

TERMS OF REFERENCE:

Position:	Socio-Economic Impact Analyst of Smart Irrigation	Est Start date: Feb 2023
Location:	Blora and Tuban	Est End date: Aug 2023
Duration	N/A days	

1. BACKGROUND OF THE PROGRAM AND INTERVENTION

Australia-Indonesia Partnership for Promoting Rural Incomes through Support for Markets in Agriculture (PRISMA) is a multi-year development program working to accelerate poverty reduction through inclusive economic growth. PRISMA adopts a market systems development approach by partnering with key-stakeholders to improve agriculture market efficiency and sustainably benefit the poor. The program aims to achieve an income increase for a total of 1,000,000 smallholder farming households by 2023. It operates in six provinces of Central Java, East Java, West Nusa Tenggara (NTB), East Nusa Tenggara (NTT), West Papua, and Papua.

1.1. INTERVENTION BACKGROUND

Water is a critical input for agricultural production and plays an important role in food security. The World Bank (2022) estimates that irrigated agriculture represents 20% of the total cultivated land and contributes 40% of the total food produced worldwide. Irrigated agriculture is, on average, at least twice as productive per unit of land as rainfed agriculture, thereby allowing for more production intensification and crop diversification.

Due to population growth, urbanization, and climate change, competition for water resources is expected to increase, with a particular impact on agriculture. The population is expected to increase to over 10 billion by 2050, and whether urban or rural, this population will need food to meet its basic needs. Combined with the increased consumption of calories and more complex foods, which accompanies income growth in the developing world, it is estimated that agricultural production will need to expand by approximately 70% by 2050.

The need for more efficient use of water resources to enable farmers to produce food using climate-resilient processes continues to grow in the face of a growing global population and the impacts of climate change. Although irrigation has been widely promoted as important for productivity and resilience, it has not been sufficiently expanded and is often inefficient.

PRISMA aims to conduct action research on optimised irrigation management through Alternate Wetting and Drying (AWD) and other methods using soil moisture sensors with paddy and maize in Central Java and East Java. Soil moisture sensors shall be deployed to provide information on the water saturation ratio in the root zone of the plant to be used as a tool for decision-making of the Irrigation Service Provider (ISP), irrigation manager and/or farmers to regulate the operation of irrigation pumps and inflows to the field.

The current practice for paddy is that the irrigation pumps are operated 24/7 during 60% of the planting phase regardless of whether the soil requires additional watering or not – mainly for weed control. The soil moisture sensor will indicate the water saturation level at the root zone during a given plant growth period and the ISP can, in theory, operate the pumps only when the plant needs it. Benefits of the soil moisture sensing are as follows:

- a. For the ISP
 - Improve the management of the irrigation system through better planning of the pump's maintenance that will potentially extend the lifespan.

- Improve the efficiency of energy consumption for pumps, either from the electricity grid or fuel. The ISP could use the money saved from lower energy expenses for service expansion and quality improvement or/and increased profits.
 - Improve the business reputation and farmer's trustworthiness in good irrigation services.
- b. For the Farmer
- Protect the soil quality from water erosion and nutrient leaching due to excessive irrigation.
 - Improve the husbandry , including effective fertilising, pest controlling, and better access to mechanization equipment, and cost savings.
- c. For the community
- Minimise risks of pollution in the water bodies, for both surface water and groundwater, from leaching of fertiliser and chemicals.
 - Safeguard the minimum baseflow and erosion in the water bodies by taking water in the quantity as required by the plant while securing the livelihood of the natural ecosystem.
 - Lesser water- and carbon-footprints from the irrigation operation.

However, introducing new technologies and husbandry practices is not just a matter of technical feasibility. The economic performance (ISP profitability and farmer productivity) and social acceptability (i.e. whether the improvements are perceived to be of value and minimally disruptive) all need to be taken into account.

2. PURPOSE OF THE ASSIGNMENT

The action research will be conducted from April – July 2023, collaborate with 4 irrigation sensors, conducted in 6 paddy fields (Blora, Central Java) and 6 maize fields (Tuban East Java) using 2 types of plot design trials:

- Management Trial (to understand the reading of the 4 sensors in a different field but under the same ISP management)
- Comparison Trial (to understand the readings of 4 sensors in the same field and under the same ISP management).

