**Participatory approaches for water monitoring and harvesting:**

**Case study from India**

Manuscript Number: WAT 2300018

**Supplementary Material**

S1: **Semi-structured interview questions for the farmer’s participation in groundwater monitoring from Unjha Block (Mehsana District) and Patan Block (Patan District), North Gujarat, India**

Interview Number\_\_\_\_\_\_\_\_

Date of the interview:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Name of the interviewer:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Section A: Farmer’s details**

1. Respondent basic details
2. Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ b) Age: \_\_\_\_\_\_\_ yrs c) Gender: □M □F □O
3. Location details
4. Village: \_\_\_\_\_\_\_\_\_\_\_\_\_ Block/Taluk: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ District: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
5. What is your main source of income: □ Agriculture □ Livestock □ Mixed □ Labour □ Others \_\_
6. For how many years have you been engaged in farming? \_\_\_\_\_\_\_\_\_\_\_ years

**Section B: Farmer’s Farm and groundwater well details**

1. How much land do you or your family own in total? \_\_\_\_\_\_\_\_\_\_acres/hectares
2. Which type of agriculture do you practice? □ Rainfed □ Irrigated □ Rainfed and Irrigation
3. How many crops do you grow in a year? \_\_\_\_\_\_\_\_\_\_\_\_

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Crops** | **J** | **F** | **M** | **A** | **M** | **J** | **J** | **A** | **S** | **O** | **N** | **D** | **No. of Irrigations** |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |

1. For how much of your agricultural land is irrigation facility available? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. What type of well is installed on your farm to provide irrigation?

□ Dug well □Dug cum borewell □Borewell

□ Private □ Government

1. Which year did you install the well in your field? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. What was the initial depth of the well you had constructed, and what is the current? I:\_\_\_\_ C:\_\_\_\_
3. What was the initial depth of the groundwater level, and what is the current? I:\_\_\_\_ C:\_\_\_\_
4. Do you provide water to other farmers? Yes:\_\_\_\_ No :\_\_\_\_
5. How many partners do you have for the well? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
6. How do you charge the farmers for the water supplied?

□ Money (per hour basis) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ □ share in the production of the crops\_\_\_\_\_\_

1. What type of pump set have you installed in your well?

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Tick | Type | Initial | Change  (if any & when) | Other Details |
|  | Diesel |  |  | Price = |
|  | Electric |  |  | Reason = |

1. What is the type of lifting device installed in your well?

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Tick | Type | Initial | | Change  (if any & when) | | Other Details |
| HP | Flowrate | HP | Flowrate |  |
|  | Submersible Pump |  |  |  |  |  |
|  | Centrifugal Pump |  |  |  |  |  |
|  | Turbine |  |  |  |  |  |
|  | Others |  |  |  |  |  |

1. What are the average pumping hours per day? Kharif\_\_\_\_\_\_\_ Rabi \_\_\_\_\_\_\_ Summer \_\_\_\_\_\_\_\_\_\_\_
2. What is the approximate operating cost for the tube well? How has this changed over the years, and what are the major reasons for the change? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. What irrigation practice do you use? □ Drip □ Sprinkler □ Raingun □ Others \_\_\_\_\_\_\_\_\_\_
2. What were the lowest levels of water you had seen in your well over 20 years? \_\_\_\_\_\_\_\_\_\_\_\_\_\_

S2: **Feedback survey on the farmers’ participatory approach in measuring and reporting groundwater levels in Unjha Block (Mehsana District) and Patan Block (Patan District), North Gujarat, India**

**Form Number\_\_\_\_\_\_\_\_**

**Section A: Farmer’s details**

1. **Respondent basic details**
2. **Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ b) Age: \_\_\_\_\_\_\_ yrs c) Gender: □M □F □O**
3. **Location details**
4. **Village: \_\_\_\_\_\_\_\_\_\_\_\_\_ Block/Taluk: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ District: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Section B: Feedback on the participatory approach**

1. **Are you willing to commit to measuring and reporting groundwater level readings long-term (3 years)?**

□ Yes □Maybe □ No

If no, then explain why\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. **How often can you measure and report readings?**

□ Weekly □Bi-weekly □ Monthly

1. **Can you provide more frequent readings for the monsoon month (on a weekly basis)?**

