

**Ex-Post Project Evaluation 2021:  
Package III-3 (Rwanda)  
Evaluation Reports**

**December 2022**

**JAPAN INTERNATIONAL COOPERATION AGENCY**

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**I2I COMMUNICATION, LTD.**

**INTERNATIONAL DEVELOPMENT CENTER OF JAPAN INC.**

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Republic of Rwanda

FY2021 Ex-Post Evaluation Report of Technical Cooperation Project

“Project for Strengthening the Capacity of Tumba College of Technology”

“Project for Strengthening the Capacity of Tumba College of Technology Phase 2”

External Evaluator: Takako Haraguchi, i2i Communication, Ltd.

## **0. Summary**

This project<sup>1</sup> was carried out at the Tumba College of Technology (TCT), a technical and vocational education and training (TVET) institution at the higher education level. Phase 1 involved establishing the operation of TCT as a TVET institution, and Phase 2 involved the strengthening of TCT as a model institution that other TVET institutions could use as reference. Relevance and coherence of the project are high as the project plan is consistent with Rwanda’s development policy and development needs, as well as Japan’s aid policy, and also takes into account synergies and mutual collaboration with other projects. As a result of Phase 1 implementation, the course management, employment of graduates, and satisfaction of graduates and employers generally reached the expected levels, and the project purpose of establishing the operation of TCT was mostly achieved. However, the overall goal of contributing to the development of Rwanda’s scientific and technological personnel was partially achieved, with the employment rate for graduates lower than established in the plan. Phase 2 compiled good practices for school management and capacity development and disseminated them from TCT to other schools. As a result, the project objectives - both the project purpose of establishing TCT as a model institution for TVET sector improvement and the overall goal of having other TVET institutions implement TCT good practices - were mostly achieved. Therefore, effectiveness and impacts are high. Efficiency is high. While the project cost exceeded that of the plan, the project period required to produce the initial outputs was according to plan. Sustainability is high. While there are issues such as a need for new investment funds, there is a prospect that the project effects that have been realized by the time of the ex-post evaluation will be sustained.

In light of the above, this project is evaluated to be highly satisfactory.

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<sup>1</sup> This evaluation covers Phase 1 and Phase 2 in an integrated manner. When the term "this (the) project" is used in this report, both phases are considered to be one project, unless otherwise noted.

## 1. Project Description



Project Location (source: 3kaku-K.)



Front gate of IPRC Tumba (former TCT)  
(source: Taken by IPRC Tumba)

### 1.1 Background

Rwanda's *Vision 2020*, a national development plan formulated in 2000, called for the realization of a knowledge-based economy and promoted the development of human resources, particularly in the fields of science and technology. However, industry in Rwanda faced a serious shortage of mid-career engineers and other technical personnel with practical skills, due to the effects of the civil war and the genocide against the Tutsi in 1994. As one of its measures, the Rwandan government decided to establish a higher technical training program (an A1 level program, a higher education program that awards an advanced diploma) and began its own efforts to prepare for the establishment of the Tumba College of Technology (TCT) and its three programs (departments): Information Technology, Electronics and Telecommunications, and Alternative Energy<sup>2</sup>. TCT's predecessor was the Tumba Technical School (upper secondary education program), which was built with Japanese grant aid and opened in 1993, but closed due to political instability in the region. The Japan International Cooperation Agency (JICA) cooperated in Phase 1 (2007-2012) of this project to support school management, with the objective of making TCT a practically-oriented higher technical education institution capable of meeting the needs of industry and society.

TCT began offering A1 level programs in August 2007. Phase 1 of the project achieved certain outputs in terms of building a school operation infrastructure, establishing a course management cycle, strengthening the basic skills of staff, and building links with industry. Meanwhile, the Rwandan government had been working to strengthen the TVET sector, and in 2008 established the Workforce Development Authority (WDA) under the Ministry of

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<sup>2</sup> The Alternative Energy Department changed its name to the Renewable Energy Department in September 2017.

Education as the coordinating arm for TVET-related activities. Phase 2 of the project (2013-2018) was implemented in light of the above, in order to further strengthen the Phase 1 outputs of TCT and accumulate experience, promote good practices that will serve as reference for other TVET institutions through the WDA, and contribute to the overall improvement of the TVET sector.

## 1.2 Project Outline

		Phase 1	Phase 2
Overall Goal		Human resource development in science, technology and innovation in Rwanda is promoted through the capacity development of TCT.	TCT's good practices are applied to other TVET institutions in Rwanda.
Project Purpose		TCT becomes an effective A1 level institution that provides practical technical education and training relevant to industrial and social needs. <sup>3</sup>	TCT becomes a model institution that provides Government of Rwanda with effective approaches for improving TVET sector.
Output(s)	Output 1	The basic management system of TCT is established.	Continuous capacity development system is established in TCT for the provision of practical technical education.
	Output 2	A course management cycle is established.	Improvement mechanism of school management is established in TCT.
	Output 3	Technical, pedagogical and managerial skills of TCT staff (teaching staff and administrative staff) are improved.	TCT shares its good practices with other TVET institutions.
	Output 4	The management capacity including employment promotion and income generation activities of TCT is enhanced.	
Total cost (Japanese Side)		941 million yen	898 million yen

<sup>3</sup> The Japanese text of the Project Purpose statement adds the explanation of the A1 level as “higher education level technical training.”

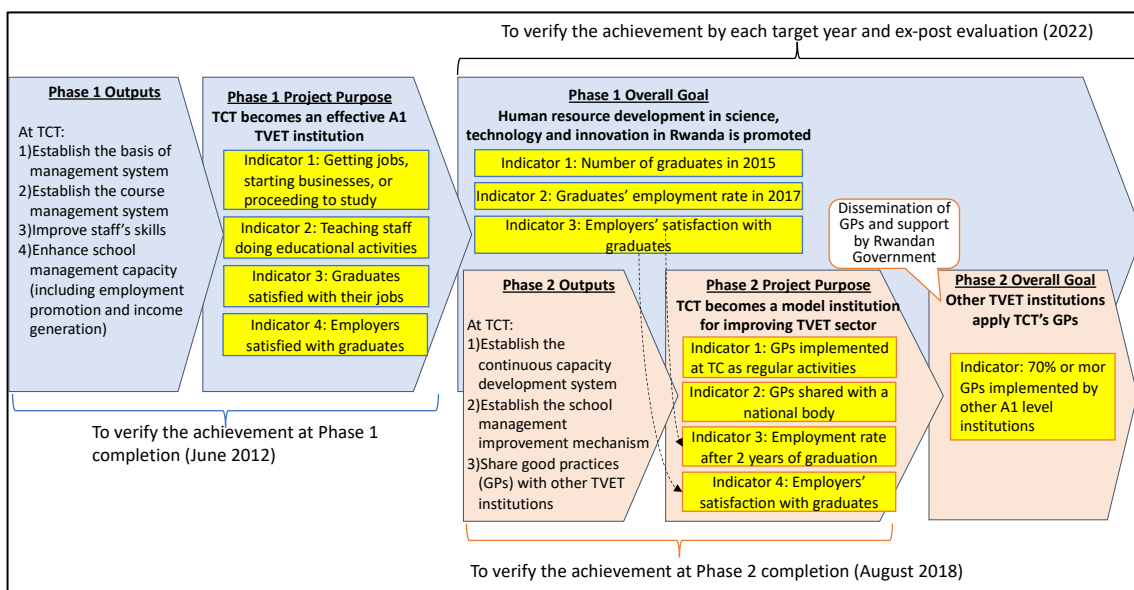
	Phase 1	Phase 2
Period of Cooperation	July 2007 – June 2012	January 2013 – August 2018 (Extension: January – August 2018)
Target Area	Tumba, Rulindo District, Northern Province (TCT main campus); Musanze, Musanze District, Northern Province (satellite center); Kigali (ICT Training Center)	
Implementing Agency	Tumba College of Technology (TCT) (Integrated Polytechnic Regional College Tumba: IPRC Tumba at the time of the ex-post evaluation) <sup>4</sup> ; Workforce Development Authority (WDA) <sup>5</sup> (Phase 2 only)	
Other Relevant Agencies/ Organizations	Ministry of Education	-
Consultant/ Organization in Japan	System Science Consultants Inc.	
Related Projects	<p>JICA Technical Cooperation</p> <ul style="list-style-type: none"> <li>• TVET Industrial Attachment Specialist (2010-2012. Individual expert dispatched to the WDA)</li> <li>• Advisor for Strengthening Partnership with Industry for TVET schools (2013-2015. Individual expert dispatched to the WDA)</li> <li>• Follow-up Cooperation for the Project for Strengthening the Capacity of Tumba College of Technology Phase 2 (2019-2020)</li> </ul> <p>JICA Grant Aid</p> <ul style="list-style-type: none"> <li>• Non-project Grant Aid (October 2005, December 2007, and September 2009. Use of the counterpart funds as part of the inputs from the Rwandan side for Phase 1 of this project)</li> </ul>	

This evaluation covered Phase 1 and Phase 2 in an integrated manner. The relationship between the two phases (as organized in the figure below) shows a linear logic running through both phases with regards to strengthening TCT. Specifically, the outputs and project purpose (launch and establishment of TCT) of Phase 1 carried over to some of the outputs

<sup>4</sup> Although the name of the school was officially changed in February 2018, this report use “TCT” to describe events, objectives, indicators, etc., up to the completion of Phase 2 in August 2018. “IPRC Tumba” is used to describe the circumstances leading up to the ex-post evaluation after the completion of the project. The history of TVET institution changes is described in “3.1.1.1 Consistency with the Development Plan of Rwanda.”

<sup>5</sup> In 2020, the responsibilities of the WDA were restructured and put under the Higher Education Council (HEC), the National Examination and Standards Agency (NESA), and the Rwanda TVET Board (RTB).

and project purpose (continued operation and improvement of TCT) in Phase 2. The indicators for the Phase 1 overall goal (number of graduates, employment rate of graduates, employers' satisfaction with TCT graduates) are similar to the project purpose indicators 3 and 4 in Phase 2. The dissemination of good practices was then added in Phase 2, in order to encourage operational change amongst TVET institutions other than TCT. In order to evaluate the effectiveness and impact of the project from the viewpoint of accountability, the level of achievement for the project purpose and overall goal was verified for each phase, and performance up to the ex-post evaluation was verified for both phases with regards to the indicators for the overall goals.



Source: Created based on JICA documents including Ex-ante Evaluation Reports and Terminal Evaluation Reports of both phases

Figure 1 Logic model of the project and scope of effectiveness/impact evaluation

### 1.3 Outline of the Terminal Evaluation

#### 1.3.1 Achievement Status of Project Purpose at the Terminal Evaluation

The project purpose for each phase was deemed mostly achieved at the time of the terminal evaluation. For Phase 1, the indicators for the project purpose were deemed mostly achieved, though the capacity of TCT to conduct course evaluations (part of Indicator 2) was deemed unknown.<sup>6</sup> For Phase 2, there were challenges pointed out with regards to the dissemination method of good practices (part of Indicator 2) and the employment rate of graduates (Indicator 3).

<sup>6</sup> The capacity was established in Phase 2, and course evaluations are sustainably conducted regularly at the time of the ex-post evaluation.

### 1.3.2 Achievement Status of Overall Goal at the Terminal Evaluation

(Including other impacts.)

While no indicators were set for Phase 1 (with indicators set at the time of the terminal evaluation for that reason), the overall goal was deemed “highly likely to be achieved” in light of the results achieved up to that point. For Phase 2, achieving the indicators within several years after project completion was deemed “quite challenging,” while the situation was expected to improve, with the evaluation concluding that further encouragement of implementation and dissemination of good practices was needed.

### 1.3.3 Recommendations from the Terminal Evaluation

The Phase 1 terminal evaluation recommended that TCT continue its public outreach, equipment maintenance, and effort to reduce staff turnover, and that the Rwandan government strengthen the top management of TCT (e.g., by appointing a vice principals), develop the legal basis for TCT, and improve the access roads to TCT. These were all addressed during the implementation of Phase 2. The Phase 2 terminal evaluation recommended that the period of cooperation be extended in order to complete the renovation of the Musanze Satellite Center, which had been delayed due to the earthquake. This was then implemented. The evaluation also recommended the continued implementation of the various activities initiated under the project, the securing of budgets, and the allocation of human resources, all of which were addressed after the completion of the project. (The post-project status is described in “3.2.2.1 Achievement of Overall Goal” and “3.4 Sustainability.”)

## **2. Outline of the Evaluation Study**

### 2.1 External Evaluator

Takako Haraguchi, i2i Communication, Ltd.

### 2.2 Duration of Evaluation Study

This ex-post evaluation study was conducted with the following schedule.

Duration of the Study: October 2021 – December 2022

Duration of the Field Study: February 11 – 25, 2022 and May 28 – June 2, 2022

### 2.3 Constraints during the Evaluation Study

This ex-post evaluation was conducted under the principle of utilizing existing information (including the results of previous surveys), without the implementation of a new survey. The indicators for effectiveness and impacts were set to be those for which it was considered highly likely that TCT would continue collecting performance data after the completion of



the project. With regards to employers' satisfaction with graduates, however, the satisfaction rate specifically for TCT (IPRC Tumba) graduates has not been surveyed as surveys of graduates have become conducted across all higher education level TVET institutions, including TCT (IPRC Tumba), due to the reform of the TVET sector described below. Therefore, to the extent possible with the resources of this ex-post evaluation, the available survey results were supplemented with interviews with several employers of TCT (IPRC Tumba) graduates. Because of the small sample size, however, the verification results for this indicator are somewhat less reliable than those of the other indicators.

### **3. Results of the Evaluation (Overall Rating: A<sup>7</sup>)**

#### 3.1 Relevance/Coherence (Rating: ③<sup>8</sup>)

##### 3.1.1 Relevance(Rating: ③)

###### 3.1.1.1 Consistency with the Development Plan of Rwanda

The project was consistent with the development plan of Rwanda both at the time of the ex-ante evaluation and project completion for each phase. With regards to national development plans, *Vision 2020* (formulated in 2020) mentioned above was valid throughout both phases of implementation. With regards to education sector policies, the *Education Sector Strategic Plan (ESSP)* (2006-2010) and the *ESSP* (2013-2017) both proposed the strengthening of science and technology education, emphasized the development of skills towards this purpose, and pointed to the need to strengthen the TVET sector.

As for policies specific to TVET, the *TVET Policy* was established in 2008, with the WDA established under the Ministry of Education as the central TVET coordinating body. A plan was also formulated to establish an integrated polytechnic regional center in each of the four provinces as a regional coordinating body. In 2015, a new *TVET Policy* was formulated, and pointed to the need for multiple levels of TVETs, including at the higher education level; institutional coherence for smooth progression and transfer between multiple levels of TVET and between TVET and general education; and improvements to the operation and management of integrated polytechnic regional centers. In accordance with this policy, the *Rwanda TVET Qualification Framework (RTQF)*, which is a subset of the *Rwanda National Qualification Framework (RNQF)*, and corresponds to international degree and qualification frameworks (International Labour Organization (ILO), United Nations Educational, Scientific and Cultural Organization (UNESCO), East African Community (EAC), etc.) were established, and the degrees and

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<sup>7</sup> A: Highly satisfactory, B: Satisfactory, C: Partially satisfactory, D: Unsatisfactory

<sup>8</sup> ④: Very High, ③: High, ②: Moderately Low, ①: Low

qualifications awarded by TVET institutions were developed<sup>9</sup>. Furthermore, in accordance with Law No. 22/2017, enacted in May 2017, the unified higher education level public TVET institution Rwanda Polytechnic (RP) was newly established, and eight existing public higher education level TVET institutions, including TCT, were redefined as integrated polytechnic regional colleges (IPRCs)<sup>10</sup> within RP. The objective of this project was to strengthen the structure and capacity of TCT in line with these policies and utilize the WDA, following its establishment, in order to disseminate the positive changes seen in TCT to other higher education level TVET institutions.

### 3.1.1.2 Consistency with the Development Needs of Rwanda

The project was consistent with the development needs of Rwanda both at the time of the ex-ante evaluation and project completion for each phase. First, with regards to the needs of TCT, the Rwandan government, in proceeding with their establishment of TCT, had faced challenges such as the planning for the overall development of the school, curriculum development, the training of staff, the establishment of a sustainable school management system, and the establishment of a career support system at the time of the Phase 1 ex-ante evaluation. This project was intended to address these challenges. In addition, the support provided for the three programs - Information Technology, Electronics and Telecommunications, and Alternative Energy - were relevant, as they were the programs that the government had prepared independently in line with its policy priorities. Furthermore, TCT was one of the first two higher education level TVET institutions to open in Rwanda in 2007. The other was Ecole Technique de Gitarama in Southern Province. However, because this school was established with only an architecture course, the three programs offered at TCT were the only A1 level programs in these areas available in Rwanda at the time, and there was a strong need to develop and strengthen them. After the start of the project, several higher education level TVET institutions were established, including the Kicukiro College of Technology in the capital city of Kigali (IPRC Kigali at the time of this ex-post evaluation)<sup>11</sup>. In light of the above, it is considered highly meaningful for TCT, which was in operation ahead of other schools, to accumulate and disseminate its good practices, so that the other schools could learn

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<sup>9</sup> The RTQF is comprised of Levels 1-7, with students learning Levels 6-7 at colleges of technology (later IPRC), higher education level technical schools. The A1 level (Advanced Diploma) awarded by TCT is equivalent to RTQF Level 7. To the time of the ex-post evaluation, the RTQF and the RNQF have been merged to form the Rwanda Education Qualification Framework (REQF).

<sup>10</sup> The integrated polytechnic regional center under the 2008 policy and the integrated polytechnic college under the 2017 law are both abbreviated "IPRC." However, the former was not limited to the higher education level but also included RTQF Level 1-5 TVET institutions. To avoid confusion within this report, the abbreviation "IPRC" is used only for the colleges under the RP umbrella as per the 2017 law.