The paddy trial plot will use surface irrigation, and the maize trial plot will use groundwater irrigation (borehole). This action research collaborates with 2 farmers (one paddy farmer and one maize farmer), and 2 ISPs (one surface irrigation ISP and one groundwater ISP). The overall objectives of this action research are:

- 2.1. Analyse sensors and related services including the feasibility, utility, cost & benefit, and acceptability of the soil moisture sensors for the management of pump-lift and boreholes irrigation systems from both surface water and groundwater sources for paddy and maize in Central Java and East Java.
- 2.2. Analyse the socio-economic impacts for ISPs and farmers of the AWD practice through soil moisture sensing, elaborating on the before-after perceptions, and observations of behaviour change.
- 2.3. Introduce smart irrigation sensors/sensor providers to the Indonesian market and find potential business partners.
- 2.4. Develop recommendations for the manufacturers of soil moisture sensors on how to promote the technology to the rural markets, incorporating local contexts as the basis of their business strategy.
- 2.5. Present the findings of the action research to the relevant government agencies in charge of irrigation at the district and/or national levels.

3. ROLES AND RESPONSIBILITIES

The aim of this assignment is to conduct socio-economic research as part of the Action Research project to determine the economic performance (farmer and ISP level) and social acceptability of the technology and AWD husbandry regime.

- 3.1. Collaborate with selected sensor providers and other actors to conduct the action research (currently four).
- 3.2. Participate in introductory workshops to introduce the socio-economic research to ISPs & Farmers.
- 3.3. Advise on overall experimental design and develop methodologies and data collection processes.
- 3.4. Collect ISP and farmer baseline data etc.
- 3.5. Collect wider baseline farmer community perception, knowledge, attitudes, and practice data.
- 3.6. Collect ongoing data throughout the season.
- 3.7. Provide analysis of the socio-economic impact for ISP and farmers on the AWD practice through soil moisture sensors from economic performance and social acceptability perspectives. The scope of work includes preparing research design, field data collection, data analysis, report writing, and presentation of the findings in the forum.
- 3.8. The analysis of economic performance from ISP and farmers' side as follows:
 - a. For SP, measured by operational cost variables including energy cost (fuel/electricity), labor cost, and maintenance cost.
 - b. Farmers, measured by operational cost (water fee, pest control, weeding, fertiliser cost, and labor cost) and yield productivity and quality.
- 3.9. The analysis of social acceptability from ISP and farmers through social research as follows:
 - a. For ISP, measured by variables as follows:
 - Their awareness and approval and perceptions etc of using technology to improve the management of the irrigation system
 - Their awareness of using soil moisture sensors to improve energy consumption and cost efficiency
 - Their awareness of using soil moisture sensors to improve the business reputation and farmers' trustworthiness in good irrigation services.
 - Awareness of AWD as a management practice
 - Their behavior changes in management and irrigation decisions toward the use of technology
 - b. For farmers, measured by variables as follows:
 - Their awareness, approval, perceptions etc to improve the plant care process, including effective fertilising, pests controlling, and better access to mechanization equipment.
 - Their awareness to protect the soil quality from water erosion due to excessive irrigation.
 - The changes in their behavior in irrigation decisions towards the use of technology
- 3.10. Develop a survey questionnaire for ISP and farmers in the areas where the action research is conducted in collaboration with the appointed officers from PRISMA.
- 3.11. Survey as the monthly interview to ISP and the served farmers in the areas preidentified by PRISMA in Blora (Central Java) and Tuban (East Java) to develop observation of the technology application from their perspective and identified potential issues during the research is carried out.
- 3.12. Perform thorough quality control on the collected data during the field assessment and further analysis.
- 3.13. Develop a systematic assessment report in English in MS-Office format and present to PRISMA for review and approval.
- 3.14. The eventual Contracted Vendor will be provided with the list of ISP and farmer profile.
- 3.15. Contracted Vendor will be required to perform the following works in collaboration with the Project:
 - a. Research design preparation
 - b. Questionnaire development

- c. Data collection and quality control
 - d. Data analysis
 - e. Report writing
 - f. Presentation of the report in the forum
- 3.16. The Contracted Vendor will be responsible for all administrative, Ethical Clearance, management, and logistical support required to carry out the work/service.