□ Yes □Maybe □ No

If no, then explain why\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. **What motivates you to be a part of this participatory approach the most?**
   1. Concerns about groundwater in your region
   2. Contribution to the scientific community
   3. Social inclusion (irrespective of caste, gender and socio-economic status)
   4. Gaining technical knowledge on measuring groundwater
2. **Would you like to continue to report the groundwater reading over Whatsapp?**

□ Yes □Maybe □ No

If no, then explain why\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. **How do you think your contribution to groundwater monitoring can benefit you?**
   1. Selecting and planning crops
   2. Knowledge of the depth of construction of a new well
   3. Knowledge of the deepening of an existing well
   4. Installation of a pumping motor in the well
   5. Planning of a water harvesting structure
2. **Would you recommend/convince your farmer friend/ relative/neighbour to engage in the participatory network?**

□ Yes □Maybe □ No

If no, then explain why\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. **Can you train the new farmers on how to measure and report the groundwater levels?**

□ Yes □Maybe □ No

If no, then explain why\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

S3**: Details about the CGWB wells in the Unjha block (Mehsana district) and Patan block (Patan district)**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Long** | **Lat** | **Sample Number** | **Station** | **Block** | **District** |
| 72.2542 | 23.7667 | P1 | Sander | Patan | Patan |
| 72.1625 | 23.7792 | P2 | Shankhari | Patan | Patan |
| 72.1236 | 23.8417 | P3 | Patan2 | Patan | Patan |
| 72.1472 | 23.8683 | P4 | Matarwadi I | Patan | Patan |
| 72.1472 | 23.8683 | P5 | Matarwadi II | Patan | Patan |
| 72.4861 | 23.8042 | U1 | Karalli (i) | Unjha | Mehsana |
| 72.45 | 23.8417 | U2 | Dosaj | Unjha | Mehsana |
| 72.3625 | 23.7667 | U3 | Unawa | Unjha | Mehsana |
| 72.35 | 23.8 | U4 | Sihi | Unjha | Mehsana |

