

THE AICHI CANAL PROJECT
COOPERATION BETWEEN LAND IMPROVEMENT DISTRICT AND JAPAN WATER
AGENCY

LE PROJET DU CANAL AICHI
COOPÉRATION ENTRE LE DISTRICT D'AMÉLIORATION DE TERRAIN ET AGENCE DE
L'EAU JAPON

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ABSTRACT

A subsistence farmer who had suffered from chronic water shortage wrote a proposal of the Aichi Canal Project, Japan's first multipurpose development project to provide irrigation, urban water, and hydroelectric power. Based on the proposal, the Government conducted feasibility studies and sought the World Bank lending. The Government also established the Aichi Canal Public Corporation (current Japan Water Agency) to construct and operate the Project and authorized it to borrow money from the Bank with Government guarantee. Employing a foreign consulting company and engaging an irrigation engineer, Professor A.A. Bishop of Utah, the Corporation completed detailed engineering studies and construction on schedule. Farmers, on the other hand, organized themselves into the Aichi Canal Land Improvement District, the statutory cooperative for investment, operations and maintenance of irrigation canals. When the Project completed, however, the irrigation area had decreased due to rapid urbanization and the discouragement of the farmers who are anxious about the increased cost of each farmer as a result. Repayments had become far beyond the amount the farmers had been prepared for. Responding to the farmers' petition for reducing their burden, the local government found a solution by reallocating a part of water rights from irrigation to the urban sectors so that the latter would shoulder more costs. Following the solution of repayment problems, farmers in the region vied with each other to draw water to their farms so that they could evolve from subsistence to horticulture and floriculture. On the other hand, urbanization continued afterward, which increased the demand for potable and industrial water further. When the increased urban water required further construction of the intake facilities, regulating reservoirs etc., the concerned water users requested the 2nd phase project of the Corporation. Thanks to the Aichi Canal Project and its 2nd phase, the steel industry, the chemical industry, the auto industry etc. have thrived in the metropolitan Nagoya. Thus Aichi Prefecture has won the first place in the value of product shipments together with a leading position in agricultural

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outputs in Japan. After many twists and turns, Aichi Canal is going to celebrate its 50 years of operations next year. The improvement of people's livelihood and the development of the region are due to the zeal of all the people and organizations that took part in the Project.

SOMMAIRE ET CONCLUSION

Un agriculteur de subsistance qui avait été tourmenté par la pénurie d'eau composé d'une proposition de premier projet du Japon de développement à usages multiples pour fournir l'irrigation, l'eau en milieu urbain, et l'énergie hydroélectrique. Le gouvernement a accompli des études de faisabilité basé sur la proposition de l'agriculteur et a demandé le prêt de la Banque mondiale à importer des machines de construction nécessaires. La Banque a exigé une agence d'exécution avec la flexibilité financière pour se charger, et l'agence a fait son rôle de terminer le grand projet selon le calendrier prévu. Les agriculteurs se sont organisés en coopérative juridiquement contraignant visant à prendre en charge le système d'irrigation qui seront construits et de payer leur part du coût du projet en tranche. Lorsque la charge des agriculteurs escalade trop, le gouvernement local est intervenu pour réattribuer le droit de l'eau et des coûts entre les secteurs.

Une fois le projet achevé, l'agriculture de subsistance précédente évolué pour horticultures et floricultures avec l'accès facile à l'eau. Les horticulteurs ont exigé le plan d'irrigation flexible. Avec la provision d'eau d'adequet, l'industrie de transformation avait développé de manière significative, et la région avait été extrêmement urbanisé. Donc la demande pour l'eau potable et l'eau industrielle a augmenté de manière significative. Lorsque le système de canal est venu le besoin de rénovation pour répondre aux changements socio-économiques, l'agence a conduit les acteurs pour mener à bien la deuxième phase du projet. C'est ainsi que Aichi Canal fêtera son 50e anniversaire.

Comme évoqué précédemment, la clé dans le succès du projet Canal Aichi a été la bonne collaboration entre la communauté internationale, le gouvernement central, des gouvernement local, les bénéficiaires et l'agence d'exécution à chaque étape de la planification, la construction, l'exploitation, la maintenance, et le réhabilitation.

1. THE AICHI CANAL PROJECT

The idea of the Aichi Canal Project originated from a proposal by a farmer in the Chita Peninsula, where water shortage had tormented subsistence farmers. He met a local agriculture school teacher who, being moved by his aspiring spirits, surveyed the region to formulate the blueprint of the Project. They explained the blueprint of the Project to local farmers to get their support to organizing an association to promote the project and to petition the local and central government to adopt their plan. "Increasing food production and multipurpose development, that's good, isn't it?" The then Prime Minister, Shigeru Yoshida approved the proposal, which made the Government finally start Japan's first multipurpose development project.

