ICLEI Local Governments for Sustainability

100% RENEWABLES CITIES & REGIONS ROADMAP

Supported by:

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IKI INTERNATIONAL CLIMATE INITIATIVE

solutionsgateway Climate, Energy, and Finance Solutions

100% RENEWABLES SOLUTIONS PACKAGE

Solar water pumps

This solution is part of a package of solutions meant to guide local and regional governments in implementing a local renewable energy transition by providing guidance on mechanisms, applications or technologies that can help accelerate their climate and energy action.

It was produced as part of the 100% Renewables Cities and Regions Roadmap project, which supports nine cities and regions across Argentina, Indonesia and Kenya to develop bankable renewable energy projects and in-depth local strategy and action plans to achieve one hundred percent renewable energy. The 100% Renewables Cities and Regions Roadmap project is implemented by ICLEI – Local Governments for Sustainability and funded through the International Climate Initiative (IKI), which is implemented by the Federal Ministry for Economic Affairs and Climate Action (BMWK) in close cooperation with the Federal Ministry for the Environment, Nature Conservation, Nuclear Safety and Consumer Protection (BMUV) and the Federal Foreign Office (AA).

DISCLAIMER

All cities are unique. The Solutions Gateway has been developed as an advanced knowledge catalogue to provide an overview of possible Low Emissions Development Solutions. The Solutions and Packages it contains provide guidance on general conditions, which may not correspond to the existing conditions in your city or jurisdiction. The consultation and use of the Solutions Gateway does not waive the need for the Local Government to assess the feasibility of a Solution or Package in the local context in its city or jurisdiction, prior to implementation. Please note that the impacts, benefits and co-benefits indicated are generally valid but may not materialize in particular circumstances.

ABOUT SOLUTIONS GATEWAY

Solutions Gateway is an online resource platform for Local Governments where they will be able to find possible Low Emissions Development (LED) Solutions for their cities.

In the context of the Solutions Gateway, Solutions are processes, or groups of actions, which Local Governments can implement to deliver climate change mitigation results and enhance local sustainable development. Taking an integrated approach, and focusing on Local Governments usual responsibilities and roles, Solutions include core actions as well as enabling and multiplying actions essential to maximize their effectiveness and efficiency. These include policy, regulatory, governance, capacity building, awareness raising, stakeholder engagement, etc.

ABOUT ICLEI – LOCAL GOVERNMENTS FOR SUSTAINABILITY

ICLEI – Local Governments for Sustainability is a global network working with more than 2,500 local and regional governments committed to sustainable urban development. Active in 125+ countries, ICLEI influences sustainability policy and drives local action for low emission, nature-based, equitable, resilient and circular development. ICLEI's Members and team of experts work together through peer exchange, partnerships and capacity building to create systemic change for urban sustainability.

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Contents

1. INTRODUCTION

Solar water pumping systems consist of electric pumps powered by photovoltaic (PV) panels and a controller. Water is often drawn from the ground or streams and stored in a tank for gravity distribution, eliminating the need for energy storage. The presence of a storage tank allows the water collected by the pump to accumulate, while the controller regulates the amount of water released. These systems have a wide range of applications, including pumping water to remote homes, irrigating fields and providing access to water in rural areas without grid electricity. Solar water pumps enable farmers to access sustainable and affordable electricity for irrigation, reducing their reliance on manual labor or expensive diesel generators.

Solar water pumping systems have grown in popularity in recent years due to their many advantages in terms of cost, maintenance and energy efficiency. These systems are used in a variety of settings, including domestic and commercial applications. The average solar radiation received at a given location ranges from 600 to 1000 W/m^2, although cloud cover can reduce this to 50-300 W/m^2. Temperature variations also affect irradiation, resulting in voltage drops and reduced overall output. However, the falling cost of PV panels has reduced the payback period for solar water pumping systems. Compared to diesel generators, these systems require minimal maintenance, typically limited to occasional module cleaning. The use of clean and renewable energy as a power source makes them even more attractive.

This solution contributes to increased agricultural productivity, income generation and community welfare, while reducing dependence on fossil fuels and greenhouse gas emissions. In addition, solar water pumping systems provide a cost-effective alternative to grid extension in off-grid areas. Overall, they contribute to food security, environmental sustainability and economic development.

