

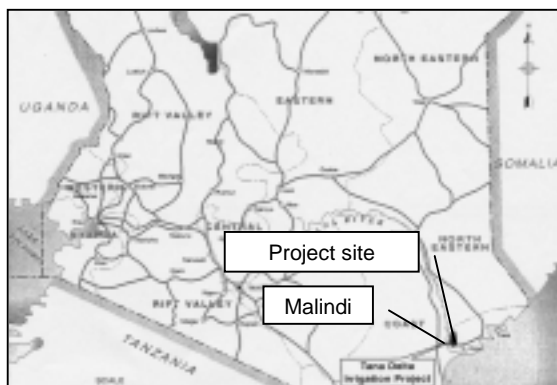
Kenya

Tana River Delta Irrigation Project (I)

Report date: March 2001

Field survey: August 2000

1. Project Profile and Japan's ODA Loan



Site Map: The Delta of the Lower Tana in the Republic of Kenya



Tana Delta Irrigation: The Head Works at Sailoni

1.1. Background

In Kenya, agriculture is the pillar of the country's economy, accounting for approximately 30% of GDP, 60% of income from exports (mainly coffee and tea) and 75% of the working population. Major agricultural products include coffee, tea, sisal hemp and other items, which are mainly produced by large-scale commercial farmers for export (cash crops), and maize (staple food), wheat, rice and other cereals, which are produced by peasants for daily consumption.

In accordance with the National Food Policy developed in 1981, the Kenyan government made efforts to increase the production of maize, wheat, rice and other main foodstuffs and attain self-sufficiency in terms of food the core of its development plans. In its Sixth Development Plan (1989-1993), the government positioned the development of irrigated agricultural land for the production of rice and other cereals as a priority policy, in addition to increasing agricultural productivity through the improvement of methods, creation of high-yield rice varieties, mechanization and other measures.

Although the principal food for Kenyans is maize, preference for rice has grown with changes in eating habits, mainly in urban areas. In 1989, an average of 43,000 tons of rice, or 2.5 kg per person, was consumed nationwide, and in four major cities, including Nairobi and Mombasa, rice consumption amounted to 10.3 kg per person. Of this volume, on a polished-rice basis, an annual average of 28,000 tons of rice, accounting for approximately 59% of the total consumption, was domestically produced with the remaining section covered by imports. The supply-demand gap

was projected to increase to 70,000-80,000 tons a year with rapid growth in the urban population, and the development of irrigated rice production was deemed to be an urgent task.

1.2. Objectives

The objective of the project was to effectively utilize the land and water resources in the delta of the lower Tana suitable for rice production to develop irrigated farmland, thereby increasing rice production to meet growth in consumption mainly in urban areas and contribute to greater import substitution and self-sufficiency. The project used the “estate system”¹, in which the executing agency introduced a mechanized culture system and managed all agricultural operations.

1.3. Project Scope

The ODA loan covered 85% of the total project cost. Specifically, it was allocated to procure materials/equipment and services required for the construction of irrigated farmland (total area: 2,180 ha; 1,840 ha for estates, 10 ha for experiment farmland, 80 ha for seedling farmland and 250 ha for farmland managed by existing peasants), as well as irrigation and farming facilities (such as staff members’ accommodations and rice-processing mills). It was also allocated to procure the majority of consulting services. Phase I (the northern section of the reclaimed land with an area of 2,180 ha) of Polder² 1, which has an irrigation area of 4,400 ha, was covered by the project. Plans called for Phase II (the southern section with an area of 2,220 ha) to be implemented on completion of Phase I.

The four programs described below will also be carried out under the project, which is positioned as a pilot project for the agricultural sector in Kenya.

(1.3.1.) Introduction of Large-scale Estate Management System

The Kenyan government already has experience in implementing large-scale irrigation projects e.g., the Moyan irrigation project, and in previous irrigation projects employed the tenant system in which land rights were granted to individual peasants. However, estate management system was introduced under the present project wherein the management and execution of all processes from production to harvesting to sales are conducted by the Tana Delta Irrigation Project Office

¹ The project adopted the estate system, a large-scale mechanized irrigated agriculture system, which is directly controlled by the Tana and Athi Rivers Development Authority (TARDA), a government-affiliated agency. The estate system is a form of agricultural management in which all agricultural development activities, including the development of agricultural infrastructure, production, quality control, marketing and sales, and administration, operation and maintenance, are managed and administered in a unified manner. Under the project, utilization and management of land (state-owned land) was fully entrusted to TARDA. One of the advantages of the estate system is that it enables highly efficient and profitable agricultural operations with small investment as compared to the peasant settlement system.

² Polder denotes reclaimed land.

(TDIPO). Irrigated rice production under this system is the first attempt of its kind to be made in Kenya.

(1.3.2.) Introduction of Agriculture Using Large-scale Mechanization Technology

Major agricultural work, including land cultivation, rice planting and harvesting, will be executed through the introduction of large agricultural machines rather than the former labor-intensive manner. Similarly, as part of the rice planting techniques, a less labor-intensive system of directly sowing seed in irrigated rice fields is being used for the first time.

(1.3.3.) Development of High-yield Rice Varieties Suitable for Coastal Regions

The project aims to develop unique high-yield rice varieties that suit the geographical and climatic conditions of the coastal regions in eastern Kenya where the Tana delta is located.