<sup>11</sup> The A1 course at Ecole Technique de Gitarama was absorbed into the Kicukiro College of Technology, and the Gitarama school returned to being a secondary education level TVET institution.

from them.

With regards to industry needs, it has already been discussed that at the time of the Phase 1 ex-ante evaluation, there was a shortage of mid-career engineers and other personnel due to the effects of the civil war and genocide against the Tutsi in the country. Since then, supply needs for these human resources were gradually being met, at least in terms of quantity. The number of students at higher education level TVET institutions, including TCT, increased from 1,981 in 2010, to 6,988 in 2012, and 13,447 in 2018<sup>12</sup>. Conversely, however, it began to be pointed out that the capacity of Rwanda's industry to accept these human resources was approaching the limit<sup>13</sup>. In fact, as discussed below, the employment rate of TCT graduates was highest during Phase 1 implementation and declined during Phase 2 implementation. The Ministry of Education, in an interview at the time of the ex-post evaluation, stated that there is no doubt that the Rwandan economy was expanding, that there was a need for a practical workforce with knowledge and skills, and that thus there had not yet been saturation, but acknowledged that the employment opportunities were limited. Rwanda's private sector expanded, with the number of formal and informal businesses increasing from about 120,000 in 2011 (employing about 280,000 people), to about 150,000 in 2014 (employing about 490,000 people), and about 190,000 in 2017 (employing about 620,000 people). However, nearly 80% of them are wholesale/retail and accommodation/food service, and more than 90% are classified as microenterprises with less than four employees, indicating a structure that makes it difficult for economies of scale to work when it comes to employment<sup>14</sup>. Further, because TVET at the higher education level does not have a long history, it is still not well recognized by existing companies. Several surveys indicate companies' preference for university graduates rather than TVET graduates when they are to hire higher education level graduates. In order to expand job opportunities and contribution to industry in this context, the Rwandan government increased its emphasis on entrepreneurship by making classes on entrepreneurship mandatory in all higher education level TVET institutions and mandating the establishment of incubation centers. Phase 2 of the project addressed these changes by specifying incubation in an output indicator during implementation and maintaining consistency with these needs by focusing on the support of entrepreneurship.

Qualitatively, a study found at the time of Phase 2 ex-ante evaluation that the supply of technical personnel with the required level of practical skills was only about 60% of demand<sup>15</sup>. In addition, a JICA survey of industry in 2020 found that companies wanted

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<sup>12</sup> National Institute of Statistics of Rwanda

<sup>13</sup> Phase 2 Terminal Evaluation

<sup>14</sup> National Institute of Statistics of Rwanda, *Establishment Census Report 2011, 2014, 2017*.

<sup>15</sup> The Phase 2 Ex-ante Evaluation Report referred to the following document. African Development Bank, Organisation for Economic Co-operation and Development, United Nations Development Programme, United Nations Economic Commission for Africa (2012), *African Economic Outlook 2012*.

higher education level TVET institutions to provide practical skills training that matched labor market needs<sup>16</sup>. Thus, it can be said that there was a continuing need for higher education level TVET institutions to supply human resources to industry.

In addition, while there was no indication from existing data and interviews with those involved that consideration to marginalized people was taken into account, there was also no indication that any particular group was disadvantaged by this.

### 3.1.1.3 Appropriateness of the Project Plan and Approach (Describe, if applicable.)

For both phases, the project plans were logically constructed with no issues observed. During Phase 2, the advancement of TVET sector reform gave rise to the possibility that the implementing agencies involved in this project would also be restructured (in fact, there was a restructuring of TVET institutions just before the completion of the project, and a restructuring of the WDA after the completion of the project). In response to this, the project team changed its plan so that the dissemination of good practices to other TVET institutions, which was the purpose of Phase 2, would be conducted mainly by TCT itself, rather than through the WDA as originally envisioned. Furthermore, after the establishment of RP, they made efforts to work with RP. These sorts of adjustments in project design, in line with the changing circumstances surrounding the project, seem to have been a facilitating factor in achieving the project's objectives, and are commendable.

The link between the two phases is also appropriate. JICA documents and interviews with former experts show that while the project was not originally envisioned with multiple phases, there was also no clear policy to end the project at the conclusion of the portion that is known as Phase 1. As discussed previously, there was a linear logic that ran through both phases. While Phase 1 succeeded in supporting various aspects of TCT operation, it also revealed areas that needed improvement. As such, the planning of Phase 2, which was to involve strengthening these Phase 1 outputs, engraining them as systems within TCT, and disseminating them to other TVET institutions, was a natural progression of the project, and advanced the project's effectiveness and sustainability.

## 3.1.2 Coherence(Rating: ③)

### 3.1.2.1 Consistency with Japan's ODA Policy

At the time of the ex-ante evaluation for both phases, the project was consistent with Japan's development cooperation policy. At the time of the Phase 1 ex-ante evaluation

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<sup>16</sup> JICA, Koei Research & Consulting Inc. (2021), *Data Collection Survey on Technical and Vocational Education and Training in the Republic of Rwanda: Final Report*. The survey targeted 31 companies including those in "the ICT, tourism, and manufacturing industries, which are expected to drive job creation" and those in "the construction industry, which has a large working population." Although this survey was conducted after the completion of Phase 2, the relatively close timing to project completion suggests that the situation was similar when the project was completed.

(2007), Japan's ODA to Rwanda, based on the results of the 2004 economic cooperation policy dialogue, focused on (i) human resource development centered around education and vocational training and (ii) rural development centered around capacity building such as infrastructure development and operation and maintenance; the improvement of basic livelihoods; and agricultural development, aimed towards multisectoral community development<sup>17</sup>. At the time of the Phase 2 ex-ante evaluation, the *Country Assistance Policy for the Republic of Rwanda* (April 2012) positioned personnel development to support growth (science and technology education and training) as a priority area, with the policy being to support improvements to the quality of education and the strengthening of industry-academia collaboration.

### 3.1.2.2 Internal Coherence

Internal coherence is high. Synergistic effects and mutual collaborations with other JICA projects were realized as initially envisioned and became a facilitating factor in achieving the outputs. Specifically, as previously mentioned, the predecessor of TCT was a technical school built with pre-civil war grant aid, and in Phase 1 of the project, the infrastructure for TCT was developed with the help of the counterpart funds from non-project grant aid. At the time of the Phase 2 ex-ante evaluation, JICA was implementing its "Program for Strengthening Education and Training in Science and Technology" (later to become the "Program for Promotion of Human Resources Development in Education and Industry" in Rwanda, which included this project. TCT teaching staff participated in other JICA project activities under this program. In addition, Japan Overseas Cooperation Volunteers (JOCV)<sup>18</sup> were dispatched to TCT to support practical classes and out-of-school activities, contributing to the enhancement of faculty skills. Such collaborations resulted in their contributing to the strengthening of the systems of producing qualified human resources for industry development - a purpose of this program. For TCT, the collaborations also resulted in the enhancement of the capacity of academic staff.

There were synergies and mutual collaborations that were not initially envisioned. The participation of TCT graduates and teaching staff in other JICA projects included in the "Program for Promotion of Science and Technology Innovation (STI)," another program developed during the implementation of Phase 2, contributed to the program's purpose of "supporting policy-making, strengthening industrial basic, facilitation of collaboration with industry and investment, and promotion of utilization of advanced technology." TCT's experience in human resource development was also accumulated. In addition, the

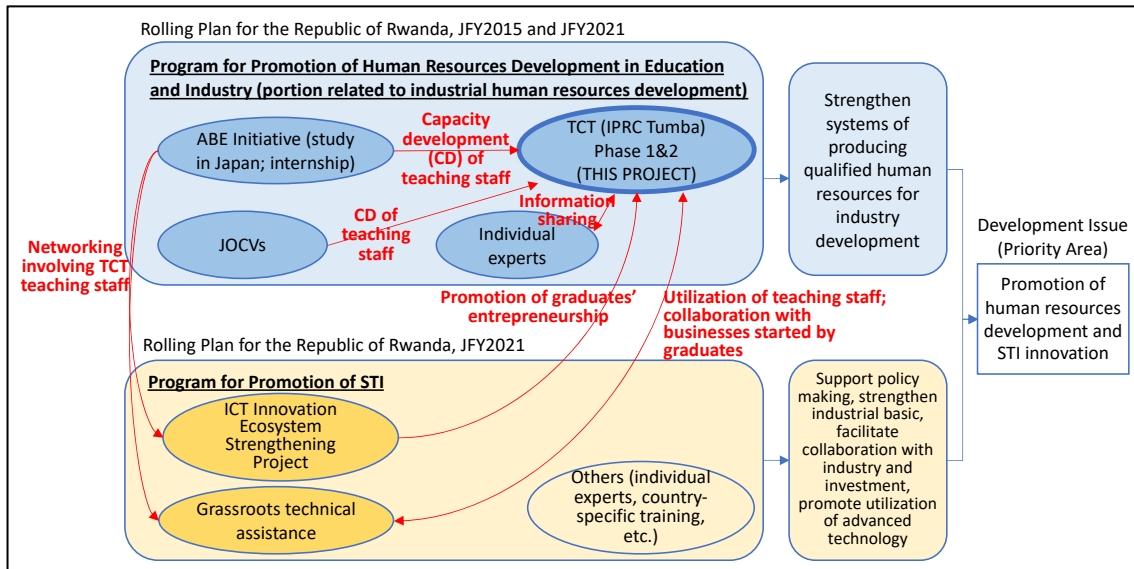
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<sup>17</sup> Ministry of Foreign Affairs (2007), *ODA Country Data Collection*.

<sup>18</sup> A total of six JOCVs were dispatched (three during Phase 1, two during Phase 2, and one after project completion).

technology transfer through the use of personnel from other countries, including those from JICA-supported higher education institutions, as third-country experts, led to high satisfaction amongst TCT staff<sup>19</sup>.

The linkages and results between this project and other projects in the above two programs are summarized in the figure below. See also “3.2.2.2 Other Positive and Negative Impacts” for the results of these synergies and mutual collaborations.



Source: Created based on Ministry of Foreign Affairs, *Rolling Plan for the Republic of Rwanda* as of April 2015 and April 2021 and JICA documents

Note: Red arrows and text indicate the results of each collaboration as identified in this ex-post evaluation.

Figure 2 Relationship between the project and programs in related fields in Rwanda

### 3.1.2.3 External Coherence

There is external coherence (no issues). In both phases, there was no assumption of active complementarity or collaboration with other donors, etc., that JICA ex-post evaluations would consider a “collaborative project”<sup>20</sup> at the time of the ex-ante evaluation. However, most of the donor support was provided at the TVET policy and systems level, and because there was segregation (coordination) by educational level and school, even for support provided to individual TVET institutions, there was no loss of

<sup>19</sup> In this project, third-country experts were actively utilized in areas where Japanese technology did not match the Rwandan context or where it was difficult to secure suitable experts. For instance, a Nepalese expert was invited to the Renewable Energy Department, as Nepal has an undulating topography similar to that of Rwanda, and is advanced in its use of solar power, small-scale hydropower, biogas, etc. In addition, teaching staff from the Electronic Engineering Polytechnic Institute of Surabaya, Indonesia, which JICA had supported through technical cooperation and grant aid in the past, were utilized with regards to technology transfer in the Electronics and Telecommunications Department.

<sup>20</sup> Related projects that involved discussions and agreements as to the content and expected results of the collaboration (including collaboration, complementarity, harmonization, cooperation), between the implementing agency, JICA, etc., during the ex-ante evaluation or implementation, are considered collaborative projects.

efficiency due to the duplication of support<sup>21</sup>. The project's support was in line with the Rwandan government's TVET policies, which consequently made it coherent with donor support provided at the policy and systems level.

In light of the above, this project is consistent with Rwanda's development policy and development needs, as well as Japan's aid policy. It also takes into account synergies and mutual collaboration with other projects, and specific results are confirmed. Therefore, its relevance and coherence are high.

### 3.2 Effectiveness and Impacts<sup>22</sup> (Rating: ③)

#### 3.2.1 Effectiveness

##### 3.2.1.1 Achievement of Project Purpose

The Phase 1 project purpose was mostly achieved. The project provided support for various aspects of school management, course management, and capacity development of staff, from the time TCT was opened. As a result, at the completion of this phase, all indicators related to course management, graduate employment, and the satisfaction rate of graduates and employers were mostly achieved as planned, as shown in the table below, indicating that TCT was on track as an A1 course TVET institution.

Table 1 Achievement of Project Purpose (Phase 1)

Project Purpose	Indicator	Actual (at the time of Phase 1 completion)
TCT becomes an effective A1 level institution that provides practical technical education and training relevant to industrial and social needs.	1. More than 75% of the graduates are employed, become entrepreneurs, or continue study in the relevant field.	Mostly achieved <ul style="list-style-type: none"> <li>According to the 2011 tracer survey, the average of the first batch graduates (graduated in November 2009) and the second batch graduates (graduated in November 2010) was 74.2% (see Box 1 for details on the employment rate).</li> </ul>
	2. TCT staff can prepare, conduct, and evaluate courses by themselves.	Mostly achieved <ul style="list-style-type: none"> <li>TCT teaching staff conducted three A1 programs and short courses without major issues.</li> <li>With regards to evaluation, however, TCT teaching staff involvement in the implementation of graduates' course evaluations was found to be low, and course evaluations by current students were not conducted. As such, the capacity for TCT to conduct course evaluations is unknown. (Teaching staff evaluations by students and feedback for the next course were established during the implementation of Phase 2.)</li> </ul>

<sup>21</sup> Support already in place at the time of the Phase 1 ex-ante evaluation included institutional development support, such as that provided by Germany, Belgium, and the Netherlands towards the establishment of TVET systems and the strengthening of the WDA. For individual TVET institutions, the World Bank and Germany provided assistance at the RTQF Levels 1-5 to resume classes after the civil war and the genocide against the Tutsi, with some of these schools later upgraded to higher education level schools, and becoming IPRCs. At the time of the Phase 2 ex-ante evaluation, support for the idea of establishing integrated polytechnic regional centers was being planned or implemented by Belgium (Southern Province), Korea (Kigali), China (Northern and Southern Provinces; construction only), and the World Bank (Eastern and Western Provinces). Information sharing and coordination with donor agencies were being conducted by the JICA Rwanda Office.

<sup>22</sup> When providing the sub-rating, Effectiveness and Impacts are to be considered together.

Project Purpose	Indicator	Actual (at the time of Phase 1 completion)
	3. TCT graduates are satisfied with working in related fields.	Mostly achieved <ul style="list-style-type: none"> <li>With regards to their satisfaction rate with TCT, 20.8% of the first and second batch graduates were very satisfied, 55% satisfied, 23.8% not very satisfied, and none were dissatisfied.</li> </ul>
	4. Employers are satisfied with TCT graduates.	Mostly achieved <ul style="list-style-type: none"> <li>The 2011 employers' satisfaction survey found that 97.4% of employers were satisfied with TCT. This figure is considerably higher than the 71.6% obtained in a similar survey of other TVET institutions, conducted by the WDA. The reason for the difference is unknown. (This indicator was assessed as "mostly achieved" because, while the satisfaction rate was fairly high, the lack of a target value means the results cannot be said to have gone "better than planned/achieved as planned.")</li> </ul>

Source: Phase 1 Terminal Evaluation Report

The Phase 2 project purpose was mostly achieved. This phase, based on Phase 1 outputs, involved the establishment of systems for school management and capacity development, and the compiling of these systems into good practices for dissemination to other TVET institutions. New efforts included the strengthening of research and development and production activities, called "RDPU activities," through the establishment of the Research and Development Production Unit (RDPU), which is meant to improve the practical skills of the staff. RDPU activities that were compiled as good practices included refurbishment of broken and unused personal computers (PCs) at secondary schools in Northern Province (Information Technology Department), the development and manufacture of smart egg incubators that increased the hatching rate of eggs (Electronics and Telecommunications Department), and the development and manufacture of energy-efficient cooking stoves (Renewable Energy Department). In addition, in order to expand employment opportunities and contributions to industry, there were efforts made to strengthen the school's employment/entrepreneurship functions by improving its support systems, through the establishment of the Career Support & Incubation Center (restructuring of the Incubation Center established during Phase 1), the implementation of a mentor system (assignment of teaching staff who provide technical advice with regards to student business ideas), and more.

As a result, indicators related to the engraining of activities considered good practices within TCT, and the sharing of these good practices with other institutions, were mostly achieved. One facilitating factor that allowed these various activities to take root in TCT, was that the project selected activities that were needed by TCT or required by policy, and gradually reduced the degree of Japanese intervention so that TCT could carry out these activities on its own. The employment rate of graduates, however, was lower than the level at the completion of Phase 1. Although there are aspects of these surveys that



make direct comparison difficult, such as differences in the number of years that passed since graduation between the surveys in Phase 1 and Phase 2, one factor may be that during Phase 1, many of the graduates got jobs in the education sector specifically (due to the need for staff for the strengthening of the TVET sector), which made the employment rate during this period particularly high. (The chronological details of the employment rate are summarized in Box 1.) The satisfaction rate amongst employers of graduates was high. Overall, it can be said that TCT improved its management and was poised to contribute to the improvement of other TVET institutions.