1.1 RELEVANCE

Agriculture is the largest water user worldwide, accounting for 70 percent of total freshwater withdrawals on average, reaching as much as 95 percent in some developing countries [1]. Climate change is projected to have a significant impact over the water cycle considerably, altering rainfall patterns and affecting the availability and quality of both surface and groundwater, agricultural production and associated ecosystems [2].

In 2005–2018, energy consumption in agriculture in the EU countries, for instance, decreased by 5.9%, but is still dominated by fossil energy sources. The energy consumption from renewable energy sources increased the fastest, as there was an increase in 2005–2018 by 85%. Electricity consumption increased by 25%. There was a decrease in consumption in the remaining cases, i.e., heat by 33%, gas products by 23%, crude oil by 15%, and fossil fuels by 9%. [3].

In Africa for instance, 95% of farmed land depends on seasonal rainfall to meet the water needs [4]. In most irrigated areas, water and energy uses are directly linked through the use of energy for water pumping. Efforts to improve water management by upgrading irrigation systems often generate greater energy expenditure at the farm level. In rainfed areas, higher rainfall will usually generate higher yields that could be associated with larger amounts of fertilizer and machinery operations. Both of these inputs require notable amounts of energy, pairing water and energy in crop production [5]. Solar water pump system is an alternative to traditional water irrigation. In some agricultural areas, drought often occurs in their irrigation systems, so that farmers are no longer productive. This solar water pumping offers technology to lift up water from the ground using solar energy and replaces the use of diesel engines.

1.2 SDGs ADDRESSED

- **SDG 1:** End poverty in all its forms everywhere
- **SDG 2:** End hunger, achieve food security and improved nutrition and promote sustainable agriculture
- **SDG 7:** Ensure access to affordable, reliable, sustainable and modern energy for all
- **SDG 12:** Ensure sustainable consumption and production patterns
- **SDG 13:** Take urgent action to combat climate change and its impacts

1.3 MAIN IMPACTS

- Reduced fuel poverty due to lower running and maintenance costs of solar water pumping systems for irrigation in the long run, as compared to conventional diesel generators water pumping.
- Solar water pumps are decentralized energy systems independent of the grid and can function in remote or off-grid areas or where energy access is limited or during power outages, ensuring a reliable and sustainable source of water for irrigation, livestock, and other agricultural purposes. This enhances agricultural productivity and crop yields, thereby improving farmers' welfare, boosting local economy and enhancing food security.
- Improved energy security and local resilience due to the use of renewable energy, and thus reduced fossil fuel dependence.
- Solar water pumping systems rely on renewable energy sources, reducing the dependence on fossil fuels and lowering carbon emissions, thereby contributing to mitigating climate change.
- Generation of local employment in the green economy through installment of solar water pumps.
- Solar pumps do not produce air pollutants during operation, unlike diesel-powered pumps, which emit particulate matter and other harmful pollutants, thereby improving air quality and human health.
- Reduced dependence on traditional pumps powered by fossil fuels may lower the risk of habitat disruption or pollution caused by oil spills or leaks associated with such systems, and indirectly benefit local wildlife and ecosystems.

1.4 BENEFITS

- Potential reduction of fossil fuels consumption
- Enabling increased use of local renewable resources.
- Reduction of air pollution associated with burning of fossil fuels, such as sulfur dioxide (SO_2), nitrogen oxides (NO_x) and particulates, due to renewable energy use.
- Green local jobs to construct and operate the solar water pumping system.
- Increase access to electricity in rural and remote areas through renewables.
- Continuous water irrigation supply to increase agricultural productivity using sustainable energy sources.
- Increase revenue of local farmers and reduce expenditure for carrying or extracting groundwater.

1.5 SUGGESTED INDICATORS FOR MONITORING RESULTS

- Number of jobs created in the sector
- Number of solar water pumping systems installed

- Number of people trained in solar water pumping systems
- Installed capacity of solar water pumping system (Wp)
- Volume of water being pumped using solar water pumping systems (m^3/day)
- GHG emission reduction from the operationalization of the system (tCO_2/year)
- Investment being deployed to scale out the system (USD/year)
- Revenue increase of local farmers due to the use of system (USD/month)

