
| Sun-path mobile app |  |
| Bucket (5-10 litres) |  |
| Pen and notebook |  |

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| **Documents to be collected from the site** | **Checklist** |
| Land permit for solar array installation |  |
| Land permit for pump intake construction (collection tank, open well, etc.) |  |
| Land permit for distribution tank construction (if applicable) |  |
| Community water use consent |  |

The following section gathers information about the community and operational modality of the project to understand how the project management structure will be set up.

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| **General information** | | | | | | |
| **Date of survey** | | |  | | | |
| **Name of the project**  ***Give a name to the project in consultation with the community, which will identify it in the future.*** | | |  | | | |
| **Name of surveyor** | | |  | | | |
| **Organisation** | | |  | | | |
| **Name of the client/s**  ***Include names of the main local people who contributed to the information on the survey*** | | | **Phone no.** | | | |
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| **Name of the client organization**  ***(cooperative, company, individual, etc.)*** | | |  | | | |
| **Type of SIP ownership** | | | Individual  Community  Local government  Others: ……………………………………………………………………………. | | | |
| **If community-owned, is the user committee formed?** | | | Yes  No | | | |
| **If community-owned, describe how they plan to distribute water** | | | No plans yet  Sell water to beneficiaries.  Free distribution, no schedule  Free distribution, water distribution scheduled by the community | | | |
| **SIP management structure** | User group (non-registered)  User committee (registered)  Other arrangements: ………………………………………………………………………………….. | | | | | |
| **If a user group is formed (non-registered), provide the details:** | Name of the user group (if any) | | | | Number of members in the user group | |
| Name: …………………………………………………..  No name | | | |  | |
| **If a user committee is formed (registered), provide the details:** | The legal name of the user committee | | | | | Number of members in the user committee |
|  | | | | |  |
| **The planned SIP funding mechanism** | Fully subsidised  Name of subsidising entity: ………………………………………………................................  Partially subsidised   |  |  |  |  | | --- | --- | --- | --- | | **Name** | | **% contribution** | **Funding type** | | Name of entity 1 |  |  | subsidy  equity  loan | | Name of entity 2 |  |  | subsidy  equity  loan | | Name of entity 3 |  |  | subsidy  equity  loan |   No subsidy   |  |  |  |  | | --- | --- | --- | --- | | **Name** | | **% contribution** | **Funding type** | | Name of entity 1 |  |  | equity  loan | | Name of entity 2 |  |  | equity  loan | | Name of entity 3 |  |  | equity  loan | | | | | | |
| **Is there any conflict within the community regarding the potential SIP project?** | Yes  No  If yes, describe the conflict:  ……………………………………………………………………………………………  …………………………………………………………………………………………  Describe the resolution of the conflict:  ………………………………………………………………………………………….  …………………………………………………………………………………………… | | | | | |
| **Location information** | | | | | | |
| **Tole name** | |  | | | | |
| **Village** | |  | | | | |
| **Ward no.** | |  | | | | |
| **Rural municipality/municipality** | |  | | | | |
| **District** | |  | | | | |
| **Province** | |  | | | | |
| **Mobile network and connection speed** | | 1. NTC, connection speed:  2G  3G  4G 2. Ncell, connection speed:  2G  3G  4G 3. Others: ………,connection speed:  2G  3G  4G | | | | |
| **Is the vehicle accessible up to the village?** | | Yes  No  Describe road type: ………………………….....  Functionality:  Year-round  Seasonal, months of inaccessibility: ……………….. | | | | |
| **Is the vehicle accessible up to the solar array location?** | | Yes  No  Describe road type: ………………………….....  Functionality:  Year-round  Seasonal, months of inaccessibility: ……………….. | | | | |
| **Is the vehicle accessible up to the water source?** | | Yes  No  Describe road type: ………………………….....  Functionality:  Year-round  Seasonal, months of inaccessibility: ……………….. | | | | |
| **Name and distance of the nearest city/town from the site** | | Name | |  | | |
| Distance | | ……………….km | | |



The following section gathers information on the agriculture value chain to gauge the utilisation of solar water pumps, their sustainability, and their impact on the community.