Table 2 Achievement of Project Purpose (Phase 2)

Project Purpose	Indicator	Actual (at the time of Phase 2 completion)								
TCT becomes a model institution that provides Government of Rwanda with effective approaches for improving TVET sector.	1. TCT's good practices are implemented independently by TCT as its regular activities.	<p>Mostly achieved</p> <ul style="list-style-type: none"> <li>Thirteen good practices were compiled by the time the project was completed. Of these, the following nine cases became engrained as regular activities within TCT. See Table 7 for a list of good practices. <ul style="list-style-type: none"> <li>Case 1 Industrial Attachment Program (IAP)</li> <li>Case 2 Graduates Tracer Survey</li> <li>Case 3 Employer Satisfaction Survey</li> <li>Case 4 PC Refurbishment</li> <li>Case 6 Asset and Consumable Management System</li> <li>Case 9 Incubation and Career Support Center</li> <li>Case 10 IPRC Alumni Association</li> <li>Case 12 Plan Do Check Action (PDCA) Cycle for School Management</li> <li>Case 13 Entrepreneurship Manuals for Trainees and Trainers at RTQF Level 6 and 7<sup>(1)</sup></li> </ul> </li> </ul>								
	2. TCT's good practices are shared with a national body for dissemination.	<p>Mostly achieved</p> <ul style="list-style-type: none"> <li>It was confirmed that good practices were shared with the WDA, and that the WDA was evaluating their content and outputs.</li> <li>Due to the TVET sector reform making it less likely that the WDA would be able to disseminate TCT good practices, they were shared with RP headquarters that was newly established in 2017 to manage all IPRCs.</li> </ul>								
	3. Employment rate after two years of graduation: more than 75%.	<p>Partially achieved</p> <ul style="list-style-type: none"> <li>According to the 2017 tracer survey, the average of the seventh batch (2.5 years after their graduation in September 2014) and the eighth batch (1.5 years after their graduation in September 2015) was 44.1% (see Box 1 for details on the employment rate).</li> </ul>								
	4. Employers' satisfaction rate of TCT graduates over one year of employment: more than 85%.	<p>Mostly achieved</p> <ul style="list-style-type: none"> <li>While two employer satisfaction rate surveys conducted by TCT had results that exceeded the target value, it was unknown whether those employed had worked under these employers for over a year.</li> </ul> <table border="1" data-bbox="726 1765 1359 1942"> <thead> <tr> <th></th> <th>2014 survey (Number of responses unknown)</th> <th>2017 survey (97 valid responses)</th> </tr> </thead> <tbody> <tr> <td>Overall satisfaction</td> <td>100.0%</td> <td>98.1%</td> </tr> <tr> <td>Average satisfaction by all items</td> <td>89.3%</td> <td>94.3%</td> </tr> </tbody> </table>		2014 survey (Number of responses unknown)	2017 survey (97 valid responses)	Overall satisfaction	100.0%	98.1%	Average satisfaction by all items	89.3%
	2014 survey (Number of responses unknown)	2017 survey (97 valid responses)								
Overall satisfaction	100.0%	98.1%								
Average satisfaction by all items	89.3%	94.3%								

Source: Phase 2 Terminal Evaluation Report, Phase 2 Project Completion Report

Note: (1) In Japanese reports, the title is equivalent to "Entrepreneurship Training Materials."

In the light of above, both phases of the project mostly achieved their purposes.

### 3.2.2 Impacts

#### 3.2.2.1 Achievement of Overall Goal

Although progress was made in strengthening Rwanda's scientific and technological human resource development by enhancing the capacity of TCT, which was the overall goal of Phase 1, it can only be considered partially achieved in light of the high expectations that had been set by the project. After the completion of Phase 1, TCT continued its operation, working towards further capacity development with the support of Phase 2 of the project. As a result, the number of A1 course graduates (Indicator 1) averaged in the 200s per year in 2015, the target year, until the time of the ex-post evaluation. While these numbers were below the target value (300 or more), they suggest that this portion of the goal was mostly achieved<sup>23</sup>. In FY2021, the Mechatronics Department was established with the assistance of the Agence Française de Développement (AFD).

The employment rate of graduates in related fields (Indicator 2) was in the 30-40% range for both the target year of 2017 and thereafter (2019 and 2021), well below the target value (over 80%). This may reflect the situation described in "3.1.1.2 Consistency with the Development Needs of Rwanda," in which employment opportunities may be limited despite there being demand for such personnel in industry. However, the number of graduates who start their own businesses has been increasing consistently, and there have also been some job creation instances in which graduates who have started their own businesses have hired junior graduates<sup>24</sup>. In addition, since the performance data available pertained to the employment status of graduates up to two years after graduation, the employment rate for all graduates may be higher (see also Box 1).

While the employer satisfaction rate (Indicator 3) appears to have met the target value

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<sup>23</sup> In addition to A1 programs, TCT (IPRC Tumba) also offers short courses. Results after the completion of the project include six cycles of the National Employment Program (NEP) course for a total of 842 participants; four cycles of the Skills Development Fund (SDF) course, developed in cooperation with the World Bank, for a total of 134 participants; and one cycle of a boot camp for youths for a total of 50 participants. The school also trains instructors in Northern Province as a certified training center for a private American computer company.

<sup>24</sup> In the interviews for this ex-post evaluation, the following graduates gave examples of their entrepreneurial activities. (i) After graduating from the Department of Information Technology, he worked in the private sector before founding a software development company. Three out of four employees are IPRC Tumba graduates. He also undertakes in-company training (IAP) for IPRC Tumba students. (ii) After graduating from the Department of Electronics and Telecommunications Engineering, he founded an ICT service and consulting company. Three out of five employees are IPRC Tumba graduates, and three IPRC Tumba faculty members serve as advisors. He has been teaching short courses and supplying training equipment to several IPRCs including Tumba (see Box 2 (2)). (iii) After graduating from the Department of Electronics and Communication Engineering, he started his own business developing and manufacturing egg incubators (see Box 2 (1)).

(85% or more of employers satisfied) as of 2017, the situation since then has not been fully surveyed and could not be accurately determined. The table below summarizes the results of the RP survey of all IPRCs and a simplified survey (interviews) conducted by the ex-post evaluator. From these, it appears that a certain degree of results has been achieved.

Table 3 Achievement of Overall Goal (Phase 1)

Overall Goal	Indicator	Actual (in the target year and at the time of ex-post evaluation)
Human resource development in science, technology and innovation in Rwanda is promoted through the capacity development of TCT.	1. Number of graduates TCT produces each year reaches at least 300 by 2015.	<p>Mostly achieved</p> <ul style="list-style-type: none"> <li>Aggregated only for A1 programs. While a precise tally of graduates is made at the time of the graduation ceremony, there are times when graduation ceremonies are held for several years' worth of graduates. The data from TCT (IPRC Tumba) graduation ceremonies, when restated to annual averages, shows 248 students (average of 2014 and 2015) in 2015 (target year), and an average of 209 students from 2016 to 2022. See Table 5 for full data.</li> </ul>
	2. More than 80% of graduates are employed, running business or continuing study in the relevant field by 2017.	<p>Achieved to a limited extent</p> <ul style="list-style-type: none"> <li>44.1% in the 2017 tracer survey (same as Phase 2, Project Purpose Indicator 3 in Table 2). Of these, 70.6% responded that their work was directly related to the field they studied at TCT, and the performance value for this, if considered to be "Employed, running a business, or in school in a related field," would be <math>44.1 \times 0.706 = 31\%</math>.</li> <li>In the tracer survey by IPRC Tumba in 2019 and 2021, the percentage employed, etc., at the time of the surveys was 53.6% in 2019 (six months after graduation) and 47.3% in 2021 (two years after graduation). While it is unclear if this represents employment in related fields, if this value is multiplied by the 70.6% obtained in the 2017 survey, the employment rate in related fields would be 37.8% in 2019 and 33.4% in 2021.</li> <li>See Box 1 for details on employment rates.</li> </ul>

Overall Goal	Indicator	Actual (in the target year and at the time of ex-post evaluation)
	3. At least 85% of employers who have employed TCT graduates for more than six months evaluate graduates' practical abilities as satisfactory.	<p>Mostly achieved</p> <ul style="list-style-type: none"> <li>In the 2017 employer satisfaction survey by TCT, the overall satisfaction rate was 98.1% and the average satisfaction rate by item was 94.3% (same as Phase 2, Project Purpose Indicator 4 in Table 2). However, it is unknown if those employed were employed for over six months at the time of the survey. Given the purpose and content of the survey, it seems safe to assume that all of the questions are evaluations of practical competence.</li> <li>According to the 2021 employer satisfaction survey conducted by RP (all IPRCs) (80 valid responses), the total percentage of respondents who were very satisfied or satisfied was 59% for "Knowledge and understanding," and 79% for "Attitude and values." There is no data for IPRC Tumba only. Only 19% of respondents were in the technical services industry.</li> <li>In a simplified survey conducted by the post-evaluators in February 2022 (interviews with the same survey items as those conducted within the project), all four employers (three private companies, two of which were started by graduates, and the Rwanda Energy Group, a state-owned company) said they were very satisfied or satisfied for the items, "Knowledge required for current job," "Skills required for current job," "Computer skills," "Comprehension," "Teamwork," and "Overall evaluation." Items in which two or more companies said they were not very satisfied or not satisfied were "Math skills," "Foreign language skills," "Communication and reporting skills," "Critical thinking and problem-solving skills," and "Sense of responsibility."</li> </ul>

Source: Phase 2 Terminal Evaluation Report, Phase 2 Project Completion Report, IPRC Tumba

Table 4 Number of A1 program students in TCT (IPRC Tumba) (FY2021)

Unit: Person

Department	1 <sup>st</sup> year			2 <sup>nd</sup> year			3 <sup>rd</sup> year			Total		
	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total
Information Technology	34	17	51	24	10	34	58	31	89	116	58	174
Renewable Energy (Former Alternative Energy)	25	15	40	37	19	56	63	12	75	125	46	171
Electronics and Telecommunication	40	10	50	44	14	58	96	18	114	180	42	222
Mechatronics (opened in the academic year 2021)	41	8	49	0	0	0	0	0	0	41	8	49
Total	140	50	190	105	43	148	217	61	278	462	154	616

Source: IPRC Tumba

Table 5 Number of graduates of TCT (IPRC Tumba)

Graduation year	Unit: Person								
	2009 2010 2011	2012 2013	2014 2015	2016 2017	2018	2019	2020 2021	2022	Total
Number of graduates	274	358	495	358	307	194	401	203	2,633
Annual average	91	179	248	179	307	194	201	203	

Source: IPRC Tumba

While not directly related to the project's overall goals, there were some activities that were implemented and established at TCT through this project, but those were not continued at the time of the ex-post evaluation. One was the Technical Advisory Group (TAG) meeting. The TAG meetings were set up for the purpose of reflecting industry needs in the curriculum through consultation between TCT and industry representatives and were held throughout both phases. However, it is IPRC Tumba's understanding that their role has ended with the development of a unified curriculum for the RP. Since the current curriculum is only through 2023, it has been noted that the meetings will resume at the initiative of the RP when the next curriculum is to be developed<sup>25</sup>.

The other is the closure of the ICT Training Center in Kigali (Kigali campus). This campus was established within the WDA building during Phase 1. The school offered short courses. However, the number of participants had been declining since the project was completed, and the premises of the Kigali campus were given to a newly established government institution in 2020. Training activities were shifted to the Musanze Satellite Center and the Tumba main campus, and all equipment installed in the Kigali campus through this project was relocated to Tumba. Originally, the Kigali campus was established because the location of Tumba made it difficult to offer industry-academia collaboration and short courses in the Information Technology Department, but with improved access to Tumba and the large number of ICT-related training courses offered in Kigali, such changes seem reasonable.

In addition, training based on the annual staff training plan introduced in Phase 1 of the project has not been continued. Based on interviews with IPRC Tumba, it appears that the training by JICA was perceived as ad hoc during project implementation.

<sup>25</sup> At each IPRC, each faculty member formulates lesson plans and conducts classes in accordance with the unified curriculum.



Equipment for hands-on training at the Tumba main campus (source: Taken by the Ex-post Evaluator)



Musanze Satellite Center (source: Taken by the Ex-post Evaluator)

#### Box 1 Employment status of TCT (IPRC Tumba) graduates

This ex-post evaluation analyzed the employment rate (percentage of graduates who were employed, running a business, or in school at the time of the survey) obtained from the 2011, 2017, 2019, and 2021 graduate tracer surveys conducted by TCT (IPRC Tumba). In addition, the results of the tracer survey conducted by RP in 2021 for all IPRCs were also used as reference.

The main results of each survey are summarized in the table below. The employment rate was highest in the 2011 survey at 74.2% and was in the 40-50% range in all other surveys. This may have been due to the limited number of TVET institutions at the higher education level in 2011, which created a particularly high demand for human resources; the increase in the supply of human resources, without the necessary increase in job opportunities to match the supply; many companies still prefer university graduates over TVET graduates; and, as discussed next, a reflection of employment trends in the private sector. In addition, analysis in the 2017 survey suggested that the employment rate was low because many graduates had fulfilled the fixed-term contracts that they signed immediately after their graduation. IPRC Tumba also explained that the slight decrease in the employment rate in 2021 was due to the COVID-19 pandemic.

While the education sector made up the highest percentage of employers in 2011, this has since declined (depending on the survey, the only data available were the percentage of those whose employer was in the education sector, or those whose job title was teaching staff<sup>26</sup>; as such, comparisons were made within each category). Although comprehensive data was not available, employment within the education sector includes employment with TCT and other TVET institutions. It is understandable that there were many who became employed in the education sector in 2011, when the strengthening of the TVET sector was beginning and there was a need for staff, and that these numbers declined thereafter.

Surveys from 2017 onwards found that the majority of graduates (60% or more) were employed in the private sector, suggesting that a steady supply of human resources is being provided to industry. The percentage of self-employment has consistently increased, indicating the

<sup>26</sup> While in TVET institutions, lecturers and assistant lecturers are considered teaching staff, and instructors and laboratory technicians are considered technical staff, it is unclear whether respondents answered these questions with these clear distinctions. In the 2011 survey, the job titles were the sum of the teacher and instructor job titles.

effectiveness of RP and the IPRCs' emphasis on supporting entrepreneurship in the absence of a significant increase in employment opportunities (the overall employment rate also shows improvement between the 2017 and 2021 surveys, when the number of years that had passed since graduation is nearly identical and highly comparable). Although a comprehensive breakdown of government agencies (non-academic sector) was not available, information from sources such as survey reports and stakeholder interviews suggest that most are technical positions, and likely to be workplaces where students can demonstrate what they have learned at TVET.

The results of the RP-conducted tracer survey of graduates of all IPRC, obtained for reference, show an employment rate that is slightly higher, but is at almost the same level as that of IPRC Tumba. The percentages of private sector employment and self-employment were over five points higher than those of IPRC Tumba. This might have been due to the fact that the survey did not place a limit on the number of years it had been since respondents had graduated (although it did indicate that most respondents were under 30 years old). While, as noted above, the employment rate declines when fixed-term employment contracts expire one to two years after graduation, it is generally believed that in the long term, the employment rate will increase the more years pass after graduation. It is also possible that the number of graduates who go independent after being employed increases over time.

	TCT (IPRC Tumba) graduates				All IPRC graduates
	TCT survey 2011	TCT survey 2017	IPRC Tumba survey 2019	IPRC Tumba survey 2021	RP survey (Reference value) 2021 <sup>(1)</sup>
Number of valid responses	240	430	427	186	363
Number of years since respondent graduated	0.5 - 1.5	1.5 - 2.5	0.5	2	Not specified
Percentage who were employed, running a business, or in school at the time of the survey	74.2%	44.1% <sup>(2)</sup>	53.6%	51.2%	52.3%
Percentage who work in the education sector, amongst those who are employed <sup>(3)</sup>	63% (51% teaching staff)	(16.6% teaching staff)	46.7%	(15.9% teaching staff)	Unknown
Percentage who work in the private sector, amongst those who are employed <sup>(3)</sup>	Unknown	68.9%	Unknown	60.2%	65.3%
Percentage who are self-employed, amongst those who are employed	6%	11.9%	14.7%	15.9%	22.6%

Source: Phase 1 and 2 Terminal Evaluation Report, IPRC Tumba, RP

Note: (1) The 2021 survey by RP did not examine employment rates by IPRC. (2) In the Phase 1 terminal evaluation, indicator achievement was verified using the percentage of respondents who had been employed, etc., at least once between graduation and the time of the survey (55.9%). This ex-post evaluation, however, used the percentage who were employed, etc., at the time of the survey, based on interviews with former experts and IPRC Tumba. (3) The "Education sector" and "Private sector" were not mutually exclusive.

The overall goal of Phase 2, the implementation of TCT good practices in other TVET institutions, was mostly achieved at the time of the ex-post evaluation<sup>27</sup>. Many of the 13 good practices compiled in Phase 2 are being implemented in some form in some or all of the other IPRCs. However, it was difficult to conduct a simple tally of that number and compare it to the indicator's target value of "at least 70%." As such, the results have been organized and discussed in Table 7.

The good practices consist of nine cases (Cases 1-3, 6, 9-13) related to the establishment of institutions and four cases of individual RDPU activities (Cases 4, 5, 7, 8). Of these, seven cases including "Case 1: Industrial Attachment Program (IAP)" and "Case 9: Incubation and Career Support Center" fall under the first category related to the establishment of institutions and have been implemented or are undergoing preparation for implementation as a unified system at the RP Headquarters and/or all IPRCs. However, very few of them have been introduced to other institutions in the same format as designated in the project ("Case 6: Asset and Consumable Management System," implemented at IPRC Musanze, is the only such case, though it is not considered one of the seven cases, since it was not implemented across RP as a whole). This is because higher education level TVET institutions were reorganized as IPRCs under the RP umbrella, with all IPRCs now operating under a unified structure and curriculum. However, it is also true that these cases were constructed within the project and implemented at TCT before this unification, and RP and IPRC Tumba acknowledge that TCT has been a reference point for RP and other IPRCs as the first instance of implementation for these cases. The guidelines developed under this project (*RDPU Operational Guidelines, Incubation and Career Support Center Guidelines*, etc.) were not applied to RPs or other institutions, but they were referred to when developing unified policies, etc. at RPs. "Case 13: Entrepreneurship Materials" was incorporated into the RP unified curriculum.

