

Ex-Ante Evaluation(for Japanese ODA Loan)

South Asia Division I, South Asia Department

Japan International Cooperation Agency

1. Name of the Project

- (1) Country: India
- (2) Project: Project for Promoting Sustainable Horticulture in Punjab
- (3) Loan Agreement: March 24, 2026

2. Background and Necessity of the Project

- (1) Current State and Issues of the Agriculture Sector and the Priority of the Project in India

Agriculture accounts for 14.6% of India's GDP and employs about 60% of the workforce, making it a key sector supporting national livelihoods. Furthermore, thanks to the improvement in productivity brought about by the Green Revolution that began in the 1960s, India is the second largest producer of rice and wheat in the world and the largest exporter of rice (United States Department of Agriculture (USDA)), making it a major global food producing and exporting country, particularly in grains. Punjab State, in particular, has advanced agricultural modernization and large-scale farming, with approximately 84% of its land area (50,362 km²) utilized for agriculture. The state accounts for approximately 18% of India's wheat production and 11% of its rice production, positioning agriculture as a core industry of the state. However, excessive abstraction of groundwater for rice-based farming has become a critical challenge (Department of Horticulture, Punjab). In Punjab, 72% of irrigated farmland relies on groundwater, and in the central region of the state the groundwater table has fallen by an average of 9.46 meters over the past 20 years (2000–2019), with a maximum decline of 22.48 meters (Department of Horticulture, Punjab). Groundwater continues to fall at a rate of 41.6 cm per year. As of 2023, the groundwater extraction rate reached 144% of the recharge volume, making sustainable water use an urgent issue. Climate change is further exacerbating the challenge: higher temperatures and increasing water scarcity have reduced yields of major crops such as rice and wheat, deteriorating soil productivity and accelerating groundwater depletion.

As a response, the Punjab State Government is promoting a shift away from water-intensive cereal cultivation toward more sustainable horticulture crops—such as vegetables and fruits—which require less irrigation and

impose lower environmental burdens. In particular, this is supported through subsidies, development of nurseries, cold-storage and market facilities, and training in horticultural techniques. However, the proportion of horticultural crops in the total cultivated area in Punjab remains at 2.7%, and the shift to horticultural agriculture has not progressed sufficiently. The background to this is that in the state's horticultural agriculture, there are challenges in spreading cultivation techniques, and the infrastructure for cultivation, storage, post-harvest processing, etc. is not sufficiently developed, resulting in post-harvest losses of vegetables reaching 20-40% (Punjab Agricultural University), and improvements are needed in terms of productivity and quality. Additionally, there are only 4 demonstration centers in the northern and central regions, limiting farmers' access to agricultural support and market information, which means they miss out on opportunities when market prices are high.

Regarding support for crop diversification, the National Institution for Transforming India (NITI Aayog)'s agricultural strategy document, "From Green Revolution to Amrit Kaal (2023)," not only aims to improve agricultural productivity, which has been the primary policy goal until now, but also aims to double farm incomes through the use of new techniques and technologies, ensure sustainability, and diversify into high-value crops, and has expanded budget allocations for these. Furthermore, the Rashtriya Krishi Vikas Yojana (2017), one of the government's key initiatives, calls for strengthening programs related to drip irrigation and crop diversification for horticultural crops, thereby improving water efficiency and conserving water resources. Furthermore, the Punjab state government has been promoting crop diversification by expanding horticultural production areas and establishing value chains through initiatives such as the "Mission for Integrated Development of Horticulture," which began in 2005. In addition, the State Climate Change Action Plan 2024 sets out measures to mitigate and adapt to climate change in the agricultural sector, such as shifting to horticultural crop cultivation and promoting varieties that are highly resistant to global warming.

In light of this situation, the "Project for Promoting Sustainable Horticulture in Punjab" (hereinafter referred to as "The project") aims to promote sustainable agriculture and increase the income of target farmers by supporting crop diversification into horticultural crops such as vegetables

and fruit trees, improving facilities and strengthening capacity to strengthen the value chain, and strengthening the capacity and structure of the Horticulture Department, in line with the above-mentioned policy of the Government of India. The project is positioned as an important project for the Government of India and the Punjab State Government.

(2) Japan's and JICA's Cooperation Policies in the Agriculture Sector in Punjab State (especially in relation to key foreign policies such as New Plan for a Free and Open Indo-Pacific (FOIP))

Japan's Country Development Cooperation Policy for India (November 2023) defines "clean socio-economic development" as a key objective and supports projects related to strengthening and diversifying agricultural productivity and sustainability and strengthening value chains. JICA Country Analysis Paper on India (March 2025) lists "rural economic development and livelihood improvement" and "addressing climate change" as development challenges, stating that addressing environmental and climate change issues while improving agricultural productivity and raising farm incomes is required. Furthermore, JICA's Global Agenda (theme-specific strategy) states, under "5. Agriculture and Rural Development (Sustainable Food Systems)," that it aims to improve farm incomes by promoting agriculture and related industries (e.g., processing and distribution). The project is consistent with these policies and analysis as well as "food security", a pillar of the new plan for a "New Plan for a Free and Open Indo-Pacific (FOIP)".