4. KEYS SELECTION CRITERIA

The consultant will be assessed on the following key criteria:

- a. Individual consultant with the proven track record and minimum 3 years of experience in the design and delivery of socio-economic research and analysis.
- b. Sound understanding of the feasibility analysis, cost and benefit analysis of the variable tested.
- c. Sound understanding of social aspect acceptance of the variable tested.
- d. Experienced in collecting data for rural business entities and farmers.
- e. Able to and experienced in technical analyzing and multisource data triangulation to produce logical and structured analysis.
- f. Strong written and verbal communication skills in both English and Bahasa.

Desirables Criteria:

- a. Sound understanding of the irrigation methods for rice and maize, as well as precision irrigation systems in Indonesia.
- b. Experienced in providing technical and managerial training to rural business entities and farmers.

5. FUNCTIONAL RELATIONSHIPS

- 5.1. The socio-economic impact consultant report directly and works closely with the related key person(s) in PRISMA (Raras Puspa Dewi and Riris W. Rasmidan).
- 5.2. Main coordination will be conducted in each step of the research to ensure the quality of the research.
- 5.3. Coordinate and actively communicate with the appointed person-in-charge within Project during the work process.
- 5.4. The Project reserves the right to inspect any of the contracted tenderer's work independently, and if needed, the contracted consultant must take the adjustment to the implementation based on the result of the inspection.

6. INDICATIVE TIMELINE

The work for the agronomist will be maximum 60 days of working within 7 months.

7. DELIVERABLES

It is expected that all associated deliverables, reports, and administrative obligations will be completed within the timeframe proposed listed in Annexes 1.

Annex 1. Output/ Deliverables / Lampiran 1. Capaian/ Hasil

No.	Deliverables to a standard acceptable to the Project / <i>Capaian hasil sesuai dengan standar yang dapat diterima oleh Proyek</i>	Means of Verification / <i>Bukti Verifikasi</i>	Due Date / <i>Batas Akhir</i>
1.	Collaborate with selected sensor providers and other actors to conduct action research		13 February 2023
2.	Advise on overall experimental design and develop work plan, research design and methodology and data collection process (schedule for field data collection, field data collection scenario plan, and data analysis plan for socio-economic analysis)	Work plan, research design and methodology, schedule and scenario for field data collection, and data analysis plan approved by the Project	20 February 2023
3.	Participate in introductory workshops to introduce the socio-economic research to ISPs and farmers		27 February 2023
4.	Collect ISP and farmer baseline data etc.		1 March 2023
5.	Collect wider baseline farmer community perception, knowledge, attitudes, and practice data.		6 March 2023
6.	Questionnaire for the monthly interview to ISP and served farmers to develop observation of the technology application from their perspective and identified potential issues during the research	Documents of the questionnaire approved by the Project	13 March 2023
7.	Collect ongoing data throughout the season.		31 July 2023
8.	Final report on the economic performance analysis from ISP and farmer side in the format of a resume in PowerPoint format as well as the full report in Ms. Word and PDF format consisting of: a. Full report in English narrative Word document b. Full report in English PowerPoint document c. Report summary in English 1-2 pages.	Approved final report by the Project that consists of: Full Report in English and Bahasa with the format of Word Document and/or PowerPoint document, as well as the report summary	14 August 2023
9.	Final report on the social acceptability from ISP and farmer side in the format of a resume in PowerPoint format as well as the full report in Ms. Word and PDF format consisting of: a. Full report in English narrative Word document b. Full report in English Power Point document c. Report summary in English 1-2 pages.	Approved final report by the Project that consist of: Full Report in English and Bahasa with the format of Word Document and/or Power Point document, as well as report summary	14 August 2023

8. HOW TO APPLY

Please send your updated CV to recruitment@aip-prisma.or.id

Application closes on 31 January 2023.

Women and people with disability are encouraged to apply.