The four cases in which individual RDPU activities were identified as good practices, are being implemented in IPRC Tumba and other IPRCs as production activities<sup>28</sup> or are being used as reference for other IPRCs through information sharing in meetings, lectures, visits, etc., to help build the capacity of those IPRCs. For "Case 4: PC Refurbishment" and "Case 8: Improved Cooking Stove" in particular, multiple IPRCs have divided the region into sections and are providing services and products to the region. IPRC Tumba also serves as a test center for improved cooking stoves manufactured by other

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<sup>27</sup> Since there was no target year specified, the results were verified at the time of the ex-post evaluation (2022), four years after project completion.

<sup>28</sup> RDPU activities were separated into research and development (RD) and production, under the RP system umbrella (as described in "3.4.2 Institutional/Organizational Aspect"). However, since some activities started as RDPU activities and were being conducted as production activities at the time of the ex-post evaluation, they are all referred to as "RDPU activities" for convenience.



institutions. Another RDPU activity not included in the 13 good practices, but developed by IPRC Tumba teaching staff as a separate RDPU activity, is the graduation requirement clearance system (part of the e-Services system), which has been implemented in all IPRCs.

In light of the above, it can be said that 11 of the 13 good practices, including those that have not directly been implemented but are positioned as precedents, are being implemented at other TVET institutions. Factors that drove implementation include the outreach to RP conducted through this project, and RP's proactive attitude towards making the most of existing experiences and engaging in mutual learning as they develop as a new organization. IPRC Tumba is recognized by RP as a school with progressive initiatives.

Table 6 Achievement of Overall Goal (Phase 2)

Overall Goal	Indicator	Actual (at the time of ex-post evaluation)
TCT's good practices are applied to other TVET institutions in Rwanda.	At least 70% of good practices where applicable are implemented by other A1 level institutions.	Mostly achieved <ul style="list-style-type: none"> <li>Five of the 13 good practices (38%) shared with RP were implemented at other IPRCs in a form similar to or more advanced than the form developed in this project. Similar activities, though not in the same form, have been implemented in other IPRCs, with 11 such cases (85%), including those in which good practices from the project served as precedents for the other IPRCs (see Table 7).</li> </ul>

Source: Phase 2 Terminal Evaluation Report, Phase 2 Project Completion Report, IPRC Tumba, RP

Table 7 State of the implementation of good practices at the time of ex-post evaluation

	State of Implementation at the Time of Ex-Post Evaluation
<b>Good practice</b>	<p>⊙: Implemented in almost the same form or a more advanced form than that developed in the project</p> <p>○: Implemented as a similar activity/activities, though not in the same form as developed in the project. The good practice has served as a precedent for these activities</p> <p>△: Similar activities exist, but cannot be said to have originated from the project's good practices</p>
Case 1: Industrial Attachment Program (IAP)	○ Introduced and currently being implemented in all IPRCs as an RP system. IPRC Tumba has also implemented this program for 100% of its students.
Case 2: Graduates Tracer Survey	○ Currently being implemented at RP headquarters and some IPRCs. Conducted annually at IPRC Tumba.
Case 3: Employer Satisfaction Survey	○ Currently being implemented at RP headquarters. While IPRC Tumba has maintained a qualitative understanding through contact with graduates during tracer surveys after the completion of the project, they plan to resume implementing surveys in the financial year 2022-2023.
Case 4: PC Refurbishment	⊙ Currently being implemented at IPRC Tumba, Kigali, Huye, and Ngoma under a memorandum of understanding with the Ministry of Education. The Musanze Satellite Center at IPRC Tumba has been serving as a repair center for secondary schools in Northern Province.

	<b>State of Implementation at the Time of Ex-Post Evaluation</b>
<b>Good practice</b>	<p>⊙: Implemented in almost the same form or a more advanced form than that developed in the project</p> <p>○: Implemented as a similar activity/activities, though not in the same form as developed in the project. The good practice has served as a precedent for these activities</p> <p>△: Similar activities exist, but cannot be said to have originated from the project's good practices</p>
Case 5: Solar Water Heater and Solar PV	○ Utilized at other IPRCs for teaching staff capacity development through observation, training, etc. IPRC Tumba continues to utilize the system, supplying hot water and electricity to the school and providing products to external parties.
Case 6: Asset and Consumable Management System	⊙ Implemented at IPRC Tumba and Musanze. Implemented at IPRC Tumba through improvements to the barcode system, etc.
Case 7: Egg Incubator	⊙ Implemented at several other IPRCs. Also utilized at other IPRCs for teaching staff capacity development through observation, training, etc. The IPRC Tumba graduates who launched the project that was turned into this case study have been operating it as a business after graduation (See Box 2).
Case 8: Improved Cooking Stove	⊙ Implemented in IPRC Tumba, IPRC Kigali, IPRC Karongi, and IPRC Musanze IPRC Tumba has been providing the product to schools, refugee camps, prisons, etc., and providing training as to its manufacturing through short-term courses, community activities, etc. It also serves as a testing center for stoves manufactured by other institutions.
Case 9: Incubation and Career Support Center	○ Introduced and implemented in all IPRCs as an RP system, in response to Rwandan government policy. However, it was reorganized into the IPRC department, the Career Development and Guidance Unit. IPRC Tumba provides students the chance to apply for incubation opportunities such as the “TVET Youth Challenge” (national level; supported by the Korea International Cooperation Agency (KOICA) and the United Nations Development Programme (UNDP)) and the “IPRC Tumba Incubation Challenge” (supported by AFD), as well as follow-up support. Approximately two out of the approximately 30 applications per year reach the prototyping stage.
Case 10: IPRC Alumni Association	○ To be established at RP headquarters, with details being discussed by RP and IPRCs
Case 11: School Management Effectiveness Survey	Implementation at other IPRCs is unknown. IPRC Tumba continues to conduct some surveys.
Case 12: PDCA Cycle for School Management	△ Replaced in all IPRCs with the planning and budgeting cycle within the Rwandan government-designated results-based performance management system for the public sector.
Case 13: Entrepreneurship Manuals for Trainees and Trainers at RTQF Levels 6 and 7 <sup>(1)</sup>	⊙ Part of these materials were incorporated into the RP unified curriculum (2021-2013) after revision and is being utilized in all IPRCs.

Source: Phase 2 Terminal Evaluation Report, Phase 2 Project Completion Report, IPRC Tumba, RP

Note: (1) In Japanese reports, the title is equivalent to “Entrepreneurship Training Materials.”



Solar water heaters/solar power generators (IPRC Tumba) (source: Taken by the Ex-post Evaluator)



Prototype creation equipment rented out to students by the Incubation and Career Support Center (IPRC Tumba) (source: Taken by the Ex-post Evaluator)

As described above, Phase 1 of the project has achieved its overall goal only to a certain extent due to the limited employment rate of graduates when compared to the plan, while the targets have been mostly achieved in terms of the number of TCT graduates and the satisfaction rate for employers of TCT graduates. Phase 2 has mostly achieved its overall goal.

### 3.2.2.2 Other Positive and Negative Impacts

#### 1) Impacts on the Natural Environment

No negative impacts on the natural environment have been reported<sup>29</sup>.

#### 2) Resettlement and Land Acquisition

No resettlement or land acquisition has occurred.

#### 3) Gender Equality, Marginalized People

IPRC Tumba reported that there was no special consideration with regards to gender and marginalized people. The percentage of women in IPRC Tumba's staff was 28% for administrative staff and 11% for teaching staff (as of 2020). At the time of the ex-post evaluation, the percentage of female students was around 25% overall (by department: 33% in the Information Technology Department, 27% in the Renewable Energy Department, 19% in the Electronics and Telecommunications Department, and 16% in the Mechatronics Department), a level close to other IPRCs with similar departments.

<sup>29</sup> As the project was judged to have minimal undesirable effects on the environment, it was classified as Category C based on the *JICA Guidelines for Environmental and Social Considerations* (April 2010).

Therefore, the project is not considered to have had either a positive or negative impact.

#### 4) Social Systems and Norms, Human Well-being and Human Rights

A positive impact that the project had was the establishment of the first higher education level TVET institution in Rwanda, and the provision of many good practices, such as IAP, incubation, etc., as prototypes or precedents for the development of systems. Through these activities, it can be said that the project contributed to the development, in Rwanda, of a higher education level TVET system that emphasizes practicality.

In addition, while not originally envisioned in the plan, the TCT Information Technology Department was designated by the EAC to be a Center of Excellence (CoE) in its field during the project, which is expected to have a positive impact that goes beyond Rwanda to the East Africa region as a whole. TCT (IPRC Tumba) has also established its vision, “to be a CoE in technical education in Rwanda and (the East Africa) region.” However, they lack the concrete know-how to turn this vision into a reality, and it seems the realization of the vision (the manifestation of its impact) is just beginning. While JICA implemented follow-up cooperation for this project in 2019, it was not able to provide support related to this know-how due to the effects of the COVID-19 pandemic.

The impact on human well-being was not investigated in this evaluation. However, IPRC Tumba reported that the IPRC Tumba RDPU activities that were conducted as social contribution activities, such as improvements to the energy efficiency of cooking stoves (provided to schools, refugee camps, prisons), etc., have improved the lives of residents. In addition, Phase 2 paved and improved the access road from the national highway to TCT (located on top of a hill), which improved accessibility not only for those involved with the school, but also for resident of the surrounding area. Stores, banks, etc., began to open on the road after its improvement. These effects were achieved because the project developed a route that was more convenient for the community, separate from the original access road.

#### 5) Unintended Positive/Negative Impacts

Synergistic effects were observed, such as personnel who participated in one JICA project forming a network and participating in other JICA projects, benefiting from both projects, then promoting what they have learned from these experiences at their original projects, and thereby helping to magnify the projects’ effects (see Box 2 for examples). It is generally presumed that the teaching staff of educational institutions have little experience in industry and lack practicality. At IPRC Tumba, however, it is clear that industry conditions are being shared at the school through graduates who have started their own businesses, other projects, and more. Links with other JICA projects have

furthered this understanding. This is likely a result of the multilayered networking on the Japanese side, the Rwandan side, and the two sides working together, and suggests that JICA's program approach in Rwanda has been successful.

Box 2 Examples of synergies between this project and other JICA projects

**(1) Social contribution by start-ups and feedback of experiences to IPRC: Synergistic effects with the technical cooperation project, the “ICT Innovation Ecosystem Strengthening Project” (2017-2021)**

A, a student in the Electronics and Telecommunications Department at TCT, had numerous innovation ideas during his studies. One of them was for a smart egg incubator that would allow users to optimize egg-hatching environments through the use of an app, thereby increasing the hatch rate. While still enrolled in the school, he produced the first prototype for the device, with the support of Phase 2 of this project. A graduated from TCT in 2017 and started his own business in 2018. He saw the need to further improve the egg incubator, and upon hearing about the ICT Innovation Ecosystem Strengthening Project, consulted a Japanese expert from this project. The expert recommended that he participate in the start-up incubation support program, “250 Start-Ups,” that had been planned through this project. A applied and was chosen for the first batch of the program. A obtained support for development funds, business management know-how, etc., produced his second prototype, and demonstrated its effectiveness in a pilot project (trial of the prototype and training) at a farm. At the time of the ex-post evaluation, the egg incubator was further refined, and its manufacture and sale are one of several projects at A's start-up. This business employed six people and provided 504 egg incubators within Rwanda, as well as five provided to farms in the Democratic Republic of Congo.

Based on these experiences, A now serves as an external instructor at IPRC Tumba and shares his ideas on innovation and other topics with other IPRCs and several companies. A's mentor while he was studying at TCT was a TCT faculty member who had studied in Japan under the “ABE Initiative” described below, and A reports that he was able to learn a considerable amount from this mentor.

**(2) Expanding the effects of technical human resource development through links to new cooperation: Synergistic effects with the scholarship program, “African Business Education Initiative for Youth (ABE Initiative)” (2014-) and the grassroots technical cooperation project, the “ICT Human Resource Development Project in Kigali, Rwanda” (Kobe City and Kobe Institute of Computing, Graduate School of Information Technology; 2017-2019, 2022-2024)**

B, a faculty member of the Electronics and Telecommunications Department at TCT, studied in the master's program at the Kobe Institute of Computing, Graduate School of Information Technology (KIC) under the trainee program (long-term training) of this project. B was also subjected to the JICA scholarship program, the “ABE Initiative,” and participated in an internship at a Japanese company, gaining insight into innovation, practical technical education, etc., in addition to obtaining his master's degree. Since returning to their job, B has been involved in many cooperation projects between Japan and Rwanda, including the installation of lightning rods in TCT by the company they interned for, which specialized in lightning arresters (TCT lightning

protection installation project, 2016-2017) under the Ministry of Economy, Trade and Industry Subsidy for Projects that Utilize Technical Cooperation and Develop Markets in Developing Countries), and was introduced in Prime Minister Abe (now former Prime Minister)’s keynote speech at the opening ceremony of the 7th Tokyo International Conference on African Development.

Specifically, B, together with personnel who have also studied at KIC under the “ABE Initiative” (with one of them being an IPRC Tumba graduate and a faculty member of the Information Technology Department) has contributed to the development not only of TVET but of Rwanda’s technical human resources as a whole, by serving as an instructor and facilitator in the grassroots technical cooperation project implemented by KIC and Kobe City, “ICT Human Resource Development Project in Kigali, Rwanda” conducting practical training courses (leadership, Internet of Things (IoT), etc.) for working adults and graduate students with university degrees or higher.

Another link between this course and IPRC Tumba is that the practical equipment used in the IoT module is procured from an ICT services and consulting company started by an IPRC graduate. The company also employs IPRC graduates and has further connections with other IPRCs in addition to IPRC Tumba, offering short courses and other services.

B is also the head of the Mechatronics Department, which was newly established in 2021.



Access road to IPRC Tumba after development  
(source: Taken by the ex-post evaluator)



Training in a grassroots technical cooperation project by IPRC Tumba teaching staff (source: Taken by the ex-post evaluator)

The Phase 1 project has mostly achieved the project purpose of developing TCT into a practical AI course TVET institution. However, with regard to the overall goal, while TCT’s contribution to strengthening Rwanda’s human resource development in science and technology was recognized, the employment rate of graduates fell far below the target level due to limited employment opportunities, amongst other factors. For Phase 2, the project has mostly achieved the project purpose of TCT becoming a model institution for TVET sector improvement and the overall goal of implementing TCT good practices at other TVET institution. The effect of promoting entrepreneurship to increase job opportunities and contribution to industry is evident, with synergistic effects with other JICA projects also

observed. Taking these points into consideration, effectiveness and impacts of the project are high.

### 3.3 Efficiency (Rating: ③)

#### 3.3.1 Inputs

Table 8 Inputs

Inputs	Phase	Plan	Actual
(1) Experts	Phase 1	100 MM*	1 Long-term (14.8 MM) 50 Short-term (213.45 MM)
	Phase 2	150 MM	15 Short-Term (160.04 MM)
(2) Trainees received	Phase 1	Training in Japan and third countries	4 persons in Training in Japan
	Phase 2	Details were to be determined	6 persons in Training in Japan 7 persons in Third Country Training 128 persons in In-country Training 1 person in Long-term Training (studying at graduate school in Japan)
(3) Equipment	Phase 1	Basic equipment necessary for each course	Practical training equipment for each department
	Phase 2	Equipment required for Production Unit (PU) activities	Construction, furniture, and equipment for the new building of the Department of Information Technology, equipment for incubation and career support, and equipment for practical training and demonstrations at the Musanze Satellite Center
(4) Others	Phase 1	Expenses for In-country Training, etc.	60 million yen of Overseas Activity Cost, 84,100 US dollars (7 million yen) for hiring local consultants
	Phase 2	Expenses for holding seminars and workshops, etc.	153 million yen of Overseas Activity Cost, 71,700 US dollars (7 million yen) for hiring local consultants
Japanese Side Total Project Cost	Phase 1	586 million yen	941 million yen
	Phase 2	692 million yen	898 million yen
Rwandan Side Total Project Cost	Phase 1	Basic infrastructure at TCT main and branch campuses, basic equipment for classes (computers, etc.), and school operation and maintenance costs	3.7 billion Rwanda francs (605 million yen), of which 2.2 billion Rwanda francs were allocated from the counterpart funds from grant aid for the construction of a multipurpose hall, expansion of staff housing and student dormitories, development of sports grounds, and repair of access roads
	Phase 2	School operating expenses	Project office and expert accommodations (unknown amount for school operating expenses)

Source: Source: Created based on JICA documents including Ex-ante Evaluation Reports and Terminal Evaluation Reports of both phases

Note: \* MM stands for man month. Amounts are rounded down to the nearest million yen. Expenditure records that are not in Japanese yen have been converted using the following exchange rates (averaged for the implementation period of each phase). Phase 1: 1 US dollar = 93.68 yen / 1 Rwanda franc = 0.16372 yen. Phase 2: 1 US dollar = 109.328 yen / 1 Rwanda franc = 0.14594 yen. Phase 1 access road repair was completed during Phase 2.

#### 3.3.1.1 Elements of Inputs

No particular problems were observed in the content, quantity, quality, or timing of

inputs on both the Japanese and Rwandan sides. The evaluation finds that the construction of facilities using the counterpart funds from grant aid, the provision of school operation expenses (Rwandan side input) and the formation of an expert team centered consistently around the same expert (consultant) and utilizing third-country experts (Japanese side input) facilitated the smooth achievement of outputs.

#### 3.3.1.2 Project Cost

The total project cost for Phases 1 and 2 exceeded planned costs at 1,839 million yen, compared to the plan of 1,278 million yen (144% of planned costs). The main reason for this excess was the increase in the number of experts in Phase 1, and the procurement of additional equipment for industry-academia collaboration and renovation of the Musanze Satellite Center in Phase 2.