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| **Agriculture value chain** | | | |
| **Name of the nearest market centre for crop sales** |  | | |
| **Distance to the market centre from the village** | …………….km | Time to reach the market centre by vehicle | ……………. hrs |
| **Are there financial institutions (FIs) present in the village?** | Yes  No    If no, the location of the nearest FI *(banks, cooperatives etc.)*: ………...……………………………  Time to reach nearest FI:…………………………………….  If yes, what type of FI?  Bank  Bank name: ……………………………………………………  Cooperative  Cooperative name: ……………………………………………..  Others: .………………………………………………………………… | | |
| **Are there loan options available for agri-related business?** | Yes  No  If yes, agri-related loan purpose: …………………………………………………………………...  Interest rate: ………..% Loan term: ………….years  Other details: …………………………………………………………………………………………..………………………………………………………………… | | |
| **Are there loan options available for solar water pumping systems?** | Yes  No  If yes, is there a ceiling to the loan amount?  Yes  No If yes, max. amount: NPR.……….  Interest rate: ……….% Loan term: ………….years  Other details: ……………………………………………………………………………………………………………………………………………………… | | |
| **Accessibility of Agriculture Knowledge Centre (AKC)** | Location of nearest AKC: ………………………………………  Distance from the village: ………………………………………  Time to reach AKC: ………………………………………… | | |
| **Describe any other Agri-related support available to the community** | ………………………………………………………………………………  ……………………………………………………………………………… | | |
| **What Agri-related enterprises are present in the village?** | ☐ Agro mill, how many? …………….  ☐ Rice mill, how many? ……………..  ☐ Dairy production, how many? …….  ☐ Cold store, how many? …………….  ☐ Others: ……………………………… | | |
| **Are there pump repair centres nearby?** | Yes  No  If yes, location: ………………………………………….  Time to reach repair centre by vehicle: ……………………………. | | |

List crop names and their coverage areas **currently practised** in the community.

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| **Crop name** | **Coverage area** | |
| **Area** | **Unit**  ***(ropani, aana, bigha, etc.)*** |
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List crop names **currently practised** and tick respective months of the plantation.

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| **Crop name** | **Baisakh** | **Jestha** | **Asadh** | **Shrawan** | **Bhadra** | **Asoj** | **Kartik** | **Mangsir** | **Poush** | **Magh** | **Falgun** | **Chaitra** |
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| **Method of irrigation** | Surface irrigation  Sprinkler irrigation  Drip irrigation  Others: …………………………………. |

Cost details of crops in **current practice.**

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| **Crop name** | **Amount (kg) grown per year** | **Unit selling price in NPR/kg** |
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Cost details of **potential crops after solar water pump intervention – preferably cash crops (vegetables, cardamom, tea, coffee, etc.).** This is just to gauge the community’s understanding and awareness of crop potential on their land.

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| **Cash crop name** | **Coverage area** | | **Anticipated harvest in the respective coverage area** | **Anticipated selling price in NPR/kg** |
| **Area** | **Unit**  ***(ropani, aana, bigha etc.)*** |
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The following section gathers information on irrigation and water to understand current practices and improvements that solar water pumps can bring.

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| **Land information** | |
| **The total size of land to be irrigated**  ***Mention the unit of measurement correctly.*** | Area: ……………………. Unit: ……………….*(bigha, kattha, ropani, aana etc.)* |
| **Types of soil** | Loamy soil  Clay soil  Sandy soil  Sil soil  Other observation: ……………………………………………………………… |
| **Is the entire land privately owned?** | Yes  No  If yes, how many owners? ……………………………..  If no, describe ownership: …………………………....................................................  ………………………………………………………………… |
| **If the land is leased:** | Lease tenure: ………………………………  Detail out lease terms: …………………………………………………………………  ………………………………………………………………… |