1.5 TYPICAL LOCAL GOVERNMENT ROLES

- **Policy Development and Regulation:** Local governments can create policies, regulations, and incentives that encourage the adoption of solar water pumping systems.
- **Financial Support and Incentives:** Providing financial support in the form of grants, subsidies, or low-interest loans can significantly reduce the initial investment cost for farmers to install solar water pumping systems.
- **Promotion and Awareness Campaigns:** Local governments can conduct awareness campaigns to inform farmers about the benefits of solar-powered systems.
- **Technical Assistance and Training:** Local governments can offer technical expertise, training programs, and workshops to educate farmers about the benefits, installation, operation, and maintenance of solar water pumping systems.
- **Engaging Stakeholders and Facilitating Access to Technology:** Local authorities can collaborate and partner with suppliers, manufacturers, farmers, agricultural cooperatives and other stakeholders to ensure the availability, accessibility and deployment of high-quality solar pumping technologies.
- **Research and Development Support:** Supporting research initiatives related to solar water pumping systems and their application in agriculture can lead to technological advancements, improved efficiency, and cost reduction.

2. INTEGRATED SOLUTION OVERVIEW

	Enabler Actions	Required Actions	Multiplier Actions
Policy	• Developing a target for installed capacity of solar water pumping system and the agriculture area coverage • Linking the target of installation of solar water pumping system to local renewable energy, climate, and food security policies • Developing a roadmap of solar water pumping system installation in the agricultural sector, which will guide local government actions such as budget preparation, capacity building, and awareness campaigns.	• Develop clear policies and regulations that facilitate the deployment of solar water pumping systems, including streamlining permitting processes, setting quality and safety standards, etc. • Offer financial incentives such as grants, subsidies, tax credits, or rebates to farmers to offset the initial costs of purchasing and installing solar water pumping systems. • Mainstream solar water pumping systems into the energy master plan. This will help the local government to prioritize installment of solar water pumping to increase the share of renewable energy.	• Policy and regulation to prohibit the use of fossil fuel in the agricultural sector will accelerate the use of solar water pumping. • Policy to use local components and local manpower in installment of solar water pumping may help to reduce the cost of investment.
Stakeholders and Awareness	• Implement demonstration projects in collaboration with local farmers or agricultural groups to enable them to witness firsthand the effectiveness and benefits of solar water pumping systems. • Organize workshops, seminars, and training programs specifically tailored to farmers, agricultural cooperatives, and local communities, focusing on the benefits, installation, maintenance, and operation of solar water pumping systems. • Host information sessions and field days where farmers, local leaders, extension agents, and community members can visit operational solar water pumping sites.	• Engage local government officials, policymakers, and decision-makers to ensure they understand the importance of promoting solar water pumping systems in agriculture, and encourage their support through policy initiatives and budget allocations. • Collaborate with local farmer associations or cooperatives to disseminate information, conduct training sessions, and share success stories related to the use of solar water pumping systems. • Collaborate closely with agricultural extension services to integrate information about solar water pumping systems into their outreach programs.	• Collaborate with non-governmental organizations (NGOs), private companies, and industry partners that specialize in renewable energy or agricultural technology to help in resource mobilization, knowledge sharing, and expanding outreach efforts. • Establish feedback mechanisms to gather insights and address concerns from stakeholders during the adoption process, and provide continuous support, follow-ups, and troubleshooting assistance to ensure the successful implementation and maintenance of solar water pumping systems.

	Enabler Actions	Required Actions	Multiplier Actions
Stakeholders and Awareness		• Launch public awareness campaigns using various communication channels such as radio broadcasts, posters, leaflets, print and social media, highlighting the benefits, cost savings, and environmental advantages of using solar-powered systems in agriculture.	
Governance	• Develop strong coordination within local government institutions such as planning office, energy office, agricultural office, and industrial office to strengthen data sharing and implementation of this Solution • Foster Public-Private Partnership collaborations with solar equipment suppliers, manufacturers, and financial institutions to create innovative financing models, supply chain efficiencies, and service delivery mechanisms to facilitate the adoption of solar-powered systems.	• Engage with stakeholders, including farmers, agricultural cooperatives, local businesses, NGOs, and research institutions, and establish platforms for dialogue, consultation, and collaboration to help understand the needs and concerns of stakeholders and align policies accordingly. • Simplify administrative procedures, permitting, and approvals for the installation and operation of solar water pumping systems to reduce bureaucratic barriers and encourage more farmers to adopt the technology.	• Set up a dedicated team (located at either the energy office or agriculture office) that facilitates stakeholder coordination. • Provide support for research and development initiatives focused on improving the efficiency, affordability, and durability of solar water pumping systems to contribute to technological advancements and innovation.
Capacity Building	• Collaborating with agricultural extension services, universities, research institutions, and industry experts to develop tailored capacity-building programs specifically designed for farmers and local communities. • Develop a database of the solar water pumping technology supply chain e.g., technology vendors and engineering services companies.	• Educate farmers and train farmers on the benefits, installation, operation, and maintenance of solar water pumping systems, • Train and build capacities of local technicians to deliver support to farmers, covering technical aspects, system management, troubleshooting, and promoting best practices. • Ensure that farmers and technicians have the skills and knowledge required for routine maintenance and repairs and deploy training programs focusing on system upkeep and troubleshooting help in sustaining the longevity and efficiency of solar water pumping systems.	• Collaborate with local CSO and private sector entities, industry associations, and international organizations to leverage expertise, resources, and networks for effective capacity-building programs. • Implement mechanisms to monitor progress and evaluate the impact of capacity-building programs, and make adjustments for continuous improvement.