#### 3.3.1.3 Project Period

The total project period for Phases 1 and 2 was ten years and eight months and slightly exceeded the plan (107% of planned project period). While Phase 1 was completed in five years, as planned, Phase 2 was extended by eight months. However, the reason for the extension was that the renovation of the Musanze Satellite Center, which had not been included in the original plan, was delayed due to the earthquake. As such, it can be said that the project period required to produce the initial outputs was according to plan.

Therefore, efficiency of the project is high.

### 3.4 Sustainability (Rating: ③)

This section defines the effect of this project that should be sustained as the “operation and human resource provision of IPRC Tumba and the sharing of good practices with other TVET institutions,” and examines whether the various conditions for sustaining this effect have been established.

#### 3.4.1 Policy and System

At the time of the ex-post evaluation, the importance of RP/IPRCs as higher education level TVET institutions has been clearly identified in the national development policy and the education and training sector policy. *Vision 2050* (formulated in 2020) states that continued development of a market-driven TVET system is critical to meeting the demand for high value-added labor. According to the Ministry of Education, the TVET sector reform that had been underway since the implementation of this project was completed with regards to reorganization, with the institutional framework set in place. Public higher



education level TVET is to be developed by RP at each IPRC under the supervision of the Higher Education Council of the Ministry of Education. The *Rwanda Polytechnic Strategic Plan (2019-2024)* was developed based on the framework of the TVET sub-sector strategy in the *Education Sector Strategic Plan (ESSP) (2018-2023)*.

Thus, it can be said that the policies and systems necessary to sustain the project effect have been secured.

#### 3.4.2 Institutional/Organizational Aspect

As previously mentioned, TCT, the implementing agency for this project, became IPRC Tumba, one of the RP's colleges, after the TVET sector reorganization. Even under the system at the time of the ex-post evaluation, IPRC Tumba's position as an A1 level TVET institution in Northern Province remained unchanged. According to the Ministry of Education and RP, there is no formal positioning of Tumba as a specific model school amongst the eight IPRCs. Rather, there is a system in which all IPRCs are meant to learn from each other and develop under the *RP Strategic Plan*<sup>30</sup>. However, the Ministry of Education, RP, and the two other IPRC principals interviewed during the ex-post evaluation all stated that there is much to be learned from Tumba in terms of high-quality facilities, commitment to innovation, etc.

With regards to the organizational structure of IPRCs, a uniform organizational structure was introduced for all IPRCs, alongside the establishment of RP. As a result, the organizational structure of IPRC Tumba has also changed from that of TCT during the implementation of this project. Specifically, alumni associations and on-campus companies (income activities) were transferred from the IPRC level to the RP level, with RDPU activities divided into RD (research and development) activities to be conducted by each department at the IPRC level, and production activities to be managed by the company at the RP level and conducted by the respective IPRC staff in charge. The Incubation and Career Support Center is now recognized as a unit on the organizational structure of IPRCs with about five staff including the Director, Business Incubation Specialist, Industrial Liaison Specialist, Entrepreneurship Development Officer, and Career Guidance Officer. It also uses some teaching staff as technical mentors depending on their expertise to support students while working on projects. As of November 2022, all the five positions except for Director have already been assigned, and the Director will join soon.. According to IPRC Tumba, there were no particular obstacles to the operation of the school under the current organizational structure.

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<sup>30</sup> RP reported that the Academic Senate at RP was a forum for each school to share its good practices. At the Senate, representatives from RP headquarters and each IPRC discuss the overall educational and research activities of RP and IPRCs.

While the number of administrative staff in the IPRCs is determined uniformly by RP, there were vacant positions in all IPRCs except IPRC Kigali. This is because smaller-scale IPRCs have less of a need for staff allocation in accordance with the organizational chart shared across all IPRCs, as well as budget and infrastructure constraints<sup>31</sup>. Since there is no fixed number of teaching staff, the number of staff is adjusted according to fluctuations in the number of students. According to IPRC Tumba, the current number of teaching staff does not pose any particular obstacle to the operation of the school.

Table 9 Number of students and staff of each IPRC in 2020

IPRC	Number of students		Number of administrative staff		Number of teaching staff	
	Total	Female	Total	Female	Total	Female
Tumba	975	239	36	10	71	8
Kigali	3,070	527	76	29	182	15
Ngoma	844	182	39	10	103	18
Karongi	1,012	245	50	13	98	9
Musanze	1,117	296	38	11	86	12
Huye	1,336	277	71	21	115	1
Gishari	1,454	245	44	12	108	7
Kitabi	349	112	33	4	17	3

Source: JICA, Koei Research & Consulting Inc. (2021), *Data Collection Survey on Technical and Vocational Education and Training in the Republic of Rwanda: Final Report*.

One challenge during the implementation of the project was the turnover of staff. According to IPRC Tumba, however, this has been addressed and improved. This was through efforts such as improvements to access roads, the elimination of the rule that staff must reside in Tumba (it is now possible to commute from Kigali), and permission for teaching staff to engage in off-campus jobs. However, the school also commented that it was natural for highly capable personnel to seek positions with better conditions. RP is developing policies on workload, promotion, faculty development, and more, in order to improve conditions for IPRC staff.

Thus, it can be said that the institutions and organizations necessary to sustain the project effect have mostly been secured.

### 3.4.3 Technical Aspect

According to IPRC Tumba, the skills of IPRC Tumba staff with regards to school administration (administration, course management, facilities and equipment management, etc.) and RDPU activities (research and development, production, project management, etc.) vary from person to person, but in general they have improved with the support of this project. Thus, it can be said that the level of skill required for the continuation of these activities is in place. Training based on the annual training plan introduced in Phase 1 of

<sup>31</sup> JICA, Koei Research & Consulting Inc. (2021), *Data Collection Survey on Technical and Vocational Education and Training in the Republic of Rwanda: Final Report*.

the project has been centralized for all IPRCs, and the staff capacity building plan has been recently developed at the RP level in consultation with all IPRCs. Also, RP has a memorandum of understanding with Kepler University (non-profit university program) to provide training opportunities related to career guidance and soft skills.

Thus, it can be said that the technical aspect necessary to sustain the project effect has been secured.

#### 3.4.4 Financial Aspect

IPRC Tumba operations are funded by the government budget and its own revenue, as well as external funds in some years, and the same prospects are available in the future as well. Both the government budget and its own revenue fluctuate widely from year to year, but IPRC Tumba explained that the amount necessary to operate the school at the current number of students has been secured<sup>32</sup>. The majority of the school's own revenue is from fees collected from students, such as examination fees, registration fees, and accommodation fees. According to IPRC Tumba, income from production activities is not significant, as many activities are government contracts or social contributions. There was no allocation in the school budget for incubation costs at the time of the ex-post evaluation, as the school was receiving external support (AFD; See Table 7, Case 9). As a measure to deal with the future termination of external support, RP suggested that IPRC Tumba set aside funds for incubation, as some other IPRCs have done, and said that the school could use the research funds allocated by RP to teaching staff for research and development with students, and for mentoring activities for student incubation. RP also said that, starting in 2023, they are planning to select a few students from across all of the IPRCs and provide them with innovation support (allowances, workshops, supplies, etc.) for one year after graduation.

Table 10 Income and expenditures of IPRC Tumba

Unit: Rwanda franc

	2017/18	2018/19	2019/20	2020/21	2021/22
<b>Income</b>	<b>492,504,713</b>	<b>281,235,324</b>	<b>302,271,661</b>	<b>430,077,619</b>	<b>179,074,600</b>
Government	88,000,000	133,804,655	199,875,194	274,073,888	127,206,400
Self income	141,169,253	147,430,669	102,396,467	75,182,243	51,868,200
International cooperation	263,335,460	-	-	80,821,488	-
<b>Expenditure</b>	<b>388,800,503</b>	<b>228,775,807</b>	<b>293,978,309</b>	<b>313,486,085</b>	<b>320,520,243</b>
Of which, maintenance and repair	11,568,240	18,077,275	26,632,300	33,340,969	22,989,182

Source: IPRC Tumba

<sup>32</sup> Government budget allocations are adjusted according to the number of students and the amount of external support the school receives. The amount allocated for 2021/2022 was particularly low because of the overseas assistance to establish the Mechatronics Department and the reduction of the number of new students due to the construction in the building for this department.

While IPRC Tumba has secured the funds necessary for the maintenance of facilities and equipment already in place, including those provided by the project, they have indicated that they are looking for external funding for investments (particularly for fiber optic technology, etc.), to accommodate the increase in students and technological innovations (the AFD support obtained at the time of ex-post evaluation was for facilities and equipment for the Mechatronics Department).

With regards to the sharing of good practices, there is no indication that the Ministry of Education or RP have set aside a budget for this purpose. However, no issues were observed, as the exchange of information is occurring within the framework of the schools' regular operations.

As described above, the financial aspect necessary to sustain the effects of the project has been secured with regards to operation and maintenance costs (necessary to sustain the effect already manifested). Though there are issues that must be addressed for further development, measures to address these are already being explored.

#### 3.4.5 Environmental and Social Aspect

No sustainability risks with regards to environmental, social, or other aspects were recognized.

#### 3.4.6 Preventative Measures to Risks

The challenges such as staff turnover cited in “3.4.2 Institutional/Organizational Aspect,” investment financing cited in “3.4.4 Financial Aspect,” and the limited employment opportunities currently available, cited in “3.1.1.2 Consistency with the Development Needs of Rwanda” and “3.2.2.1 Achievement of Overall Goal” could be said to pose risks towards the sustaining of the project effect. As discussed in each section, however, RP and IPRC Tumba are currently implementing and exploring measures to address these challenges, and they do not seem to be issues that will significantly reduce the effect that has been manifested at the time of the ex-post evaluation.

#### 3.4.7 Status of Operation and Maintenance

The status of operation and maintenance of IPRC Tumba's facilities and equipment, including equipment developed under this project, was good. The asset and consumable management system developed in the project was functioning, with improvements.

In the light of above, slight issues have been observed in the financial aspect, but there are good prospects for improvement/resolution. Therefore, sustainability of the project effects is high.

## **4. Conclusion, Lessons Learned and Recommendations**

### 4.1 Conclusion

This project was carried out at TCT, a TVET institution at the higher education level. Phase 1 involved establishing the operation of TCT as a TVET institution, and Phase 2 involved the strengthening of TCT as a model institution that other TVET institutions could use as reference. Relevance and coherence of the project are high as the project plan is consistent with Rwanda's development policy and development needs, as well as Japan's aid policy, and also takes into account synergies and mutual collaboration with other projects. As a result of Phase 1 implementation, the course management, employment of graduates, and satisfaction of graduates and employers generally reached the expected levels, and the project purpose of establishing the operation of TCT was mostly achieved. However, the overall goal of contributing to the development of Rwanda's scientific and technological personnel was partially achieved, with the employment rate for graduates lower than established in the plan. Phase 2 compiled good practices for school management and capacity development and disseminated them from TCT to other schools. As a result, the project objectives - both the project purpose of establishing TCT as a model institution for TVET sector improvement and the overall goal of having other TVET institutions implement TCT good practices - were mostly achieved. Therefore, effectiveness and impacts are high. Efficiency is high. While the project cost exceeded that of the plan, the project period required to produce the initial outputs was according to plan. Sustainability is high. While there are issues such as a need for new investment funds, there is a prospect that the project effects that have been realized by the time of the ex-post evaluation will be sustained.

In light of the above, this project is evaluated to be highly satisfactory.

### 4.2 Recommendations

#### 4.2.1 Recommendations to the Implementing Agency

- (1) It is recommended that RP review the good practices of this project and implement aspects of these practices that could be implemented even under the current system, such as the asset and consumable management system, across all IPRCs.
- (2) It is recommended that RP share cases of other IPRCs that have secured funding for innovation activities and incubation from their own budgets, with IPRC Tumba and all IPRCs, as good practices. In addition, RP is recommended to realize their plan to support graduate innovation activities, and to further enhance the sustainability of this project through these efforts.
- (3) It is recommended that RP include a question about which IPRC graduates are from in the graduate tracer survey and the employer satisfaction survey, so that trends specific to each IPRC can be analyzed, and so that the utility of the survey results

can be enhanced. For example, RP/IPRCs could reinforce areas where employer demand is not being met and strengthen career support in areas where employment is difficult to find.

- (4) It is recommended that IPRC Tumba continue its smooth operations. In particular, it is important to maintain and strengthen the school's practical education capacity to increase industry awareness of IPRCs and enhance graduates' employability in existing employment opportunities as well as the supply of human resources to industry through the promotion of entrepreneurship. Maintaining and promoting teaching staff's involvement with industry (networking with graduates, conducting joint innovation activities, etc.) and actively participating in incubation efforts, would be effective in this regard. In addition, IPRC Tumba could consider reallocating its own resources (ensuring that a small amount of funding is available for students to create prototypes) so that the incubation that is currently underway through external assistance at the time of the ex-post evaluation can be maintained in the future. It is also important for the school to continue seeking funding sources to update equipment and keep pace with technological innovations.
- (5) In addition to the above-mentioned relations with industry, IPRC Tumba is recommended to utilize the results of the graduate tracer surveys and the employer satisfaction surveys (the latter to be conducted in the future) to identify gaps between the human resources it seeks and the human resources it produces and reinforce weaknesses. Although these surveys are now under the responsibility of RP due to the restructuring, it would be effective for each school to conduct its own surveys in order to identify specific problems in individual IPRCs and formulate countermeasures.
- (6) If IPRC Tumba is to achieve its vision of becoming a CoE in technical education in the East Africa region, they are recommended to resume the preparatory work (case studies and benchmarking of other CoEs in the country and in the region, and the development of concepts and proposals to RP based on these) that was suspended due to the COVID-19 pandemic to functionalize the CoE designated by the EAC.

#### 4.2.2 Recommendations to JICA

JICA is recommended to provide support in the field of science and technology and higher education in a way that involves IPRC Tumba (through the effective use of human resources such as trained staff and graduates). This ex-post evaluation was able to confirm that this project functions as a component of the program approach ("Program for Promotion of Human Resources Development in Education and Industry" and "Program for Promotion of STI") and generates synergistic effects with other JICA projects. However,

the discussion was limited to those centered around TCT, and it was not possible to gain a comprehensive understanding of the interrelationships amongst the many related projects. It would be possible to further increase effectiveness by updating the big picture of the interrelationships within and among these programs, which are organized under JICA, in line with the development issues of Rwanda, to match the current situation of JICA's assistance and organize the particularly effective instances of coordination. The ex-post evaluation suggests that the support for technological innovation and equipment upgrades in the three departments targeted by this project as well as the incubation support (either direct support to IPRC Tumba or through the acquisition of links to other JICA projects, such as that for the ICT Innovation Ecosystem Strengthening Project) should allow IPRC Tumba to further utilize the capacity and human resources built by this project and achieve the goals of the mentioned JICA programs.

#### 4.3 Lessons Learned

##### (1) Good practices for ensuring the sustainability of a new institution

This project was to support the establishment of TCT, which was set up by the Rwandan government, from almost the very beginning, including its operating basis, course management, industry-academia collaboration, etc. Factor that made this project distinctive include the consistent support provided over the long-term by a team of high-quality experts (i.e., with specialized knowledge and skills, good information gathering, networking, and communication skills, and extensive experience in technical cooperation), the flexibility to adapt to the changing policies and needs of the Rwandan side and to provide the support needed, and the gradual shift in the ownership of activities to the Rwandan side. This has ensured not only high effectiveness and impacts, but also sustainability.

##### (2) Contributions of cross-scheme networks to maximize development impact in a small country

In Rwanda, JICA support in the fields of science and technology and higher education under multiple schemes (technical cooperation projects, individual experts, grant aid, grassroots technical cooperation projects, and long-term training), including this project, have resulted in the formation of human networks on both the Japanese and Rwandan sides, which were used effectively for all of the projects. This has allowed the networks to maintain some sort of connection to JICA even after the completion of the projects and has led to opportunities for new activities (short training, graduate employment, participation in other JICA projects, etc.). It is considered effective, when cooperating with a small country with limited resources, for the government, implementing agencies, JICA office, and expert (consultant) teams to think proactively about utilizing individual project outputs across

projects, and to consider this utilization from the planning stage.

### (3) Ensuring sustainability of the training system implemented

Training based on the annual training plan introduced in Phase 1 was not continued after the completion of the project. The IPRC explained that having come under the RP umbrella, it was no longer possible to maintain the previous system. However, it is also possible that the training provided as a part of the JICA project was recognized to be ad hoc or only to be provided while JICA assistance was available. If training is to be implemented not just under the JICA project but as an engrained system, fully sharing the purpose of the training with the implementing agency and establishing the training as an official system within the period of cooperation, is likely to be effective.

## **5. Non-Score Criteria**

### 5.1. Performance

#### 5.1.1 Objective Perspective

It can be said that JICA played its role as an agency involved in the project successfully and was able to contribute to the results. It is commendable that JICA was able to respond to the Rwandan side's requests and establish a high-quality team of experts, and that it was able, in Phase 2, not only to enhance TCT operations, but also to have effects on other TVET institutions through the sharing of good practices. In addition, the JICA Rwanda Office participated in development partner meetings in the TVET sector, reporting on the progress of the project and coordinating with other partners to ensure that there was no duplication of support, which enhanced the coherence of this project<sup>33</sup>.

The supervision system of JICA was also appropriate in light of changes in the project environment. As discussed in "3.1.1 Relevance," the coordination of activities with regards to the policy priorities of the Rwandan side, TVET sector reorganization, and the transition to the RP/IPRC structure, is thought to have led to the high sustainability of the project effect through high ownership by the Rwandan side.