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| **Record the GPS points around the perimeter of the irrigation land (for scattered pieces of land, record the overall catchment area)** | | | | |
| **Waypoint number** | **Description** | | **Latitude** | **Longitude** |
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| **Water information** | | | | |
| **Water requirement per day**  ***(if known, otherwise, must calculate it by the irrigation requirement)*** | | ………………………. ltrs/day | | |
| **Name of the water source** | |  | | |
| **Type of water source** | | Bore-well  Open-well  Canal    River  Pond  Others: ……………………………… | | |
| **Describe the physical location of the water source** | |  | | |
| **Water source ownership** | | Public  Private  If private, is the owner willing to share the water source for pumping?  Yes  No  Any concerns? ....………................................................................................................... | | |
| **Is there any conflict within the community regarding water use?** | | Yes  No  If yes, describe the conflict: …………………………………………………………………………………………  …………………………………………………………………………………………  Describe the resolution of the conflict:  …………………………………………………………………………………………  ………………………………………………………………………………………… | | |
| **GPS location of water source i.e. pump intake** | | Latitude: …………………………...  Longitude: ………………………… | | |
| **If river pumping, is the pump intake location at risk of flood damage during monsoon?** | | Yes  No  If yes, discard pump intake location or mention mitigation strategy: …………………  ………………………………………………………………………………………. | | |
| **If river pumping, will there be adequate water level in the pump intake throughout the year?** | | Yes  No  If no, discard pump intake location or mention mitigation strategy: …………………  ……………………………………………………………………………………….. | | |
| **If river pumping, what is the distance between the river and the sump well?** | |  | | |
| **If bore-well, what is the diameter of the bore-well (inches)?** | | Diameter of the bore-well (inches): ……………  The total depth of the bore-well: ……………  ft  meter  The static water level of the bore-well: ……………  ft  meter  Describe how the static water level is measured: ……………………………………….. | | |
| **If open-well, what is the depth of the bore-well (meters)?** | | Diameter of the open-well: ……………  ft  meter  The total depth of the open-well: ……………  ft  meter  The static water level of the open-well: ……………  ft  meter  Describe how the static water level is measured: ………………………………………. | | |
| **If canal or stream, what is the water flow rate?** | | ……………………………litres/min  Describe measuring method:  Bucket measurement  Others: ……………………. | | |
| **Any risks of water source drying?** | | No, consistent year-round  Yes, drying in certain months  If the risk of drying, mention which months: ……………………………………………. | | |
| **Any risks of water source depletion (inadequate for pumping)?** | | No, consistent year-round  Yes, low water in certain months  If the risk of depletion, mention which months: …………………………………….. | | |
| **Describe the quality of water**  ***(clear/murky/sandy etc.)*** | |  | | |
| **Describe the current uses of the water source** | | |  |  | | --- | --- | | **Purposes of water use** | **% of households** | | Irrigation |  | | Drinking water |  | | Livestock |  | | Other: ……………………………………………… |  | | Other: ……………………………………………… |  | | | |
| **The existing water-pumping mechanism** | | | | |
| **What is the current mechanism for irrigation?** | | Rainwater  Canal  Diesel pumps  Electric pumps    Handpump  None  Others: …………………………………………. | | |
| **What is the limiting factor of the current mechanism for irrigation that justifies the intervention of a solar water pump?** | |  | | |
| **If electric pump(s) are also used, what is the reason for pursuing a solar water pump?** | |  | | |
| **If a diesel pump(s) is used, provide details** | | |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | **SN** | **Ownership type** | **Size** | **Fuel consumption per hour** | **Daily usage hour** | **Days per week used** | | 1 | Purchase  Rent | …………..  HP  kW |  |  |  | | 2 | Purchase  Rent | …………..  HP  kW |  |  |  | | 3 | Purchase  Rent | …………..  HP  kW |  |  |  | | 4 | Purchase  Rent | …………..  HP  kW |  |  |  | | | |
| **If any diesel pumps are rented, what is the rental cost per hour?** | | ……………………NPR/hour | | |
| **Cost (per litre) of diesel in the location?** | |  | | |

The following section gathers technical information for the solar water pumping system.

Note to surveyor: If the solar array location is on a riverbank, then discard the location because it will be at risk of flooding.

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| **Solar array location** | |
| **Land ownership type** | Private  Public  Others: …………………………. |
| **Is the concerned owner willing to allocate the land for solar array installation?** | Yes  No  Any concerns?  …..................................................................................................  ………………………………………………………………………… |
| **GPS location of solar array location** | Latitude: …………………………...  Longitude: ………………………… |
| **Area available for the array installation** | …………………….. sq. m |
| **Topography type** | Flat  Slope  Uneven |
| **If the land is sloped, what is the direction and degree of the slope?** | The direction of slope:…………….. *(north/south/east-west, etc.)*  Slope degrees: ……. |
| **Are there any nearby obstacles that may cause shading in the array? Describe.**  ***Trees, buildings, electric poles etc.*** | Yes  No  Describe: …..................................................................................................  ……………………………………………………………………………………………………….................................................................. |



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| **Sketch the array location.**  North |

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| **Controller** | |
| **Location for controller** | Outside (mount in the solar array structure)  Outside (any other location)  Inside (nearby building)  Describe controller location: ………………………………………………………………………… |
| **Ground distance from controller to solar array** | ………………………….. m |
| **Measure the earth resistivity near the controller location** | ………………………….. m |
| ………………………….. ohm |