	Enabler Actions	Required Actions	Multiplier Actions
Technical	• Offer guidelines, best practices, and technical support for the installation of solar water pumping systems to ensure proper setup, minimize errors, and maximize system performance. • Provide engineering and design expertise to farmers or agricultural cooperatives to create tailored solar water pumping solutions that meet specific agricultural requirements, including system sizing, component selection, and designing the layout for optimal efficiency.	• Conduct site assessments and feasibility studies to identify suitable locations for solar water pumping systems, evaluating factors such as solar irradiance, water availability, topography, and agricultural needs to determine the most effective system designs. • Developing guideline of solar water pumping system, including its technical specification, guide to design and install the system. This will help to ensure built quality of the system • Provide technical support and assistance to farmers during the planning, installation, and post-installation phases to help in addressing queries and technical gaps. This can be done through dedicated helplines, field visits, or technical teams.	• Set quality standards and ensure compliance with technical specifications for solar equipment and installation to help maintain the reliability and durability of the systems • Equip local technicians to provide engineering and design expertise to farmers or agricultural cooperatives to create tailored solar water pumping solutions that meet specific agricultural requirements.
Finance	• Educate farmers about financial options, subsidies, and incentives available for solar water pumping systems. • Encourage community involvement through crowdfunding platforms or community-based financing initiatives to help raise funds.	• Allocate fiscal budget and provide financial assistance through subsidies or grants to farmers or cooperatives to significantly lower the upfront costs associated with adopting solar water pumping systems. • Create special loan programs or partnering with financial institutions to offer low-interest loans for farmers interested in investing in solar water pumping systems. • Create suitable financing models by collaborating with private sector entities, such as solar equipment suppliers or energy service companies, to make investment on solar water pumping systems more feasible.	• Regularly evaluate the effectiveness of financial programs and adapt them based on the observed outcomes to ensure that the financial support provided aligns with the identified needs.

3. WORKFLOW /PROCESS PHASES

3.1 PREPARATION

- Conduct a needs assessment and feasibility study of solar water pumping systems at the community level, including data collection on local solar radiation performance, water availability, topography, and agricultural needs, etc.
- Based on the assessment, develop policies, regulations, and guidelines to support the adoption of solar water pumping systems. These policies may include incentives, standards, and procedures for installation, operation, and maintenance.
- Develop a roadmap for solar water pumping systems for the agricultural sector, and mainstream into the energy master plan.
- Determine the budgetary requirements for implementing solar water pumping systems, and allocate financial resources for subsidies, grants, loans, or other financial incentives to support farmers in adopting solar technology.
- Conduct awareness campaigns and disseminate information about the benefits, technical aspects, financial incentives, and procedures for installing solar water pumping systems, using workshops, training programs, and informational materials.
- Developing a platform of collaboration between local government, central government, donors, technology vendors, engineering companies, and farmers.

3.2 APPROVAL

- Ensure that the tender / procurement of the solar water pumping system follows national and local technical specifications and quality standards.
- Establish a streamlined process for farmers to apply for incentives, grants, or loans for installing solar water pumping systems.
- Manage permit and financial assistance application processes and ensure that eligible farmers receive appropriate support.

3.3 PROCUREMENT

- Engage with reputable vendors or suppliers of solar water pumping systems and facilitate partnerships or negotiate agreements to ensure farmers have access to high-quality and cost-effective systems.
- Evaluate and select reliable vendors or suppliers for quality solar equipment and installation services through a transparent and competitive bidding process.