The maintenance of communication and cooperation with the implementing agency is also considered positive. This aspect of JICA's involvement in the project garnered positive comments from both IPRC Tumba and the Ministry of Education. According to the Phase 2 mid-term review, the shift from direct training as the center of capacity development activities, as in Phase 1, to RDPU activities, had caused some frustration amongst the Rwandan counterpart personnel. After thorough discussion involving both parties, the two

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<sup>33</sup> Furthermore, from 2019 until the time of the ex-post evaluation, the JICA Rwanda Office and the principal of IPRC Tumba have co-chaired the Research and Innovation Task Force of the TVET Sub-Sector Working Group.



sides were able to come to a compromise (resuming some aspects of the original training program and deciding on the content of the training program while respecting the Rwandan side's needs and also discussing how the content fit into the training objectives) and restore the trust relationship. It should also be noted that the principal of TCT at the time (now an official in the Ministry of Education) commented that, although sufficient discussions had been held regarding training, he wished the Rwandan side had been able to participate in the discussion on resource allocation (what percentage of the project cost would be used to purchase equipment, etc.).

## 5.2. Additionality

The added value of this project is that it supported the set-up and establishment of the first higher education level TVET institution in Rwanda from when it first opened. It is commendable that the project has produced this pioneering case study and that in doing so, it also utilized the outputs of TVET support provided by JICA in other countries.

Republic of Rwanda

FY2021 Ex-Post Evaluation Report of Grant Aid Project

“The Project for Development of Irrigation Scheme in Ngoma District”

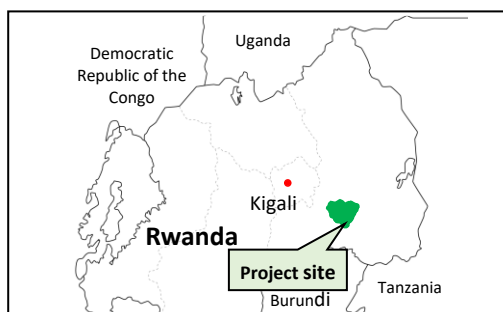
External Evaluator: Nomoto, Ayako,

International Development Center of Japan Inc.

## 0. Summary

The project aimed to promote efficient use of agricultural water and intensive agriculture by developing irrigation facilities in Rurenge and Remera Sectors, Ngoma District, Eastern Province, and thereby contribute to improving agricultural productivity. The project was consistent with the development plan and needs of the Republic of Rwanda both at the time of planning and ex-post evaluation, and its relevance can be confirmed. The project was consistent with Japan’s ODA policy for Rwanda. Although it was not envisaged at the time of planning, it was consistent with other projects of the Japan International Cooperation Agency (JICA) and with other development partners. Therefore, the relevance and coherence are high. The project produced outputs almost as planned, and although the project cost and project period slightly exceeded the plan, the efficiency of the project is high. Among the expected effects, the irrigated area was in line with the plan, and the time required for irrigation was also improved; however, the total planted area did not reach the target value. On the other hand, the expected impact, such as an increase in agricultural gross income, was achieved by shifting to more profitable crops; however, the impact of the chia seed, which does not use irrigation water, was significant. Therefore, the effectiveness and impact of the project are moderately low. The operation and maintenance of the project facilities has some minor problems in institutional/organization and financial aspects as well as the status of operation and maintenance; however, they are expected to be improved/solved, and therefore, the sustainability of the project effects is high. In light of the above, the project is evaluated to be satisfactory.

## 1. Project Description



Project Location<sup>1</sup>



Hillside farmland surrounding marshland<sup>2</sup>

<sup>1</sup> Source: 3kaku-K

<sup>2</sup> Taken by the external evaluator

## 1.1 Background

Agriculture and rural development were key industry sectors driving Rwanda's economic development and poverty reduction. Rwanda's *Strategic Plan for Agricultural Transformation (2013-2017)* (hereinafter referred to as "SPAT III") aimed to reduce poverty, improve nutrition, and shift from subsistence to knowledge-intensive agriculture, and positioned the promotion of irrigated agriculture as a key issue, with irrigation development as one of the subprograms.

Meanwhile, most of the land in Rwanda is hilly and suffers from low agricultural productivity and food shortages due to soil erosion and degradation during the rainy season and inadequate irrigation systems on hillside land. Therefore, to effectively implement SPAT III, the Government of Rwanda developed the "Land-husbandry, Water-harvesting, and Hillside-irrigation Project" (hereinafter referred to as "LWH") to improve agricultural production and sustainable growth and to commercialize and diversify agricultural products in a market-oriented manner. The Ministry of Agriculture and Animal Resources, the then implementing agency of LWH, planned to construct about 100 agricultural reservoirs and develop 10,000 ha of irrigation areas under the plan.

Against this background, the Government of Rwanda requested Japan a grant aid project for constructing a reservoir and irrigation facilities based on the LWH.

The Ngoma 22, a site of the project, consists of 265 ha of hillside farmland and 35 ha of marshland paddy field. The farmers there irrigated their fields only by drawing water from small canals flowing through the marshland and spring water scattered at the foot of the mountains and mainly cultivated maize and beans with rainwater for subsistence. Rice cultivation was carried out in the marshland paddy field; however, there were only earthen channels using small rivers, and facilities such as gates and diversion works for water intake and diversion had not yet been developed.

## 1.2 Project Outline

The objective of this project is to promote the efficient use of agricultural water and intensive agriculture by constructing irrigation facilities in Rurenge Sector and Remera Sector, Ngoma District, Eastern Province, thereby contributing to the improvement of agricultural productivity.

Grant Limit / Actual Grant Amount	1,549 million yen / 1,548 million yen
Exchange of Notes Date /Grant Agreement Date	August 2014 / September 2014
Executing Agency(ies)	(Initially) Ministry of Agriculture and Animal Resources (At the time of ex-post evaluation) Rwanda Agriculture and Animal Resources Development Board
Project Completion	November 2016
Target Area	Nine villages in Rurenge and Remera Sectors, Ngoma District, Eastern Province (Site Name: Ngoma 22)
Main Contractor(s)	Konoike Construction Co., Ltd.
Main Consultant(s)	Sanyu Consultants Inc.
Preparatory Survey	August 2013 – May 2014
Related Projects	[Technical Cooperation] “Smallholder market oriented agriculture project” (October 2014 – June 2021) “Project for Water Management and Capacity Building” (April 2019 – March 2025)

## 2. Outline of the Evaluation Study

### 2.1 External Evaluator

Nomoto, Ayako, International Development Center of Japan Inc.

### 2.2 Duration of Evaluation Study

This ex-post evaluation study was conducted with the following schedule.

Duration of the Study: October 2021 – December 2022

Duration of the Field Study: February 16, 2022 – March 9, 2022, May 25, 2022 – May 30, 2022

### 2.3 Constraints during the Evaluation Study

Some of the indicators to measure the quantitative effects and impacts of the project were only analyzed qualitatively because the executing agency did not capture their definitions or collect

data.

### **3. Results of the Evaluation (Overall Rating: B<sup>3</sup>)**

#### 3.1 Relevance/Coherence (Rating: ③<sup>4</sup>)

##### 3.1.1 Relevance (Rating: ③)

###### 3.1.1.1 Consistency with the Development Plan of the Republic of Rwanda

The project has been consistent with the development plan of the Government of Rwanda for developing productive agriculture and irrigation infrastructure both at the time of planning and the ex-post evaluation.

At the time of planning, Rwanda's long-term national development plan, *VISION 2020*, planned to promote agriculture based on high productivity, high-value addition, and market needs. In addition, SPAT III (2013-2017) identified the promotion of irrigated agriculture as a key issue, with the goals of poverty reduction, improved nutrition, and a shift from subsistence agriculture to higher value-added agriculture. To effectively implement SPAT III, the Government of Rwanda developed the LWH, which is a program that aims to improve agricultural production, achieve sustainable growth, and commercialize and diversify agricultural products in a market-oriented manner. This project was requested based on the LWH.

At the time of ex-post evaluation, *VISION 2050*, the successor policy to *VISION 2020*, plans to promote market-led, high-tech, irrigation-maximizing agriculture. The *Strategic Plan for Agriculture Transformation 2018-24* (hereafter referred to as "PSTA 4"), the successor policy to SPAT III described above, continues to transform from subsistence agriculture to a knowledge-based, value-creating sector that contributes to the national economy and ensures food and nutrition security. The policy's Priority Area 2: Productivity and Resilience focuses on promoting sustainable and resilient production systems for crops and aims to increase the irrigated area from 48,508 ha to 102,284 ha with focused investments in improving land productivity. Rwanda Agriculture and Animal Resources Development Board (hereinafter referred to as "RAB"), the executing agency, has developed the *RAB Strategic Plan (2020-2024)* based on PSTA 4 above. Promoting sustainable and resilient agricultural production systems is one of the pillars of this plan's strategy, including focused investments in land productivity enhancement and irrigation infrastructure development.

###### 3.1.1.2 Consistency with the Development Needs of the Republic of Rwanda

The project has been consistent with the development needs for irrigation development and productivity improvement both at the time of planning and ex-post evaluation.

At the time of planning, agriculture in Rwanda accounted for about 30% of GDP, approximately

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<sup>3</sup> A: Highly satisfactory, B: Satisfactory, C: Partially satisfactory, D: Unsatisfactory

<sup>4</sup> ④: Very High, ③: High, ②: Moderately Low, ①: Low

80% of the population was engaged in agriculture, and the agriculture industry was growing at about 5%. However, the arable land is small, and most are hilly, so irrigation development had not progressed, and productivity and profitability were low. In Ngoma District, Eastern Province, which includes the project site, rainwater was not effectively used for irrigation, and the crop yield was low. The farmers in the project site were small and had no room to expand their farmland, and the irrigation facilities had not been developed yet. However, it would have been beneficial to increase production by increasing yield.

At the time of ex-post evaluation, agriculture accounted for 24% of GDP (2021) and 67.8% of the working population (2020) and remained an important part of the economy. Rwanda's arable land area was small at 0.4 ha/household (2020), and as stated in the development policy, productivity improvement was a challenge. The arable land area in Ngoma District was also small at 0.5 ha/household (2020) and 69% of all farmers had less than 0.5 ha/household (2018). Furthermore, 78.9% of all farmers in the district grew maize (compared to the national average of 67.7%), and 88.6% grew beans (compared to the national average of 88.6%) and were dependent on traditional crops<sup>5</sup>. Thus, even at the time of ex-post evaluation, there is a need to increase productivity and shift to value-added crops.

### 3.1.2 Coherence (Rating: ②)

#### 3.1.2.1 Consistency with Japan's ODA Policy

At the time of planning, this project was in line with Japan's ODA policy. The *Country Assistance Policy for the Republic of Rwanda (April 2012)* positioned agricultural development (high value-adding and business development) as a priority area. The policy stated that, considering the current situation in which small-scale farming with little arable land was practiced, assistance covering all aspects from the field (production technology) to policy would be provided to make this sector an essential industry for promoting economic growth. The assistance included improving agricultural productivity through the development of food production infrastructure.

#### 3.1.2.2 Internal Coherence

The technical assistance "Project for Water Management and Capacity Building" (hereinafter referred to as "WAMCAB") (April 2019 - March 2024), which was not planned at the time of the ex-ante evaluation of this project; however, started after the project completion and synergies were observed.

WAMCAB has identified the project site as one of the areas to be supported and is working to strengthen the maintenance and management system of the developed irrigation facilities. After

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<sup>5</sup> Sources at the time of the ex-post evaluation: *Gross Domestic Product-2021* (National Institute of Statistics of Rwanda: NISR), *ILOSTAT, Agricultural Household survey Report 2020* (NISR), *Comprehensive Food Security & Vulnerability Analysis* (NISR et al.)

the completion of the construction of facilities under the project, there was a long period (2016-2018) when the irrigation facilities subject to maintenance and management could not be used due to the delay in the start of the utilization of the reservoir because of unfavorable weather conditions, and the Irrigation Water Users Organization (hereinafter referred to as “IWUO”)) did not function. WAMCAB restructured the IWUO, and at the time of the ex-post evaluation, the IWUO was operating and maintaining the irrigation facilities (as detailed in Section “3.3 Effectiveness and Impacts” and Section 3.4 “Sustainability”). The WAMCAB’s strengthening of IWUO capacity has generated synergies in terms of the effectiveness and impact of the project.

### 3.1.2.3 External Coherence

At the time of planning, the World Bank, the United States, and Canada supported the Government of Rwanda’s LWH from 2010 to 2015, which was consistent with the project implemented under the LWH. At the time of the ex-post evaluation, the “Sustainable Agriculture Intensification and Food Security Project” (hereinafter referred to as “SAIP”), a follow-on project to LWH, was being implemented with the support of the World Bank. SAIP aims to improve agricultural productivity, market access, and food security and continues to be highly consistent with the project. Further, there was coordination with the SAIP, including the implementation of the terracing of hillside farmland which was the responsibility of the Rwandan side. However, the implementation of the above works was not planned at the time. RAB also conducted land husbandry to protect the catchment of Ngoma 22.

Concerning the international framework, Goal 2: Zero Hunger of the Sustainable Development Goals (SDGs) states that “By 2030, ensure sustainable food production systems and implement resilient agricultural practices that increase productivity and production, that help maintain ecosystems, that strengthen capacity for adaptation to climate change, extreme weather, drought, flooding, and other disasters and that progressively improve land and soil quality.” Thus, the project is consistent with the SDGs.

From the above, regarding the relevance, the project is consistent with Rwanda’s development plan and development needs (irrigation development and productivity improvement). Regarding coherence, the project is consistent with Japan’s ODA policy, and internal coherence and external coherence are also found, although they were not planned at the planning stage. Therefore, its relevance and coherence are high.

## 3.2 Efficiency (Rating: ③)

### 3.2.1 Project Outputs

The outputs from the Japanese side of the project are mainly facility construction (reservoir, pumping station, main canals, secondary canal network, discharge tanks, regulating tanks,

drainage boxes, plot construction for paddy field), procurement of equipment (5 pumps, solar panels, hoses, etc.) and capacity building program (soft component). Figure 1 shows the location of the irrigation facilities developed under the project.

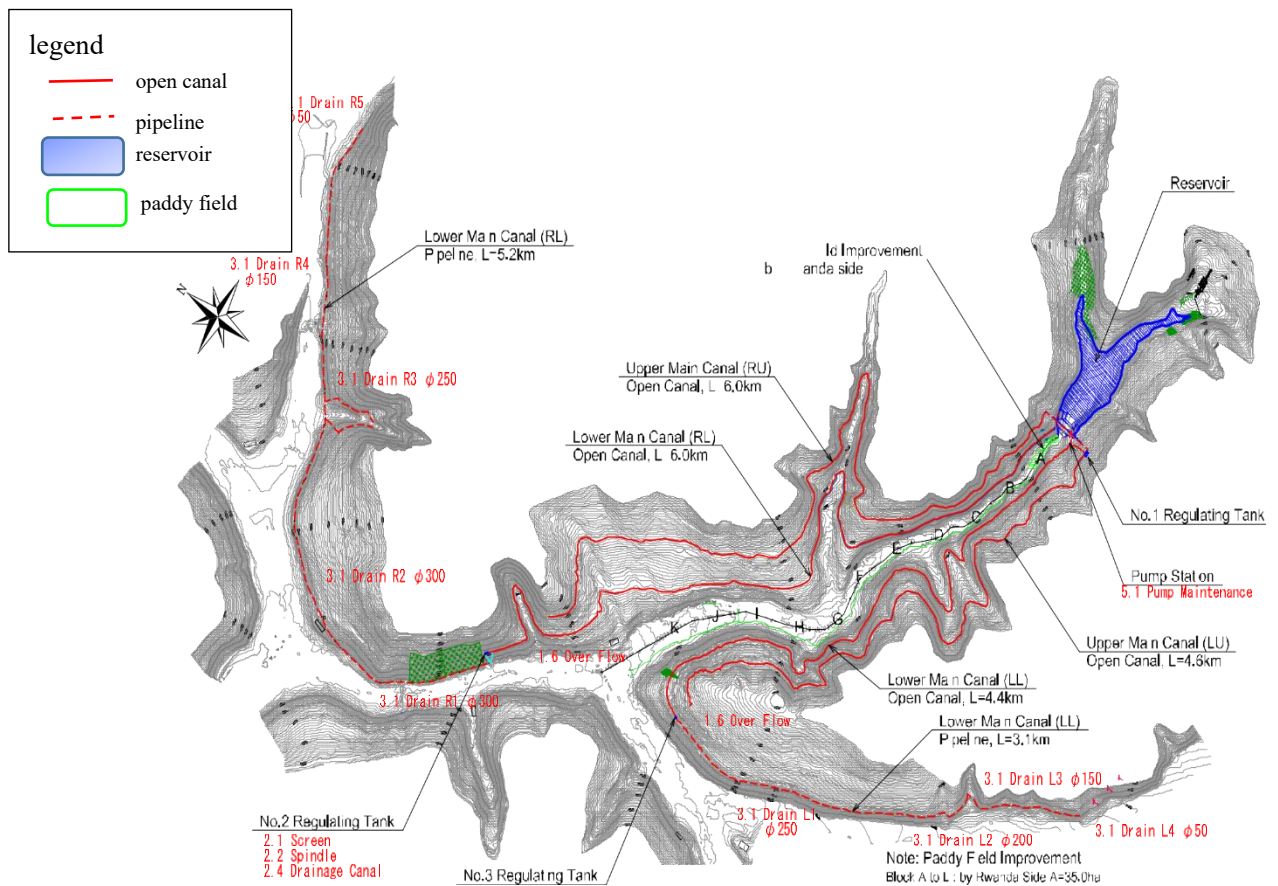


Figure 1 Location of irrigation facilities<sup>6</sup>

Irrigation facilities were constructed as shown in Table 1, and outputs were produced almost as planned. The Japanese side canceled the plot construction of the paddy field because the total project cost would exceed the grant amount due to the exchange rate fluctuation, and the Rwandan side bore the plot construction work. At the time of the defect inspection in July 2018, the completion of plot construction of the paddy field was confirmed. In addition, to implement the project within the maximum amount of the grant due to exchange rate fluctuations, it was decided to exclude heavy machinery for paddy field plot construction (tractors, levelers, ditch diggers), boats for dam maintenance, and other equipment not directly affecting the construction of irrigation facilities from the procured equipment. This change was unavoidable and appropriate.