S4**: Details about the ATAL JAL wells in the Unjha block (Mehsana district) and Patan block (Patan district)**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Long** | **Lat** | **Sample number** | **Site  Name** | **Type** | **Source** | **Well depth (mbgl)** | **Aquifer** | **Block** | **District** |
| 72.30 | 23.77 | P'1 |  | Piezometer | SGWB | 200 | Confined II | Patan | Patan |
| 72.30 | 23.77 | P'2 | Ruvavi | Piezometer | SGWB | 53.9 | Unconfined | Patan | Patan |
| 72.30 | 23.77 | P'3 | Ruvavi | Dug Well | SGWB | 35.1 | Unconfined | Patan | Patan |
| 72.28 | 23.78 | P’4 | Matpur | Piezometer | SGWB | 60 | Unconfined | Patan | Patan |
| 72.25 | 23.77 | P’5 | Sander | Dug Cum  Bore Well | CGWB | 30.01 | Unconfined | Patan | Patan |
| 72.22 | 23.83 | P’6 |  | Piezometer | SGWB | 90 | Unconfined | Patan | Patan |
| 72.24 | 23.84 | P'7 | Mota-ramanda | Piezometer | SGWB | 57.56 | Unconfined | Patan | Patan |
| 72.22 | 23.85 | P'8 | Santi | Piezometer | SGWB | 57.11 | Unconfined | Patan | Patan |
| 72.23 | 23.86 | P'9 | Kamlivada | Piezometer | SGWB | 57.3 | Unconfined | Patan | Patan |
| 72.20 | 23.87 | P'10 | Hajipur | Piezometer | SGWB | 57.35 | Unconfined | Patan | Patan |
| 72.12 | 23.84 | P'11 | Patan2 | Dug Well | CGWB | 26.06 | Unconfined | Patan | Patan |
| 72.16 | 23.78 | P'12 | Sankhari | Dug Well | SGWB | 29.3 | Unconfined | Patan | Patan |
| 72.16 | 23.78 | P’13 | Sankhari | Piezometer | SGWB | 89 | Unconfined | Patan | Patan |
| 72.16 | 23.78 | P’14 | Shankhari | Dug Well | CGWB | 23 | Unconfined | Patan | Patan |
| 72.11 | 23.76 | P’15 | Mithi Vavadi | Dug Well | SGWB | 28 | Unconfined | Patan | Patan |
| 72.06 | 23.80 | P'16 | Kungher | Piezometer | SGWB | 150 | confined I | Patan | Patan |
| 72.05 | 23.85 | P’17 |  | Piezometer | SGWB | 55.03 | Unconfined | Patan | Patan |
| 72.03 | 23.86 | P’18 |  | Piezometer | SGWB | 87 | Unconfined | Patan | Patan |
| 72.49 | 23.80 | U’1 |  | Piezometer | SGWB | 120 | Confined I | Unjha | Mehsana |
| 72.49 | 23.80 | U’2 | Karalli II | Piezometer | CGWB | 128.35 | Confined II | Unjha | Mehsana |
| 72.49 | 23.80 | U'3 | Karalli (iii) | Piezometer | CGWB | 33 | Unconfined | Unjha | Mehsana |
| 72.37 | 23.70 | U'4 | Karalli (i) | Piezometer | CGWB | 210 | Confined II | Unjha | Mehsana |
| 72.47 | 23.82 | U’5 |  | Piezometer | SGWB | 84 | Unconfined | Unjha | Mehsana |
| 72.45 | 23.84 | U'6 | Dosaj | Dug Well | CGWB | 18.76 | Unconfined | Unjha | Mehsana |
| 72.47 | 23.86 | U’7 |  | Piezometer | SGWB | 97 | Confined I | Unjha | Mehsana |
| 72.45 | 23.87 | U’8 | Bhunav | Dug Well | SGWB | 22.5 | Unconfined | Unjha | Mehsana |
| 72.40 | 23.86 | U’9 |  | Piezometer | SGWB | 119 | Confined I | Unjha | Mehsana |
| 72.34 | 23.85 | U’10 |  | Piezometer | SGWB | 120 | Confined I | Unjha | Mehsana |
| 72.37 | 23.83 | U’11 |  | Piezometer | SGWB | 300 | Confined III | Unjha | Mehsana |
| 72.37 | 23.83 | U’12 |  | Piezometer | SGWB | 246 | Confined II | Unjha | Mehsana |
| 72.37 | 23.83 | U’13 |  | Piezometer | SGWB | 205.72 | Confined II | Unjha | Mehsana |
| 72.39 | 23.80 | U’14 | Unjha | Dug Well | CGWB | 16.6 | Unconfined | Unjha | Mehsana |
| 72.40 | 23.80 | U’15 | Unjha | Dug Well | SGWB | 15.7 | Unconfined | Unjha | Mehsana |
| 72.35 | 23.80 | U'16 | Sihi | Dug Well | CGWB | 25.01 | Unconfined | Unjha | Mehsana |
| 72.35 | 23.80 | U'17 | Shihi | Dug Well | SGWB | 20.4 | Unconfined | Unjha | Mehsana |
| 72.32 | 23.80 | U’18 |  | Piezometer | SGWB | 129.87 | Confined I | Unjha | Mehsana |
| 72.32 | 23.80 | U’19 |  | Piezometer | SGWB | 213 | Confined II | Unjha | Mehsana |
| 72.32 | 23.80 | U’20 |  | Piezometer | SGWB | 300 | Confined III | Unjha | Mehsana |
| 72.33 | 23.75 | U’21 |  | Piezometer | SGWB | 120 | Confined I | Unjha | Mehsana |
| 72.33 | 23.75 | U'22 | Pali | Piezometer | SGWB | 56.14 | Unconfined | Unjha | Mehsana |