3.4 IMPLEMENTATION

- Ensure installations of solar water pumping systems are based on the established technical guideline and quality specifications
- Provide technical support and assistance to farmers with guidance on system selection, design, installation, and maintenance, by collaborating with technical experts or partnering with relevant organizations to ensure farmers receive accurate and reliable information.

- Provide ongoing support, maintenance, and technical assistance to farmers for the operation and upkeep of the solar water pumping systems.
- Collect data on system performance, energy savings, water usage, and agricultural productivity associated with the use of solar water pumping systems.
- Prepare periodic reports detailing the outcomes, successes, challenges, and lessons learned from the implementation process.

3.5 MONITORING

- Establish mechanisms for monitoring the performance, efficiency, and impact of installed solar water pumping systems.
- Undertake periodic review of policies, programs, and outcomes to assess the effectiveness of initiatives.
- Based on feedback and evaluation, make adjustments to improve the support system for solar water pumping systems in agriculture.

4. REALITY-CHECK

This solution is applicable:

- In locations where there is adequate availability of sunlight or solar radiation, water sources, and suitable agricultural needs.
- In agricultural areas that have difficulty getting a supply of irrigation water, or in specific conditions (for example, in dry season).
- In areas that use diesel power to extract irrigation water, so that the solar water pumping system provides a more sustainable solution.
- In rural or remote regions where grid electricity is unavailable or unreliable, solar water pumping systems offer a reliable and sustainable solution for accessing water for irrigation, livestock, or domestic use.

4.1 REQUIRED PRE-CONDITIONS

- Develop supportive policies, regulations, and guidelines that encourage the adoption of renewable energy technologies like solar water pumping systems.
- Allocate funds or secure financial resources to support the implementation of solar water pumping systems. This includes budgetary provisions for subsidies, grants, loans, or other financial incentives to make the systems affordable for farmers.
- Ensure the availability of technical expertise or partner with experts in solar energy systems to provide guidance, technical assistance, and training to farmers and local stakeholders.
- Evaluate the availability of suitable sites for installing solar panels and the proximity to water sources to optimize the efficiency of the systems.

4.2 SUCCESS FACTORS

- Engagement with farmers, agricultural cooperatives, local communities, and relevant stakeholders to assess needs, gather input, and create awareness about the benefits of solar water pumping systems. Collaboration and stakeholder buy-in are crucial for successful implementation.
- Conducting market analysis to identify reliable suppliers, manufacturers, or vendors of solar water pumping systems.
- Providing training programs and capacity-building initiatives for farmers and local technicians on the operation, maintenance, and troubleshooting of solar water pumping systems.
- Developing a long-term sustainability plan for the maintenance, repair, and replacement of components in solar water pumping systems. Ensure continuity of support and resources beyond the initial implementation phase.

4.3 FOLLOW-UP NEEDED AND/OR RECOMMENDED

- Establishing systems for monitoring the performance, energy production, water delivery, and impact of solar water pumping systems, allowing for regular evaluation and adjustment of strategies to optimize outcomes.
- Conducting training to farmers on how to operate and maintenance the system.
- Developing tailored fiscal instruments that fit the needs of farmers and technology suppliers, plus attract private investment.

4.4 BARRIERS

- The upfront cost of purchasing and installing solar water pumping systems can be high, making it financially challenging for some farmers, especially those with limited resources, to afford the initial investment without adequate financial support.
- Insufficient technical expertise or knowledge within local government departments can hinder the planning, implementation, and monitoring of solar water pumping projects. Similarly, lack of skilled personnel for system design, installation, and maintenance can be a significant barrier.
- Complex permitting processes, bureaucratic procedures, or unclear regulations related to solar installations might create barriers or delays in obtaining necessary approvals for deploying solar water pumping systems.
- Inadequate awareness among farmers and stakeholders about the benefits, operation, and financial support available for solar water pumping systems can slow adoption rates.
- Ineffective coordination and collaboration between different government departments or agencies involved in the implementation process can lead to inefficiencies and delays.

4.5 RISKS

- Financial risks related to budget allocation and funding availability for the implementation of solar water pumping projects, and associated financial strain where the initial investment required for subsidies, grants, or loans might exceed the allocated budget.
- There could be risks associated with the technology itself, such as equipment malfunction, technical failures, or underperformance of solar water pumping systems.
- Inadequate technical expertise among local government staff or contractors responsible for system installation, maintenance, or troubleshooting can pose a risk.