The project is also expected to contribute to the achievement of SDGs Goal 1 (No poverty), Goal 2 (Zero hunger and promote sustainable agriculture), Goal 8 (Economic growth and employment), and Goal 13 (Climate action).

(3) Other Donors' Activities

In other Indian states, the World Bank is implementing a project to promote climate-resilient and sustainable horticulture in Rajasthan (2012-2021). The Asian Development Bank has also been supporting horticultural crop cultivation in Himachal Pradesh since 2023. The Food and Agriculture Organization of the United Nations is also implementing a project to improve grain value chains in Himachal Pradesh (2023-2028) and a technical cooperation project to reduce rice straw burning and promote alternative uses (2019-2026). In Punjab, Israel and the Netherlands are providing support for

improving horticultural techniques at demonstration sites in the state, based on an agreement with the Indian government.

3. Project Description

(1) Project Objective

The objective of the Project is to promote sustainable horticulture and improve farmer's income by diversifying into high-value horticultural crops, and infrastructure development for stronger value chain, and capacity development, thereby contributing to environmental conservation and sustainable socio-economic development in Punjab.

(2) Project Site / Target Area

State of Punjab

(3) Project Beneficiaries (Target Group)

Direct beneficiaries (farming population who will achieve income improvement through support for crop diversification to horticultural crops and sales promotion): Approximately 85,000 people.

Final beneficiaries (consumers who will benefit from the high added value of horticultural crops produced through the project): Approximately 10.55 million people.

(4) Project Components

(a) Development of Climate Resilient and Environmentally Sustainable Horticulture Value Chain

(a-1) Support for diversification of horticultural crops, such as vegetables and fruit trees (e.g., selection of priority crops by region, introduction of drip irrigation systems)

(a-2) Strengthening of a high-quality seedling supply system (e.g., establishment of state-of-the-art seedling production facilities, development of seedling distribution infrastructure within the state, and cultivation training)

(a-3) Development of post-harvest infrastructure (e.g., processing and packaging facilities, cold chain logistics, and quick-freezing processing units)

(a-4) Renovation and strengthening of existing market infrastructure to expand sales channels

(b) Advancement of Technology and Promotion of Sustainability within the Horticulture Value Chain (e.g., pilot activities for introducing advanced

agricultural technologies, collaborative research with academic institutions for the introduction of sustainable agricultural technologies, and development and operation of a data sharing platform)

(c) Support for Institutional Development of the Horticulture Sector in the State (e.g., establishment of business management units at the state and district levels, strengthening of agricultural extension systems) and capacity building of farmer organizations (e.g., revitalization of existing farmer organizations, establishment of new farmer organizations, and various training)

(d) Consulting services (e.g., detailed design support, construction supervision, organizational strengthening support)

(5) Estimated Project Cost

21,983 million Yen (Japanese ODA loan: 18,684 million Yen)

(6) Schedule

March/2026-March/2034 (97 months)

March 2034 is considered as the completion of the project.

(7) Project Implementation Structure

1) Borrower: President of India

2) Guarantor: N/A

3) Executing Agency: Department of Horticulture, Punjab

4) Operation and Maintenance System :

During implementation, the State Project Management Unit (SPMU) and District Project Management Unit (DPMU) will play a central role, and after project completion, the Department of Horticulture (DoH) will play a central role in operation and maintenance with organizations and groups responsible for each project component. Specifically, the facilities in the horticultural crop cultivation areas will be managed and maintained by farmers and producer groups, while the storage, processing facilities and demonstration fields will be managed by producer groups, market participants, and private companies after the project ends. Training on the operation and maintenance of these facilities will be provided through the project, and producer groups will cover operation and maintenance costs from their sales revenues. The executing agency will operate and maintain the rest of the facilities using the State government budget. Regarding technical aspects, DoH will take over operations from the SPMU and DPMU to strengthen the capabilities of farmers and producer groups after the project. Therefore, there are no particular technical concerns. Furthermore, the Finance Department of the Punjab State

Government has confirmed that it will appropriately allocate budgets for the operation and maintenance costs, so there are no particular financial concerns.