2. PROJECT IMPLEMENTATION

In October 1951, the Ministry of Agriculture and Forestry opened an office in the area for feasibility studies of irrigation projects. The office spent for the feasibility studies on Aichi Project five years and 131 million yen in total, which exceeded 15% of the Ministry's study budget of the same years. Especially, the budget in FY1955 for Aichi Canal accounted for 30% of the Ministry's annual study budget. Based on the studies, the office proposed the Aichi Canal Project Master Plan including irrigation, potable water and industrial water, as well as hydro-electric power generation. The total project cost was equivalent to one-third of the annual public works budget in Japan at that time. Because of its huge budget, the project is still called as "one of the greatest projects in 20th century in Japan."

In 1952, thirty two thousand farmers who would benefit from Aichi Canal constituted the Aichi Canal Land Improvement District, which was the statutory cooperative of the benefited farmers for construction, operations and maintenance of agricultural infrastructures. Incidentally, the Government submitted an application for a loan of 254 million dollars to the World Bank (the International Bank for Reconstruction and Development) to meet the foreign currency needs in such sectors as the steel industry, power generation, and toll road construction. To the Aichi Canal Project, among them, about 14 million dollars was allocated mainly to import construction machines. After having received the application, the World Bank sent a delegation to conduct on-site surveys in July 1954 and held rounds of discussions with the Ministry of Agriculture and Forestry. As the implementation agency of the Project, the Aichi Canal Public Corporation was established on October 30, 1955, being authorized to borrow a Bank loan with government guarantee. Based on the Bank's suggestion, the Corporation employed a foreign consulting company to complete detailed engineering studies and engaged an irrigation engineer, Professor A.A. Bishop of Utah. The loan contracts being signed, the Corporation started construction works in November 1957. Despite the big size of the Aichi Canal covering Nagano, Gifu and Aichi Prefectures, the Corporation completed the construction of a dam, reservoirs, regulating ponds, intake facilities, main canals, lateral canals etc. in five fiscal years as being scheduled. The whole project completed in June 1961, and water distribution began on September 30 in the same year.

3. OUTLINE OF THE PROJECT

The goals of the Project were as follows:

- increasing food production and the improvement of livelihood of farmers through irrigation to the existing paddy, newly reclaimed paddy fields and uplands in the area of 30,675 hectares in Gifu and Aichi Prefectures,
- the improvement of people's standard of living by supplying potable water to the population of about 280 thousands,
- industrial development by supplying industrial water of about 21.8 million m³ per annum, and
- increasing power generation through the construction of a new power plant in conjunction with Makio

Dam, through the utilization of the untapped water resources in the Kiso River System.

Major construction works included a rock-fill type dam with 68 million m³ of effective storage capacity, regulating reservoirs, intake facilities with 30m³/sec of maximum intake volume, 112km of main canal, 1008km of lateral and tertiary canals, and 34,000kw of power generation. (The power generation project was consigned to an electric power company.)

4. OPERATIONS AND MAINTENANCE

It was determined by law that the Aichi Canal Public Corporation took charge of the operations and maintenance (O&M) of the completed facilities. The Corporation started O&M of the key facilities that required coordination among the irrigation, potable water and industrial water sectors. It also opened branch offices at the dam site, next to the intake facility and along the 112km of main canals with the O&M duties of 121 lateral irrigation canals being entrusted to the Aichi Canal Land Improvement District.

The District set up its five offices and organized member farmers into O&M units to which it allotted part of the O&M duties and tariff collection jobs. O&M units were formed in such a manner that each unit would cover a service area of 100 to 300 hectares along a single lateral canal. Their service areas were also adjusted to be within the territory of a single municipality. Under the O&M units, sub-units were also formed with a size ranging from 30 to 80 hectares. Their responsibilities are as follows:

- The District carries out major rehabilitation works of the entrusted canal systems. It also takes charge of O&M of high pressure pumping stations and a regulating reservoir. The District directly controls gates and weirs in the fourteen out of 121 lateral canal systems, which delivers water to two or more O&M units, up to the point beyond which a single O&M unit distributes water.
- O&M units operate other lateral canal systems up to the division weirs through which water flows to a single sub unit.

Water is distributed based on demand in such a way: the representative of each sub unit totals the water demands of their member farmers for the next week and reports it to the O&M unit. The water demand is summed up and relayed to the Corporation through the O&M unit and then the District. Based on these requests, the Corporation delivers water to the District effectively and functionally.

5. COST REPAYMENT

In the beginning, the beneficiary area of the Project was not confirmed by the following reasons.

- Many farmers did not commit themselves to the Project due to the inconclusive estimate of costs they would have to shoulder.
- The suburbs of Nagoya City were under rapid development when the Project started.

When the Project completed in 1961, the Aichi Canal Public Corporation confirmed 21,665 hectares as the

beneficiary area, which should have been more than 30 thousand hectares in the beginning. The Corporation tried to levy the prescribed share of the Project cost on the Aichi Canal Land Improvement District as one of its beneficiaries. The resulting cost allotted to farmers was 19.5%, and the annual redemption was 35.6 thousand yen per hectare: far beyond the amount for which farmers had been prepared.