<sup>6</sup> Compiled by the external evaluator from documents provided by JICA.



Table 1 Outputs (Japanese side)

Facility	Plan	Actual
1. Dam and reservoir	<ul style="list-style-type: none"> <li>• Storing capacity : 960,000m<sup>3</sup></li> <li>• Bank height : 14.9m</li> <li>• Dam type : Homogeneous fill dam</li> <li>• Spill way : RC type, Rectangular open canal</li> <li>• Discharge facilities for low water level: 1 set</li> <li>• Intake facilities on both banks: 1 set</li> <li>• Other ancillaries: 1 set</li> </ul>	As planned
2. Pump station	<ul style="list-style-type: none"> <li>• Pump house: RC type, Direct foundation</li> <li>• Pump equipment: Horizontal centrifugal pump (11kw×5 pumps)</li> <li>• Solar panel: 280W、24V、153 panels</li> </ul>	[Modification] Solar panel: 181 panels
3. Main irrigation canal (Open canal, Pipeline)	<ul style="list-style-type: none"> <li>• Open canal: Concrete lining, Length 18.7km</li> <li>• Pipeline: Length 8.1km</li> <li>• Diversion box, Drainage facilities: 1 set</li> </ul>	[Modification] <ul style="list-style-type: none"> <li>• Open canal: Length <b>21.0km</b></li> <li>• Pipeline: Length <b>8.3km</b></li> </ul>
4. Discharge tank	<ul style="list-style-type: none"> <li>• No.1 Discharge tank: 3.75m×2.0m</li> <li>• No.2 Discharge tank: 3.75m×2.0m</li> <li>• No.3 Discharge tank: 2.0m×2.0m</li> </ul>	As planned
5. Regulating tank	<ul style="list-style-type: none"> <li>• No.1 Regulating tank: RC type, Capacity 1,500m<sup>3</sup></li> <li>• No.2 Regulating tank: RC type, Capacity 330m<sup>3</sup></li> <li>• No.3 Regulating tank: RC type, Capacity 120m<sup>3</sup></li> </ul>	As planned
6. Drainage box	<ul style="list-style-type: none"> <li>• Drainage collection box: 185 boxes, Drainage canal</li> </ul>	[Modification] <ul style="list-style-type: none"> <li>• Drainage collection box: <b>219</b> boxes</li> </ul>
7. Secondary canal and on-farm facilities	<ul style="list-style-type: none"> <li>• Pipeline: Length 26.7km</li> <li>• Hydrant: 1 set</li> </ul>	[Modification] <ul style="list-style-type: none"> <li>• Pipeline: Length <b>26.2km</b></li> </ul>
8. Plot construction for existing paddy field	<ul style="list-style-type: none"> <li>• Plot construction: 1 set</li> <li>• Diversion box: 12 places</li> <li>• Irrigation canal/drain and O&amp;M road: 3.85km</li> </ul>	[Modification] <ul style="list-style-type: none"> <li>• Plot construction: Plot construction was canceled. Rwanda was to bear the cost of the work.</li> </ul>

Source: Materials provided by JICA

Under the soft component, activities (technology transfer) on “IWUO Operational Capacity Strengthening,” “Inland Aquaculture,” “Irrigation Facility Maintenance and Water Management,” “Farming Technology (Horticulture),” “Farming Technology (Paddy),” and

“Water Storage Test” were carried out to RAB staff, IWUO Executive Committee members, IWUO member representatives, District Irrigation Steering Committee (hereinafter referred to as “DISC”), Sector agronomists, and others as planned. The post-training tests and questionnaires on training materials and understanding showed that the training was well understood and outputs were achieved.

As for the Rwanda side’s outputs, the plot construction of the paddy field and terracing works of hillside farmland had already been implemented at the time of the ex-post evaluation; however, the safety fence had not yet been implemented. According to the executing agency, they plan to apply for the budget in the new fiscal year (from July 2022).

### 3.2.2 Project Inputs

#### 3.2.2.1 Project Cost

Table 2 shows the planned and actual project costs. While the planned project cost for the Japanese side was 1,549 million yen, the actual cost was 1,548 million yen (195 million yen for design and construction supervision and 1,353 million yen for the construction work), which was 100% of the planned cost and within the plan. The project cost on the Rwandan side was scheduled to be approximately 60 million yen; however, the actual cost was 144 million yen. The actual cost on the Rwandan side significantly exceeded the plan due to securing land, compensation for residents, terracing of hillside farmland, and plot construction of the paddy field that was changed from the Japanese side to the Rwandan side.

The total project cost for the Japanese and Rwandan sides was 105% of the plan, which slightly exceeded the plan.

Table 2 Project cost

	Plan	Actual	Ratio against the plan
Japanese side	1,549 million yen	1,548 million yen	100%
Rwandan side	Approx. 60 million yen	144 million yen	240%.
Total	Approx. 1,609 million yen	1,692 million yen	105%.

Source: Documents provided by JICA for planned and actual figures for the Japanese side. The actual figure for the Rwandan side was provided by the executing agency.

Note: Actual project cost of the Rwandan side was 940 million Rwanda francs (Rwf), converted to yen using the 2014-2016 average IFS rate.

### 3.2.2.2 Project Period

While the project period was planned to be 23 months (including the detailed design and bidding period), the actual project period was 27 months, slightly exceeding the plan (117% of the plan). The project period exceeded the plan mainly due to the following reasons. (1) The detailed design required a review of the project components, which took time to coordinate with the executing agency, resulting in a one-month delay in the bidding period from the original plan and a one-month delay in the completion accordingly. (2) As a result of checking the geological conditions beneath the dam, the thickness of the defective soil was thicker and broader than initially expected; it was found to be necessary to excavate the defective soil and replace it with good-quality soil. As a result, the work schedule was reviewed, and a three-month extension was necessary.

Therefore, efficiency of the project is high.



Solar panels for pump operation



Pumps



Reservoir

## 3.3 Effectiveness and Impacts<sup>7</sup> (Rating: ②)

### 3.3.1 Effectiveness

#### 3.3.1.1 Quantitative Effects (Operation and Effect Indicators)

“Irrigated area (hillside farmland),” “Planted area (hillside farmland),” and “Irrigation time savings for paddy cultivation” were set as the operation and effect indicators of the project. Of these, “Irrigated area (hillside farmland),” as the operation indicator, was achieved in the project completion year of 2016.

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<sup>7</sup> When providing the sub-rating, Effectiveness and Impacts are to be considered together.

Table 3 Operation Indicator

	Baseline value	Target value	Actual value		
	2013	2019	2016	Revised target year 2020	Year of the ex-post evaluation 2021
		3 Years After Completion	Completion Year	4 Years After Completion	5 Years After Completion
Indicator 1 Irrigated Area of hillside farmland (ha)	26	265	265	265	265

Source: documents provided by JICA (target value), documents provided by the executing agency (actual values)

The effect indicator, “Planted area (hillside farmland),” is shown in Table 4. It was assumed that it would take one year from the completion of dam construction to water storage and start of the operation; that is, the target year for operation and effective indicators was set as “three years after project completion.” However, due to the unforeseen weather condition that the precipitation in 2016 was lower than the most severe drought year in the past 30 years, the minimum water level of the reservoir was not reached, and the reservoir was put into operation two years after the completion of the dam construction (in July 2018). Therefore, the target year was set to 2020, one year later than the planned 2019, three years after the completion of the project.

The total planted area did not meet the target value in the revised target years 2020 and 2021 (51% and 65% of planned); however, the area planted in 2022 was 89% of the target. In Rwanda, cropping is carried out in three seasons: Season A (August to January), Season B (February to May), which are rainy seasons, and Season C (June to August), the dry season. The implementation of the project has made it possible to plant crops in Season C (dry season), even in hillside farmland; however, the increase in the planted area has been limited to a certain extent. On the other hand, as described in “3.3.1.2 Qualitative Effects,” in Seasons A and B (rainy season), there has been a shift from conventional crops such as maize and beans to a new crop, chia seed. The area planted with chia seed increased significantly in Seasons A and B to a total of 195 ha in 2021 and 317 ha in 2022, which greatly impacted the increase in area planted in 2022.

There are two main reasons why the total planted area did not reach the plan in 2020 and 2021. Firstly, pipelines after the No. 2 and No. 3 regulating tanks had not been functioning due to blockages caused by the inflow of grass and trees of unexpected size and sediment. As a result, 60 to 100 ha of the pipeline area has not been planted in Season C (dry season). RAB identified a blockage in pipelines in the spring of 2020. However, according to the interviews at the site

(WAMCAB staff, IWUO, and farmers<sup>8</sup>), the pipelines have not been used since the completion of the project, and there was no communication among the parties concerned (RAB, IWUO, DISC, etc.) regarding the situation. Nonetheless, in May 2022, based on the construction supervision by the project consultant, the local contractor carried out the installation of screens on the regulating tanks to prevent the inflow of sediment and foreign materials from the regulating tanks to the main pipelines and the installation of flushing functions (9 places) on the main pipelines. As a result, it is expected that the pipelines will be reopened to water and that crop planting will occur. Secondly, planting new crops in Season C (dry season) has not progressed. At the time of planning, from the viewpoint of marketability, productivity, and food security, it was planned to plant traditional crops such as maize and beans in Seasons A and B (rainy season) and to plant new crops such as vegetables in Season C (dry season). The new vegetable crops were to be grown in the hillside farmland; however, the barriers for farmers to change from staple crops to new crops are high as it requires knowledge and funds. It is taking time to expand the area for new crops. The executing agency, RAB, will continue to guide farmers.

According to RAB and farmers, the impact of COVID-19 has been minimal. According to RAB, the government has allowed farmers to continue their activities during the lockdown period. However, restrictions on the movement of goods and services have restricted access to markets, resulting in a slight impact on the area planted.

Table 4 Effect Indicators

	Baseline value	Target value	Actual value		
	2013	2019	Revised target year 2020	Year of the ex-post evaluation 2021	Year of the ex-post evaluation 2022
		3 Years After Completion	4 Years After Completion	5 Years After Completion	6 Years After Completion
Indicator 1 Planted area of hillside farmland (ha)	99	610	312	398	542
(Breakdown)					
Season A	—	—	89	165	291
Season B	—	—	115	170	235
Season C	—	—	108	63	17

<sup>8</sup> A qualitative survey of farmers: A total of 35 farmers (18 males and 17 females) (average farmland size 0.7 ha) from (1) Rurenge Sector hillside farmers, (2) Rurenge Sector marshland rice farmers, (3) Remera Sector hillside farmers, (4) Remera Sector marshland rice farmers and (5) Remera Sector hillside farmers (land subject to pipelines) were interviewed on the effectiveness and impact of the project.

Source: documents provided by JICA (target value), documents provided by the executing agency (actual values)

Note: In 2022, Season A is August 2021 - January 2022, Season B is February - May 2022, and Season C is June - August 2022.

In addition, “Irrigation time savings for paddy cultivation (man-day/ha)” is listed in the ex-ante evaluation sheet as an indicator. However, this indicator could not be obtained because the executing agency did not have a system to collect and monitor the indicator and did not measure the data accordingly. Interviews with marshland rice farmers confirmed the reduction of labor hours. They no longer have to wait for water because water is now distributed according to a timetable. Besides, they had to wait for water for eight hours before the project was implemented, but now it takes less than 30 minutes to irrigate one plot (4 ares).

### 3.3.1.2 Qualitative Effects (Other Effects)

#### (1) Change of crop

The project was expected to shift to more profitable crops in the hillside farmland. In the hillside farmland, traditional crops such as maize and beans had been grown under rainfed conditions. However, after the implementation of the project, vegetables (cabbage, tomato, carrot, red pepper, etc.) and fruits were grown during season C, which is the dry season.

Especially profitable chia seeds have been introduced in recent years. Of the approximately 1,068 members of the target IWUOs, 323 had introduced chia seeds at the time of the ex-post evaluation. The area planted with chia seeds increased significantly from 15 ha in 2020 (season B only) to 195 ha in 2021 and 317 ha in 2022 (seasons A and B combined), indicating a significant change in cropping patterns. Chia seed is grown in the rainy season (seasons A and B) and can be grown without irrigation water; however, the contract with a buyer requires the land to be irrigated (since insufficient water at the time of sowing and transplanting may delay growth). The irrigation facility development by the project was the trigger for the change of crop type.

#### (2) Strengthening of Irrigation Water Users Organization (IWUO)

As a result of the soft component, it was expected that IWUO would be operated sustainably and soundly after the completion of the project. As a result, RAB, Ngoma DISC, and other concerned agencies would steadily play their roles to sustainably maintain the facilities developed under the project. Irrigation at the right time and amount to meet the demands of IWUO members was expected. Further, it was expected that 100% of the water use fees would be collected and the funds would be used for maintenance.

However, the qualitative effect in terms of strengthening IWUO was limited. At Ngoma 22, the project site, IWUO did not exist before the implementation of the project. Although the soft component of the project supported the establishment of IWUO, interviews with RAB and

farmers indicated that after the completion of the project, until April 2019, when WAMCAB, a technical cooperation project, started working at the site, IWUO was not functioning. Due to the delay in the start of the utilization of irrigation water as described in “3.3.1.1 Quantitative Effects” and the significant time lag between the project completion and the start of irrigation, IWUO did not conduct proactive activities, such as regular cleaning and maintenance of the pipelines. The lack of functioning IWUO can be said to be a contributing factor to the blockage of the pipelines. As discussed in Section “3.4 Sustainability,” IWUO was operating at the time of the ex-post evaluation; however, this cannot be attributed to the effects of the soft components.

### (3) Strengthened farmer ownership of irrigation facilities

Farmers’ ownership of irrigation facilities was also observed. However, this fostering was also influenced by the WAMCAB and cannot be attributed to the project. The WAMCAB magnified the IWUO and organized the end-users into groups. The farmers now have a high sense of ownership because they plan and apply for water allocation from the bottom up, from the irrigation unit (consisting of five or six farmers), the water use team (composed of five or six irrigation units), and to the zone committees. Besides, they send representatives to the IWUO General Assembly. Ownership has also been further enhanced by members cleaning the main and secondary canals once a month or as needed as community work.

## 3.3.2 Impacts

### 3.3.2.1 Intended Impacts

Among the effects assumed in the ex-ante evaluation sheet, “main crop unit yield,” “agricultural gross income,” “stabilization of residents’ living and livelihood, and cooperation between hillside farmers and paddy farmers” were classified as the impacts.

#### (1) Quantitative effects: main crop unit yield

Table 5 shows the yield of the main crops before and after the implementation of the project. The target values were almost achieved among the main crops except for carrots. As for carrots, few farmers are still planting carrots, and RAB will continue to encourage them to grow carrots which have high productivity. The average unit yield of chia seed is about 1.2 t/ha in the project area (Season A and Season B in 2021). Since the average unit yield of chia seed is 450-1,250 kg/ha<sup>9</sup>, it can be said that the unit yield of chia seed is relatively high in the project area.

As for paddy rice, interviews with farmers confirmed that they did not have enough water before the project was implemented, but now that they have enough water, their yield has increased.

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<sup>9</sup> Source: Data provided by the executing agency and <https://www.agrifarming.in/chia-seeds-cultivation-sabja-farming> (accessed on March 8, 2022)

Table 5 Main Crop Unit Yield

	Baseline value	Target value	Actual value		
	2013	2019	2016	Revised target year 2020	Year of the ex-post evaluation 2021
		3 Years After Completion	Completion Year	4 Years After Completion	5 Years After Completion
Indicator 1 Main Crop Unit Yield (kg/ha)					
1-1Paddy (% of target)	4,000 -	6,000 -	4,000 67%	5,300 88%	5,500 92%
1-2Maize (% of target)	2,000	5,000	0 0%	4,500 90%	5,000 100%
1-3 Carrot (% of target)	10,000	25,000	0 0%	14,000 56%	15,000 60%
1-4 Tomato (% of target)	10,000	20,000	0 0%	30,000 150%	31,500 157%
<Reference> Chia seed	-	-	-	600	1,240

Source: documents provided by the executing agency

Note: (i) maize: seasons A, B; (ii) carrots and tomatoes: seasons A and B in 2019, season C in 2020, 2021; (iii) chia seeds: season B in 2020, seasons A, B in 2021

## (2) Agricultural gross income

In the ex-ante evaluation sheet, the agricultural gross income per household (Rwf/year/household) was set as the quantitative effect; however, RAB did not collect this data. Nonetheless, almost all farmers interviewed indicated that the amount of gross income had increased compared to before the project was implemented.

The impact of chia seeds on improving agricultural gross income is significant especially, based on interviews with farmers. Although chia seeds do not use irrigated water, being on irrigated land is a prerequisite for contracts with the buyer. The farmers belong to KOTUNGO, an agricultural cooperative specializing in chia seeds (all members are IWUO members). Under the contract between the buyer and KOTUNGO, they jointly purchase seeds and ship the products, thereby increasing their cash income<sup>10</sup>. Rice is also jointly sent to the market through the rice cooperative that has existed for a long time, while other crops are consumed at home or sold privately.

<sup>10</sup> During the field visit under this ex-post evaluation study, no negative information was obtained from farmers, KOTUNGO, IWUO, Sector agronomists, WAMCAB, and RAB. Most of the farmers interviewed were satisfied with the gain from the chia seed. However, after the information collection, RAB told us that after the success in the first year, farmers registered economic losses due to unstructured market.