(8) Collaboration and Sharing of Roles with Other Donors

- 1) Japan's Activity: None in particular
- 2) Other Donors' Activity: None in particular

(9) Environmental and Social Consideration/Cross-Sectoral Issues/Gender Category

1) Environmental and Social Consideration

- ① Category: C
- ② Reason for Categorization: The project is deemed to have minimal adverse impact on the environment in accordance with the Japan International Cooperation Agency's Guidelines for Environmental and Social Considerations.

2) Cross-Sectoral Issues:

Climate Change and Biodiversity:

The conversion of grain cultivation to horticultural crops implemented in the project will help reduce the risk of groundwater depletion, curb methane (CH₄) emissions from paddy fields, and curb and reduce open burning of rice straw. Furthermore, the use of biochar, nitrification-inhibiting fertilizers, and drip fertility irrigation will enable carbon sequestration and storage (carbon dioxide/CO₂) and reductions in greenhouse gas (GHG) emissions such as nitrous oxide (N₂O). The project's climate change mitigation effect (estimated GHG emission reductions) is approximately 25,000 tons/year of CO₂ equivalent. In conjunction with these efforts, joint research between Japanese academic institutions and local universities and research institutions, as well as pilot activities by Japanese private companies, are planned to contribute to measures against air pollution and climate change and to reduce environmental impacts.

3) Gender Category: ■GI(S) (Gender Integration Project)

<Details of Activities/Reason for Categorization>

A gender analysis identified issues such as time constraints resulting from housework, low wages for women due to gender-based division of labor in production work, and low female participation rates in training (28% overall). To address these issues, the project will incorporate awareness-raising activities aimed at improving livelihoods and gender equality into its training. The gender

action plan aims to ensure a 40% female participation rate among all training participants. Furthermore, the impact of these efforts will be measured by the income of women involved in agriculture.

(10) Other Important Issues

The project aims to utilize the advanced technology and expertise of Japanese companies in the horticulture field and will involve trial introduction and demonstration of products and services at horticultural technology demonstration fields and training facilities. Furthermore, through pilot activities within the project, it aims to match with local needs and utilize the technology of Japanese companies to enhance the development effectiveness of the project. In addition, joint research is planned between multiple universities and research institutions in Japan and India on research themes that are in line with the objectives of the project. Furthermore, the project plans to introduce a system aimed at online project monitoring and centralizing trading price information for agricultural products. In the detailed design, data integration with the Indian central government-led agricultural data platform (Agri Stack) will be considered as necessary.

4. Targeted Outcomes

(1) Quantitative Effects

1) Outcomes (Operation and Effect Indicators)

| Indicator | Baseline (Actual value in 2025) | Target (2036) [2 years after project completion] |
|---|------------------------------------|---|
| Farmers' income (Indian rupees/month) | (Note 1) | (Note 2) |
| Increase of Area and Target of crop diversification (ha) (Note 3) | 0 | 34,000 |
| Reduction of Groundwater consumption (1,000 m ³ /year) | 0 | 218,986 (Note 4) |
| Post-harvest losses in horticultural produce (Vegetables) (%) | 12.9% (Note 5) | 5.2% |
| Post-harvest losses in horticultural produce (Fruits) (%) | 14.0% (Note 5) | 5.7% |

| | | |
|--|----------|----------|
| Income of all female actors involved in Agriculture-related activities (Indian rupees/month) | (Note 1) | (Note 2) |
|--|----------|----------|

(Note 1) The benchmark value will be based on the results of a baseline survey conducted after the project commences.

(Note 2) Target values will be set and revised based on the detailed action plan and baseline survey.

(Note 3) This refers to the area of land area converted from rice cultivation to horticultural crops such as vegetables or fruit trees.

(Note 4) Compared to the base year, the annual change in groundwater usage due to conversion to cultivated crops will be confirmed.

(Note 5) Values based on a 2022 survey by the Food and Agriculture Organization of the United Nations (FAO). They will be revised based on the baseline survey.

(2) Qualitative Effects

Mitigation of groundwater depletion and air pollution through conversion to horticultural crops, improvement of women's social and economic status, promotion of employment for women and young people, establishment of horticultural crop supply chains, reduction of economic and climate change risks through crop diversification and value-added production (adaptation effect to climate change), strengthening of farmers' organizations to enhance market competitiveness, expansion of technology and know-how through strengthening of agricultural extension systems, etc.

(3) Internal Rate of Return

Based on the assumptions listed below, the economic internal rate of return (EIRR) for the project is 13.75%. Since no direct revenue is expected from the project, the financial internal rate of return (FIRR) is not calculated.