S5**: Details about the field survey wells in the Unjha block (Mehsana district) and Patan block (Patan district)**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Long** | **Lat** | **Sample Number** | **Village** | **Block** | **District** | **Type of Well** | **Well Depth (m bgl)** |
| 72.265 | 23.763 | P\_1 | Fulesana | Patan | Patan | Borewell | 152.4 |
| 72.263 | 23.765 | P\_2 | Kamlivada | Patan | Patan | Borewell | 304.8 |
| 72.256 | 23.766 | P\_3 | Kamlivada | Patan | Patan | Borewell | 304.8 |
| 72.26 | 23.783 | P\_4 | Fulesana | Patan | Patan | Borewell | 295.656 |
| 72.233 | 23.861 | P\_5 | Sankhari | Patan | Patan | Borewell | 304.8 |
| 72.23 | 23.867 | P\_6 | Sankhari | Patan | Patan | Borewell | 304.8 |
| 72.231 | 23.868 | P\_7 | Kamlivada | Patan | Patan | Borewell | 213.36 |
| 72.171 | 23.774 | P\_8 | Sander | Patan | Patan | Borewell | 54.864 |
| 72.165 | 23.78 | P\_9 | Sander | Patan | Patan | Borewell | 292.608 |
| 72.164 | 23.78 | P\_10 | Sander | Patan | Patan | Borewell | 56.388 |
| 72.156 | 23.794 | P\_11 | Sander | Patan | Patan | Borewell | 304.8 |
| 72.024 | 23.833 | P\_12 | Sankhari | Patan | Patan | Open Well | 33.528 |
| 72.022 | 23.833 | P\_13 | Sander | Patan | Patan | Borewell | 51.816 |
| 72.481 | 23.783 | U\_1 | Unava | Unjha | Mehsana | Open well | 24.384 |
| 72.483 | 23.783 | U\_2 | Upera | Unjha | Mehsana | Borewell | 182.88 |
| 72.484 | 23.784 | U\_3 | Upera | Unjha | Mehsana | Borewell | 182.88 |
| 72.48 | 23.786 | U\_4 | Dasaj | Unjha | Mehsana | Borewell | 274.32 |
| 72.482 | 23.787 | U\_5 | Karli | Unjha | Mehsana | Open well | 12.192 |
| 72.483 | 23.787 | U\_6 | Upera | Unjha | Mehsana | Borewell | 182.88 |
| 72.483 | 23.789 | U\_7 | Dasaj | Unjha | Mehsana | Borewell | 271.272 |
| 72.483 | 23.789 | U\_8 | Upera | Unjha | Mehsana | Open well | 30.48 |
| 72.511 | 23.826 | U\_9 | Sihi | Unjha | Mehsana | Open well | 24.384 |
| 72.505 | 23.827 | U\_10 | Sihi | Unjha | Mehsana | Borewell | 304.8 |
| 72.506 | 23.83 | U\_11 | Sihi | Unjha | Mehsana | Borewell | 304.8 |
| 72.501 | 23.832 | U\_12 | Sihi | Unjha | Mehsana | Borewell | 332.232 |
| 72.476 | 23.8 | U\_13 | Karli | Unjha | Mehsana | Borewell | 198.12 |
| 72.454 | 23.786 | U\_14 | Karli | Unjha | Mehsana | Open well | 15.24 |
| 72.459 | 23.766 | U\_15 | Karli | Unjha | Mehsana | Open well | 15.24 |
| 72.45 | 23.842 | U\_16 | Unava | Unjha | Mehsana | Borewell | 320.04 |
| 72.447 | 23.845 | U\_17 | Unava | Unjha | Mehsana | Borewell | 365.76 |
| 72.397 | 23.851 | U\_18 | Karli | Unjha | Mehsana | Open well | 18.288 |
| 72.397 | 23.85 | U\_19 | Karli | Unjha | Mehsana | Borewell | 198.12 |
| 72.396 | 23.85 | U\_20 | Karli | Unjha | Mehsana | Borewell | 198.12 |
| 72.345 | 23.806 | U\_21 | Hajipur | Unjha | Mehsana | Borewell | 213.36 |
| 72.344 | 23.802 | U\_22 | Karli | Unjha | Mehsana | Open well | 19.812 |
| 72.349 | 23.8 | U\_23 | Hajipur | Unjha | Mehsana | Borewell | 76.2 |
| 72.349 | 23.8 | U\_24 | Hajipur | Unjha | Mehsana | Borewell | 76.2 |
| 72.361 | 23.767 | U\_25 | Kamli | Unjha | Mehsana | Borewell | 182.88 |
| 72.358 | 23.768 | U\_26 | Kamli | Unjha | Mehsana | Borewell | 289.56 |
| 72.358 | 23.767 | U\_27 | Kamli | Unjha | Mehsana | Borewell | 304.8 |
| 72.357 | 23.766 | U\_28 | Dabhi | Unjha | Mehsana | Borewell | 381 |
| 72.324 | 23.784 | U\_29 | Unava | Unjha | Mehsana | Open well | 27.432 |
| 72.324 | 23.784 | U\_30 | Dabhi | Unjha | Mehsana | Borewell | 365.76 |