The District immediately petitioned the central and local governments for the reduction of farmers' payment. Later in the same year, more detailed surveys by the District made it clear that the area should be revised again to 15,000 hectares. Responding to the petition and the survey, the Aichi Prefecture government decided to reallocate both water rights and costs from irrigation to the potable and industrial water sectors. Together with the three years of extension in the repayment schedule, the costs shouldered by farmers were reduced to 14.4% of the total Project cost: the finalized annual redemption of 24 thousand yen per hectare.

When the Aichi Canal Project completed, the tertiary canals and ditches up to farmers' fields had not been constructed yet. It was after when the cost allotment was settled that infrastructures for agricultural production in the region were improved remarkably thanks to the following reasons.

- Because irrigation services became satisfactory, member farmers became proactive in further investment.
- The District worked hard to extend tertiary canals in response to the strong requests from its members, because water was delivered to their proximity.
- Local and national governments promoted various land improvement programs, such as irrigation, drainage, land reclamation, land consolidation, soil exchange, and farm road construction.

6. DEVELOPMENT OF REGIONAL AGRICULTURE

After the Project, agriculture in the region has evolved from subsistence farming to vegetable and fruit horticultures and floricultures, together with stockbreeding being given the water necessary for efficient farming. Fruit production increased from 1.28 billion yen to 7.58 billion yen per annum, while flower production jumped up from 260 million yen to 7.55 billion yen. The gross agricultural product increased from 25.57 billion yen in FY1963 to 66.41 billion yen in FY2004. Consequently, Aichi Prefecture became one of the leading prefectures in agricultural outputs in Japan.

7. CHANGES IN SOCIAL AND ECONOMIC ENVIRONMENT

After the Aichi Canal began its operations on September 30, 1961, water use changed drastically in its beneficiary area. Annual water consumption rose from 143 billion m³ in FY1963 to 460 billion m³ in FY2005. The ratio of irrigation to urban water use was 65% to 35% in FY1963, but it became 23% to 77% in FY2005. The population served with tap water from Aichi Canal was about 200 thousand in 10 cities and 4 towns in FY1963. In FY2004, it became almost 1.26 million in 12 cities and 7 towns.

Industrial water is now supplied to about 80 plants, factories and offices in 6 cities and 3 towns and fulfills the water demand in the steel industry, the chemical industry, the auto industry etc. Besides, the area served with industrial water extends from Gifu Prefecture to the southern part of Nagoya City. The total value of product shipments from the Project reached 3.6 trillion yen in FY2004, compared with the figure of 32.59 billion yen in FY1963. Thus, Aichi Prefecture has also kept the first place in the value of product shipments among the 47 prefectures in Japan since 1977.

8. THE AICHI CANAL SECOND PHASE PROJECT

Once water was served, horticulturists and floriculturists soon came to demand more flexible irrigation schedules and less communal work for ditch maintenance etc., and so did the part-time farmers who gained permanent occupation in one of the rapidly developing industries, for they could farm only off-days/hours. Also, the need to increase the canal capacity became evident due to the escalated demand for potable and industrial water. Urbanization around the newly constructed open canals increased the inflow from there due to the originally unpredicted flood from residential areas, which often damaged thinly-lined canals, eroded unlined high cut-offs and left sedimentation in the canal bed. The strong request for consecutive intake of potable and industrial water from the canals prevented their regular maintenance, fundamental rehabilitation, and reinforcement with even the temporary halt of those water uses.

Under these circumstances, the Aichi Canal Second Phase Project was carried out from 1983 to 2004. The objectives and the major components of the project were as follows:

1. reconstruction of the main canals into double-way flumes with an increased capacity so that regular maintenance can be done while water is running through either way of the flume,
2. construction of regulating reservoirs in the middle and at the end of the main canals together with telemetric systems for improved water control,
3. reconstruction of lateral canals into pipelines for easier irrigation scheduling for farmers, and
4. construction of additional intake facilities and conveyance canals to meet the increased demand for potable and industrial water.

9. CONCLUSION

Aichi Canal is going to celebrate its 50th anniversary in 2011. The Project has changed the subsistence farming into highly profitable horticultures and floricultures. Water supplied by the Project contributed to the improvement of people's standard of living and the development of Nagoya City, one of the biggest industrial centers in Japan. The glorious successes are due all the strong, steady and consistent will of such farmers, residents, organizations, municipalities and local governments concerned that took part in the

Project. People and their communities in the Project area are deeply paying their respect to those pioneers of this feat, and try to pass on these contemporary heritage to the next generations.

REFERENCES

- Aichi Canal Public Corporation. 1961. Implementation Plan of the Aichi Canal Project. (Japanese)
- Aichi Canal Land Improvement District . 2002. 50 years of Aichi Canal Land Improvement District. (Japanese)
- International Bank for Reconstruction and Development. 1957. Report on Aichi Irrigation Project Japan.
- Ohsawa, Kenshu and Tatematsu, Isao. 2005. History and Features of Aichi Canal. Journal of the Japanese Society of Irrigation, Drainage and Reclamation Engineerings. Vol. 73 No.2 : 87-90. (Japanese)