The farmers interviewed reported many positive impacts of increased agricultural gross income, including improved quality of life and increased investment in agriculture. All the farmers talked about how their increased cash income has enabled them to renovate their houses, buy motorcycles, pay for their children's education, and pay for medical health care. They have also been able to purchase livestock such as cattle and goats, purchase new farmland, hire people at cropping and harvest time, and make other agricultural investments. The ability to borrow money from banks has also contributed to the increase in agricultural investment. Belonging to agricultural cooperatives has enabled many farmers to have personal bank accounts, and as a result, they have been able to borrow money from banks.

Furthermore, it was reported that before the implementation of the project, vegetables were purchased from the market. However, they can cover their consumption now. And before the implementation of the project, there was malnutrition because vegetables could not be purchased. However, they can grow vegetables in season C now, so they are well-nourished after the implementation of the project.

### (3) Cooperation between different communities and between hillside farmers and marshland paddy farmers

As a qualitative effect, increased cooperation between the different communities (Rurenge and Remera sectors) and between hillside and paddy farmers was expected. According to interviews with farmers, information sharing has been achieved through participation in IWUO General Assembly and other activities, and trust between different sectors and marshland and hillside farmers was built.

### (4) Differences in benefits by beneficiaries

As mentioned above, chia seed is grown in seasons A and B and can be grown without irrigation water; however, the contract with the buyer is conditional on the land being irrigated. Since land under the pipelines that are not currently irrigated also meets this condition, farmers there also participated in the cultivation of chia seeds and their joint shipment at the farmers' cooperative. They were satisfied with the increase in gross income from chia seeds. However, although they were satisfied with the revenue from chia seeds, they considered it more desirable if they could plant the crops during season C (dry season), considering the needs for food security. They are not complaining as they are not paying for water but feel they are not enjoying the same benefits as the farmers under the open canals. However, it is expected that the measure to resume pipeline water supply (implemented in May 2022) will enable farmers in the pipeline areas to plant crops in Season C (dry season).

In addition, farmers who do not own much land have not been able to grow chia seeds because the contract for the chia seeds buyer requires the ownership of farmland over a certain area (0.5

ha). However, according to interviews with farmers, farmers who do not grow chia seeds are satisfied because they can now plant in Season C (dry season), and their gross income had increased compared to before the project was implemented. The agricultural cooperative encourages farmers with small holdings to receive the benefits of chia seeds through co-cropping.

### 3.3.2.2 Other Positive and Negative Impacts

#### (1) Impacts on the Natural Environment

The project does not fall under the large-scale category under the agricultural sector, and hydropower, dam and reservoir sector in *the Guidelines for Environmental and Social Considerations of the Japan International Cooperation Agency* (formulated in April 2004). The undesirable impacts on the environment were considered insignificant, and the project does not fall under the sensitive characteristics and areas listed in the said guidelines; therefore, the project was classified as Category B. RAB did not monitor the irrigation facilities during construction and in service as the negative impacts on the natural environment were considered low, and adverse impacts on the natural environment during the operation were minimum. According to interviews with RAB, IWUO, and farmers, there have been no adverse effects on noise, water quality, or water quantity during construction and after service.

#### (2) Resettlement and Land Acquisition

At the time of planning, it was assumed that the project would result in the acquisition of approximately 4 ha of private land and submergence of 22 ha in the marshland (state-owned land); however, no resettlement would occur. According to the executing agency, resettlement has not happened. The evaluator attempted to confirm the details of land acquisition and compensation for private land; however, the response was not obtained during this ex-post evaluation. According to the executing agency, adequate compensation was provided in accordance with Rwandan law. Some farmers used the submerged state-owned lands as paddy field informally, but according to Rwandan law, such cases were not compensated. However, the area of paddy field has recovered after the plot construction, and the paddy farmers who were allocated land due to the plot construction have not lost any land for cultivation. In addition, according to the IWUO president, the acquisition of land and submerged land has not caused any negative impact on the farmers.

#### (3) Gender Equality, Marginalized People, Social Systems and Norms, Human Well-being and Human Rights, and others

According to the farmers' interviews, the project positively impacted women. In the marshland rice farmers, women were put off getting water compared to men because of the limited amount of water before the project implementation; however, after the project completion, women have equal access to irrigation water because there is enough water. There are no conflicts over water

accordingly.

#### (4) Unintended Positive/Negative Impacts

The main canals of the project consist of a lower main canal that uses the dam weir level as it is and delivers water by gravity and an upper main canal that pumps the water and then forwards it by gravity. In this project, a solar system was installed as the primary power source for pump operation.<sup>11</sup> According to RAB, the solar system is installed in other irrigation schemes in their project (Small Scale Irrigation Project) because the electricity cost is low (irrigated area: about 800 ha).

Thus, among the expected effects, the irrigated area was as planned, and the time required for irrigation also improved. The total planted area reached 89% of the target in 2022 but did not reach the target in 2020 (target year) and 2021. This situation happened mainly because some irrigation facilities were not utilized due to the blockage of pipelines.

Meanwhile, the expected impact, such as an increase in agricultural gross income, was achieved by shifting to a more profitable crop, chia seed, for which irrigated land is a prerequisite for contracts with the buyer, and chia seeds contribute to an increase in agricultural gross income. It seems natural for farmers to choose chia seeds to increase their income. However, it is difficult to say that it is an appropriate use of irrigated land, although it is evaluated that the project has added the value of “irrigated land” for the site for chia seed production. The project’s negative social, environmental, and economic impacts are considered negligible.

In light of the above, the project has achieved its objectives only to a certain extent. Therefore, effectiveness and impacts of the project are moderately low.

### 3.4 Sustainability (Rating: ③)

#### 3.4.1 Policy and System

As mentioned in “3.1.1.1 Consistency with the Development Plan,” sustainability in terms of policy and system is ensured, as increased irrigated area, increased land productivity, and value-added agriculture are targeted in PSTA4 and the *RAB Strategic Plan*.

#### 3.4.2 Institutional/Organizational Aspect

##### (1) Irrigation Water Users Organization (IWUO)

The irrigation facilities developed under the project are operated by the Irrigation Water Users

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<sup>11</sup> Under the unique topographical conditions of Rwanda, where narrow river basins exist between hills, the topographical survey revealed that the area that could be irrigated only by gravity irrigation was significantly insufficient for planned purposes. The introduction of relatively inexpensive solar pumping systems (distributed in several locations) was planned. After a comparative study of the layout of pumping facilities, including solar pumps and power supply facilities, it was decided that the current integrated installation of a water storage pumping station (solar power generation plus commercial electricity) would enable a stable supply of irrigation water for a small monthly expense, and the project would quickly produce benefits and be highly sustainable, leading to the adoption of the system.

Organization (IWUO). The Government transferred the facilities to District which ensures right management by IWUO. With the support of WAMCAB, the technical cooperation project, the IWUO has been restructured and functioning as a water users' association with farmers in the project site (Ngoma 22) and a site called Mwamba. At the time of ex-post evaluation, about 1,800 households (including 1,068 households in Ngoma 22, the project site) were members of the IWUO. The Executive Committee (President, Finance Officer, and Infrastructure Officer), under the IWUO General Assembly, has functioned. In addition, Dispute Resolution Committee and Audit Committee have been formed, with committee members drawn from both marshland and hillside areas.

The General Assembly is held twice a year with representatives of 12 zones (5 from each zone), six zones each of hillside and marshland. The agenda of the General Assembly includes financial reports, IWUO rule changes, audit reports, and reports on maintenance and others. The paid staff consists of a pump operator, a manager, security guards, cleaners, and water distribution management.

#### (2) Rwanda Agriculture and Animal Resources Development Board (RAB)

The executing agency, RAB, has supported the IWUO through its headquarters and field office, Ngoma Station.

The Land Husbandry, Irrigation Innovation and Technology Transfer Department is in charge at the RAB headquarters. The Department has 52 staff members, three of whom are involved in the project: the Head of the Department, the Land Husbandry and Irrigation Innovation Specialist, and the IWUO Specialist. At the time of the project's completion, an IWUO Support Unit in RAB was responsible for establishing and operating IWUOs. However, it does not exist as a unit, and there is one IWUO specialist at the headquarters. This specialist supervises irrigation schemes across the country, checks their financial status and accounts, and coordinates them.

At the field level, at the time of the ex-post evaluation, the Ngoma Station supports the project. The station covers three districts, including Ngoma District. An electrical engineer, a small-scale irrigation engineer, and an agricultural officer will provide the necessary support for irrigation.

RAB has limited staff at both headquarters and Ngoma Station compared to the volume of work and cannot conduct regular follow-ups of the IWUO and project facilities; however, it is supposed to provide support when requested by the IWUO. RAB's undertakings are complemented by DISC, Sector agronomists, IWUO etc. As indicated in "3.3.1.1 Quantitative Effects," coordination issues have existed, and the IWUO has not immediately informed RAB of any problems with the facilities; however, these mechanisms are also expected to be improved through strengthening them through WAMCAB. According to RAB, they are also planning to increase the number of staff through reorganization.

### (3) District

In Rwanda, DISC coordinates all irrigation-related activities, approves irrigation facility repairs, etc. The sector agronomists, agricultural cooperatives, IWUOs, etc., attend the DISC meeting. DISC did not have meetings for the past two years due to COVID-19. However, DISC resumed in May 2022 and is expected to continue functioning.

Thus, sustainability of the institutional/organizational aspect is generally ensured. However, there are some issues, such as a shortage of personnel.

#### 3.4.3 Technical Aspect

The technical cooperation project, WAMCAB, which aims to “improve the irrigation management capacity of IWUOs,” is being implemented until 2025 and is expected to continue strengthening IWUOs’ operational capacity, maintenance capacity, and farming techniques. In addition to experts, WAMCAB hires a manager for the IWUO at Ngoma 22 to support the day-to-day management of the IWUO. WAMCAB will also provide technical guidance (on-the-job training) to the IWUO on current facility deficiencies, as discussed below.

RAB hires professional pump operator and water distribution superintendents and contracts a security company to provide security for irrigation facilities. Going forward, this should be catered by IWUO.

As for the solar system, the electrical engineer at the RAB Ngoma Station has expertise in solar systems and will be on hand to address any issues that arise.

Thus, capacity strengthening through the technical cooperation project has continued, and technological sustainability has generally been ensured.

#### 3.4.4 Financial Aspect

For IWUO, water use fees of about Rwf 7 million per year (Rwf 7.7 million in 2021) are collected and used for minor repairs of facilities, and other necessary maintenance costs are being paid. For marshland rice farmers and chia seed farmers, water use fees are automatically deducted from the sales proceeds paid to farmers by the agricultural cooperatives which ship the crops jointly. Thus, collection of water fees is assured. However, water use fees are not paid for crops that do not go through agricultural cooperatives, and there are about 215 farmers who have not paid the water use fees in season B of 2021. Raising awareness, capturing, and collecting fees is being conducted by IWUO and WAMCAB for these farmers.

As for IWUO’s paid staff, the manager is employed and paid by WAMCAB; from April 2022, IWUO will also pay part of the salary, and according to RAB, IWUO has the ability to pay the manager’s salary in the future. In addition, the wages of security guards (reservoirs, canals, etc.)

and cleaning personnel are paid by the IWUO.

RAB pays part of the costs for the operation and maintenance of the project facilities, including the cost of electricity<sup>12</sup> for pump operation, personnel costs for a pump operator and water distribution managers, and security costs (mainly contracting a security company to provide security for solar panels, pump facilities, etc.). According to RAB, fuel and personnel expenses for the past three years totaled approximately Rwf 402 million. In addition, over the past three years, about Rwf 94 million has been spent on purchasing spare parts such as valves, air vents, and hoses. In addition, RAB has a Government Funded Irrigation (GFI) budget, which is a source of funding for the repair of government irrigation facilities, and can be used to repair the project facilities as required.

Thus, financial sustainability is mostly ensured; however, there are some issues, as some water use fees have not been collected.

#### 3.4.5 Environmental and Social Aspect

No environmental or social concerns were identified at the time of the ex-post evaluation. Therefore, there are no sustainability risks in this aspect.

#### 3.4.6 Preventative Measures to Risks

No other sustainability risks were found.

#### 3.4.7 Status of Operation and Maintenance

As for daily maintenance, the regulating tanks, diversion boxes, drainage collection boxes, and solar panels are cleaned and maintained monthly by IWUO-paid staff and temporary workers. The open canals are cleaned twice a month during the dry season and once a week during the rainy season. Spare parts are managed and obtained by RAB.

As for the status of the facilities, in addition to the elimination of the blockage of the main pipeline as described in “3.3.1.1 Quantitative Effects,” the following problems were observed during the ex-post evaluation: (1) slope collapse due to erosion caused by sediment inflow and overflow from the open canals during heavy rain. (2) partial pump failure (although the primary power source is a solar panel, a problem with the soft starters that control the voltage when commercial power from the grid is used causes problems in the operation of one pump). RAB will apply for a budget for the new fiscal year (from July 2022), and RAB will purchase the soft starters and repair the slope collapse.

Other deficiencies, such as inadequate drainage at the end of open canals and partial blockage of secondary canals due to insufficient cleaning and difficulty in desludging, will be addressed by

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<sup>12</sup> After the field visit, RAB informed us the cost of electricity is now under the IWUO.

the IWUO with technical guidance and support from the WAMCAB.

As described above, the operation and maintenance status of the facilities was not satisfactory at the time of the ex-post evaluation; however, improvements are expected, and therefore, no problems were found.

Thus, slight issues have been observed in the institutional/organizational and financial aspects, including the current status of operation and maintenance; however, there are good prospects for improvement/resolution. Therefore, sustainability of the project effects is high.

## **4. Conclusion, Lessons Learned and Recommendations**

### 4.1 Conclusion

The project aimed to promote efficient use of agricultural water and intensive agriculture by developing irrigation facilities in Rurenge and Remera Sectors, Ngoma District, Eastern Province, and thereby contribute to improving agricultural productivity. The project was consistent with Rwanda's development plan and needs both at the time of planning and ex-post evaluation, and its relevance can be confirmed. The project was consistent with Japan's ODA policy for Rwanda. Although it was not envisaged at the time of planning, it was consistent with other projects of JICA and with other development partners. Therefore, the relevance and coherence are high. The project produced outputs almost as planned, and although the project cost and project period slightly exceeded the plan, the efficiency of the project is high. Among the expected effects, the irrigated area was in line with the plan, and the time required for irrigation was also improved; however, the total planted area did not reach the target value. On the other hand, the expected impact, such as an increase in agricultural gross income, was achieved by shifting to more profitable crops; however, the impact of the chia seed, which does not use irrigation water, was significant. Therefore, the effectiveness and impact of the project are moderately low. The operation and maintenance of the project facilities has some minor problems in terms of institutional/organization and financial aspects as well as the status of operation and maintenance; however, they are expected to be improved/solved, and therefore, the sustainability of the project effects is high. In light of the above, the project is evaluated to be satisfactory.

### 4.2 Recommendations

#### 4.2.1 Recommendations to the Executing Agency

##### (1) Responding to irrigation facility failures

At the time of the ex-post evaluation, some of the facilities and equipment, such as pump station equipment (e.g., soft starters) and slope collapses, were defective. It is recommended that RAB should allocate in the FY2022/2023 budget (from July) the amount necessary for these repairs

and take necessary measures. It is also recommended that the safety fence, which was to be installed upon project completion as an expense to be borne by Rwanda, be installed in the FY2022/2023 budget.

#### (2) Maximizing the use of agricultural land

The planted area has not reached the target, especially concerning Season C. It is expected that the area planted in season C will increase as a result of the pipeline rehabilitation. RAB should provide appropriate outreach and technical guidance to farmers to increase the planting of new crops and maximize land use.

#### 4.2.2 Recommendations to JICA

It is desirable to follow up on RAB response items and IWUO response items with WAMCAB support for the planned measures on the irrigation facility failures.

#### 4.3 Lessons Learned

##### The necessity of cooperation with technical cooperation projects during and after completion of the project and technical assistance after completion of the project

If the operation and maintenance organization (user organization) has not been established before the project implementation, short-term support through training by the soft component during the project implementation is not sufficient. Long-term support in cooperation with the technical cooperation project or longer-term soft component beyond the completion of facility construction is desirable.

In the project area, the IWUO was not yet established before the implementation of the project, so the members (farmers) did not have experience, knowledge, and skills in IWUO operation. In addition, it took time for the reservoir to reach the minimum water level due to unfavorable weather conditions. There was a gap between the project completion (November 2016) and the actual availability of irrigation functions (July 2018). IWUO was not able to experience the maintenance of the facilities during that time. As a result, the IWUO was not functional until WAMCAB, the technical cooperation project, was on site in 2019, and regular cleaning and maintenance were not performed, leading to sediment deposition and pipeline malfunction. At the time of the ex-post evaluation, the IWUO had significantly improved its operational and maintenance capacity with the help of WAMCAB. However, to ensure appropriate organizational operation and maintenance, the IWUO should be supported by the technical cooperation project at a more appropriate time, during or immediately after the completion of infrastructure development under the grant aid project. Or, it is necessary to implement longer-term soft components and provide long-term support.



### Need to set appropriate indicators

In the project, agricultural gross income and irrigation time savings were set as operation and effect indicators; however, the executing agency did not have a system to collect and monitor them. It is necessary to set indicators that can be collected regularly after thorough consultation with the executing agency. In addition, regarding the total planted area of hillside farmland, one of the operation and effect indicators, the planted area per season (rainy season and dry season), was not set. The effect of season C, which is considered to obtain the most significant benefits on the planted area of hillside farmland due to irrigation, could not be accurately observed. When setting the indicators, it is necessary to break down the area per season.

## **5. Non-Score Criteria**

### 5.1. Performance

#### 5.1.1 Objective Perspective

JICA played an essential role and provided necessary support to the executing agency by giving them technical advice and implementing the project transparently through regular technical and financial reports, etc. JICA Rwanda Office and headquarters visited the sites several times and communicated well with the executing agency.