【EIRR】

Costs: Project costs, operation and maintenance costs (excluding taxes)

Benefits: Benefits from horticultural crop promotion (crop diversification, reduced post-harvest losses, benefits from facility development such as packhouses)

Project Life: 30 years

5. External Factors and Risk Control

(1) Preconditions: None in particular

(2) External Factors: None in particular

6. Lessons Learned from Past Projects

One lesson learned from agricultural sector projects funded by Japanese ODA loans in India was that there were limited personnel available to carry out agricultural extension work, resulting in insufficient agricultural guidance being provided to target farmers. The project will ensure a sufficient number of agricultural extension workers are available and that they are appropriately deployed prior to project implementation and will establish a system for monitoring the status of agricultural guidance during the implementation stage. Furthermore, to complement agricultural guidance activities, the project will provide training opportunities for farmers to share their techniques and knowledge with each other, and, as part of its support for promoting private-sector collaboration, will utilize agricultural guidance provided by instructors from contract farming companies and agricultural guidance services provided by private-sector advanced agricultural technology companies.

7. Evaluation Results

The project is in line with India's development challenges and policies, as well as the cooperation policies and analysis of Japan and JICA. Furthermore, it will contribute to the promotion of sustainable horticulture through the curbing of excessive groundwater pumping and the strengthening of agricultural extension systems, and to the improvement of incomes of target farmers through the improvement of profitability brought about by support for crop diversification. It is therefore believed that the project will contribute to the achievement of SDGs Goal 1 (No poverty), Goal 2 (Zero hunger and promote sustainable agriculture), Goal 8 (Economic growth and employment), and Goal 13 (Climate action), so there is a high need to support the implementation of the project.

8. Plan for Future Evaluation

(1) Indicators to be Used

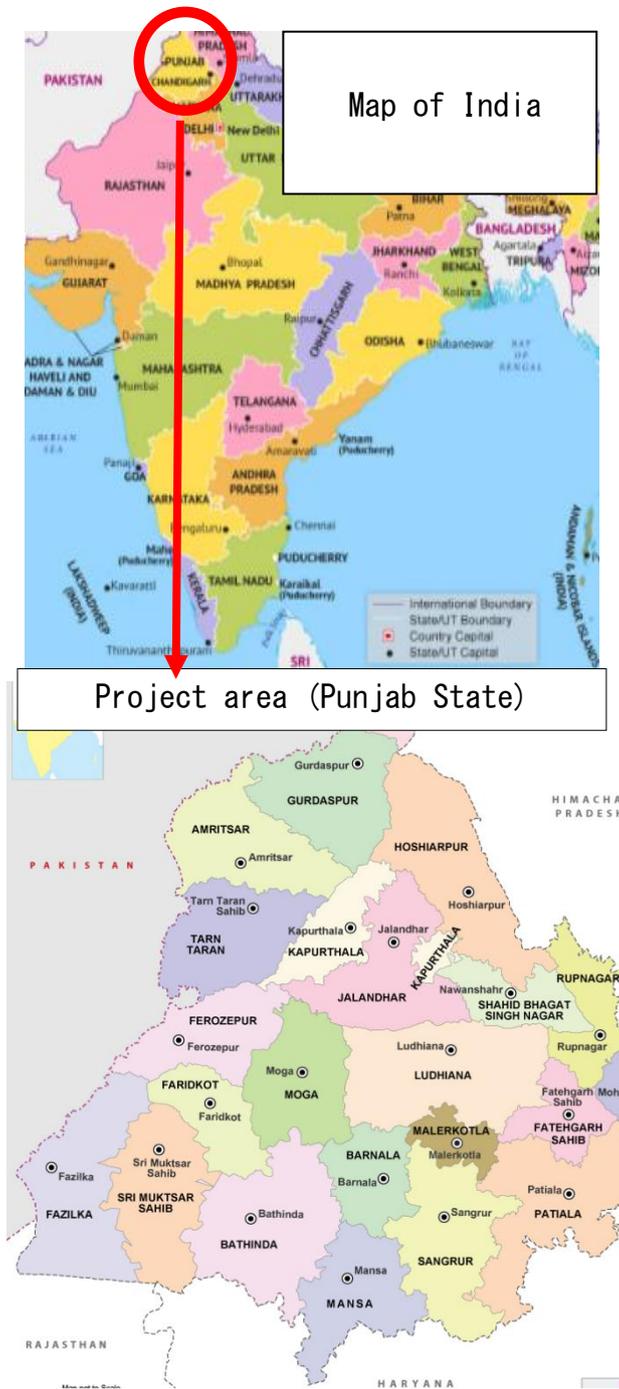
As indicated in Sections 4.

(2) Future Evaluation Schedule

Ex-post evaluation: 2 years after the project completion

END

Appendix: Map of Project for Promoting Sustainable Horticulture in Punjab



Source: Maps of India (<https://www.mapsofindia.com/>, Punjab District Map ([mapsofindia.com](https://www.mapsofindia.com/)))