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| **Collection reservoir (pump intake)** | |
| **Is there an existing collection reservoir?** | Yes  No  If yes, capacity: ……………….  litres  m3  Reservoir structure *(concrete, HDPE etc.)*: .……………………………................................................. |
| **GPS location of the existing collection reservoir** | Latitude: …………………………  Longitude: ………………………… |
| **If a collection reservoir is to be constructed, is there land available?** | Yes  No  If yes, land ownership type:  Private  Public  Others: ………………………………..  Is the concerned owner willing to allocate the land for a collection reservoir?  Yes  No  Any concerns? .………................................................................................................................................................. ………………………………………………………………… |
| **What type of collection reservoir is planned to be constructed? *(concrete, HDPE etc.)*** |  |
| **GPS location of the new collection reservoir** | Latitude: …………………………  Longitude: ………………………… |

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| **Distribution reservoir (for water storage and distribution)** | |
| **Is there an existing distribution reservoir?** | Yes  No  If yes, capacity: ……………….  litres  m3  Reservoir structure *(concrete, HDPE, etc.)*: ………………………………................................................. |
| **GPS location of existing distribution reservoir** | Latitude: …………………………  Longitude: ………………………… |
| **If a distribution reservoir is to be constructed, is there land available?** | Yes  No  If yes, land ownership type:  Private  Public  Others: ………………………………..  Is the concerned owner willing to allocate the land for a distribution reservoir?  Yes  No  Any concerns? .………........................................................................................................................................................................................................................................... |
| **What type of distribution reservoir is planned to be constructed? *(concrete, HDPE etc.)*** |  |
| **GPS location of the new distribution reservoir** | Latitude: …………………………  Longitude: ………………………… |



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| System head | |
| **Is the vertical height from the pump intake to the highest distribution point measured on-site?** | Yes  No  If yes, mention the vertical height: ………………………m  Describe how the vertical height is measured.  ……………………………………………………………………………………………….  If not, how will the vertical height be determined?  Google Earth (less accurate)  Others: ……………………………………………………….. |



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| Transmission and distribution network | |
| **How is the water distribution planned?** | Open canal flow  Distribution pipe  Others: ………… |
| **If open canal flow, provide details** | Does the open canal cover the entire catchment area?  Yes  No  If no, how much land area does it cover? …………………. |
| **Are there existing distribution pipes?** | Yes  No  If yes, does the existing distribution pipe cover the entire catchment area?  Yes  No  If no, how much land area does it cover? …………………….  Mention the diameters of the distribution pipes:  Main pipe: ……………. inches  Branch pipes: ……………. inches  Type of pipe material *(GI, HDPE etc.)*: …………………………………. |
| **Will the distribution pipes require water meters?** | Yes  No  If yes, describe the purpose: ……………………………………………  How many: ……………… |
| **Ground distance of transmission pipe from the pumping area to the distribution tank** | ………………………….. m |
| **Ground distance from the distribution tank to the nearest land area to be irrigated** | ………………………….. m |
| **What method was used for distance measurement above?** | Using a measuring tape  From Google Earth (less accurate)  Others: ………………………….... |
| **GPS location where the pipe output from the distribution tank meets the nearest land area to be irrigated** | Latitude: …………………………  Longitude: ………………………… |



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| **Record the GPS points of the transmission and distribution points including nodes for gate valves** | | | | |
| **Waypoint number** | **Description** | **Tick for gate valve nodes** | **Latitude** | **Longitude** |
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| Sketch the water transmission line path from the water source to the distribution tank, then the water distribution line path from the distribution tank to irrigation land. Mark the water source, distribution tank, solar array location, irrigation land and any landmarks.  North  *For example*  *Source*  *Tank*  *Solar*  *Temple* |

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| **Grid information** | |
| **Estimated distance of the national grid from the project location** | ………………………….. m |
| **Estimate timeline when the grid will be available in the project location** | No plans  Soon  If soon, by when?  ………………………………………………………. |
| **From the surveyor’s point of view, which configuration of solar water pump configuration is recommended and why?** | Off-grid solar water pump  Give reason: ………………………………………………………………………………………………………………………………………………  Solar water pump with manual changeover for national grid connection  Give reason: ………………………………………………………………………………………………………………………………………………  Grid-connected and net-metered solar water pump  Give reason: ……………………………………………………………………………………………………………………………………………… |

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| **Additional information** | |
| **Remarks (any other relevant information)** |  |