- Quality assurance and performance standards may not be met by selected vendors or contractors, leading to substandard installations or inefficient systems.
- Lack of community support or acceptance due to misconceptions about solar technology, resistance to change, or insufficient stakeholder engagement can hinder project implementation.
- Improper site selection or inadequate assessment of environmental impact can lead to unintended consequences such as land degradation, habitat disruption, or ecological imbalances due to the installation of solar panels.

5. CLIMATE CHANGE MITIGATION POTENTIAL

This solution replaces the use of diesel powered pumps to distribute irrigation water by using solar energy. This solution will certainly contribute to reducing greenhouse gas emissions in the agricultural sector and help to mitigate the impact of climate change. For example, in Bangladesh, a financing program that encourages replacement of the existing 1.3 million diesel pumps nationwide with solar pumps is projected to eliminate 1.2 billion liters of diesel, or 3.2 million tonnes of GHG emissions per year [4]. In addition, this solution guarantees the availability of food supplies because continuous water supply can increase agricultural productivity. In the end, this solution also has a positive impact on the welfare of farmers - building their adaptive capacities and encouraging local economic growth.

6. NATIONAL – SUBNATIONAL INTEGRATION IN THE CONTEXT OF THIS SOLUTION

6.1 BENEFITS TO LOCAL GOVERNMENT

- Deploying solar water pumping systems in rural agricultural areas enhances agricultural productivity, leading to increased incomes for farmers, and contributing to overall rural development by bolstering local economies and reducing poverty.
- Solar water pumping reduces dependency on fossil fuels and grid-based electricity for irrigation purposes, enhancing independence and resilience in agricultural operations.
- By promoting the use of renewable energy sources like solar power, local governments contribute to mitigating climate change. Solar water pumping systems help reduce greenhouse gas emissions, aligning with climate adaptation and mitigation strategies.
- Solar-powered systems have minimal environmental impact compared to traditional pumps using fossil fuels, as they do not produce air or water pollution during operation.
- The deployment of solar water pumping systems can stimulate economic growth by creating job opportunities, particularly in the renewable energy sector, installation, maintenance, and support services.
- Taking proactive steps toward promoting renewable energy technologies demonstrates the local government's commitment to environmental stewardship, sustainable development, and innovation, which enhances the government's image and reputation both locally and globally.

6.2 BENEFITS TO OTHER LEVELS OF GOVERNMENT

- Supports the achievement of targets for renewable energy development .
- Shifting from traditional energy-intensive pumping systems to solar-powered ones reduces the need for subsidies on fossil fuels, leading to potential fiscal savings for governments.

- Contributes to the achieving GHG emission reduction target set under Nationally Determined Contributions (NDCs).
- Enhanced national food security as agricultural productivity is increased, and boosting growth in the national economy.
- By harnessing renewable solar energy, other governments can diversify their energy sources, enhancing energy security and reducing vulnerability to fluctuations in fuel prices or supply disruptions.

7. RESOURCES/SUPPORT

7.1 CASE STUDY

UTILIZATION OF A SOLAR WATER PUMP FOR THE MARGASARI VILLAGE RICE FIELD IRRIGATION PROGRAM

Suastiyanti, D., et. al., 2017, Pemanfaatan Solar Water Pump untuk Program Pengairan Sawah Desa Margasari [6]

Abstract: Margasari Village, Curug Village, Banten Province has abundant sources of groundwater and inexhaustible sunlight, especially during the dry season. The natural potential that is owned by Margasari Village is a source of strength for the supply of water that can be used for irrigating rice fields. So far, the people of Margasari Village have depended on their food needs (especially rice) from paddy fields which only rely on rainwater for irrigation (rainfed rice fields). Solar water pump technology is a technology that utilizes the natural potential of Margasari Village, whose water source comes from groundwater. Solar water pump is a water pump that is driven by electricity generated by solar power that comes from the heat of the sun. For the application of this technology, 12 m deep drilling has been carried out and produced clean groundwater using a shallow well electric water pump with specifications: 220V/50Hz, output power of 125 Watt and input current = 1.55 A. The power required to provide the panels solar power is approximately 1.55 A x 220 volts = 341 Watt peak (Wp). The power of 341 Wp is supplied from 2 solar panels, each with a capacity of 150 Wp. An inverter is used to convert DC current into AC and a battery is used to draw electricity for the first time. There has been an increase in rice production by 86.67% and an increase in meeting the demand for clean water by 143.33%. The reservoir will be fully filled with water in just 15 minutes.

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