(1.3.4.) Double Cropping

Double cropping of rice is another objective of the project and another first in Kenya.

1.4. Borrower/Executing Agency

TARDA: Tana and Athi Rivers Development Authority /Same as left

1.5. Outline of Loan Agreement

Loan amount/Loan disbursed amount	¥6.031 billion/¥6.025 billion
Exchange of notes/Loan agreement	March 1990/March 1990
Terms and conditions	Interest rate: 2.5%, Repayment period (grace period): 30 years (10 years), General untied
Final disbursement date	December 1997

2. Results and Evaluation

2.1. Relevance

The project aims to increase rice production and reduce rice imports, thereby raising the ratio of self-sufficiency. A look at the changes in domestic rice production during the period from 1990 to 1998 shows that annual production remained as low as 40,000 tons or less with no marked fluctuations. Even today, improving rice production in Kenya is one of the priority issues for the agricultural sector, and the project continues to be relevant. Immediately after the project was completed, however, the site sustained enormous damage from floods caused by El Nino in 1997, and the initially intended effects failed to be delivered. The site was still under recovery at the time of evaluation.

Table 1 Rice Supply Balance in Kenya

(Unit: 1,000 tons)

	1990	1991	1992	1993	1994	1995	1996*	1997*	1998*
1. Unhulled rice production	59	60	58	51	60	60	60	55	55
2. Polished rice production	38	38	37	33	38	38	40	37	37
3. Rice imports	38	61	106	37	94	28	29	62	64
4. Rice exports	0	0	0	0	0	0	0	0	0
5. Total rice supply (2+3-4)	76	99	143	70	132	66	69	99	101
6. Self-sufficiency ratio (%) (2/5)	50	38	26	47	29	58	58	37	37

Source: JBIC materials. *However, figures for the period from 1996 to 1998 are those from FAO statistical data.

2.2. Efficiency

(2.2.1.) Project Cost

At the time of planning, the total project cost was ¥7.096 billion of which ¥6.031 billion, accounting for 85% of the total, was to be covered by ODA loan. The final disbursement was ¥6.025 billion, however.

(2.2.2.) Implementation Schedule

Initial plans called for the project to be completed in October 1996, but it was actually completed in December 1997, approximately 14 months behind schedule. The major reasons were (1) the need to partially reassess the designs of intake ports and other facilities, and (2) the undeveloped state of access road from Malindi.

(2.2.3.) Implementation Organization

In order to implement the project, TARDA set up a project office, called the “Tana Delta Irrigation Project Office (TDIPO),” under the direct control of its president to supervise construction and to administer and manage the estate after completion of the project. Independent authority was granted to the TDIPO in terms of personnel administration (except that of major executives), materials/service procurement, financial control and other operations.

2.3. Effectiveness

(2.3.1.) Effects on Irrigation Area and Rice Production

The project was completed in December 1997. However, because the site sustained enormous damage in the same month from floods caused by El Nino phenomenon, it was not possible to attain the planned levels of effectiveness in terms of irrigation area (1,840 ha) and rice yield (18,400 tons on an unhulled-rice basis and 12,000 tons on a polished-rice basis) (see Table 2 and Figures 1 and 2). In terms of irrigation area, however, targets had effectively been met in 1997, when work was completed. The effects of the project need to be reevaluated after the recovery work is

completed.

Table 2 Irrigation Area, Actual Irrigation Area and Rice Yield

	Plan (At appraisal)	1997 ⁽³⁾ (Project completion date)	1998 (2 nd year)	1999 (3 rd year)	2000 (4 th year)
Irrigation area ⁽¹⁾ (ha)	1,840	1,786	40	475	208
Actual irrigation area ⁽²⁾ (ha)					
(a) Rainy season (March to September)	n.a.	260	0	175	n.a.
(b) Dry season (October to February)	n.a.	620	40	300	n.a.
Rice yield (unhulled) (tons)	18,400	1,426	122	1,229	n.a.
Rice yield (polished) (tons)	12,000	720	7	573	n.a.

Source: TARDA materials

Notes:

- (1) The irrigation area refers to the irrigated areas in the section of farmland that is managed under the estate system. The total area of farmland covered by the project is 2,180 ha. At the time of planning, the breakdown of farmland was 1,840 ha for estates, 10 ha for experimental farmland, 80 ha for seedling farmland and 250 ha for farmland managed by existing peasants.
- (2) The actual irrigation area refers to the section of irrigated land in which rice has actually been planted.
- (3) Figures for 1997 are pre-flood ones.

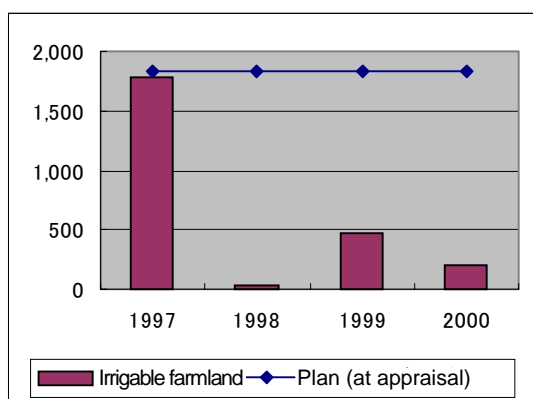


Figure 1 Comparison of Planned and Actual Irrigation Area

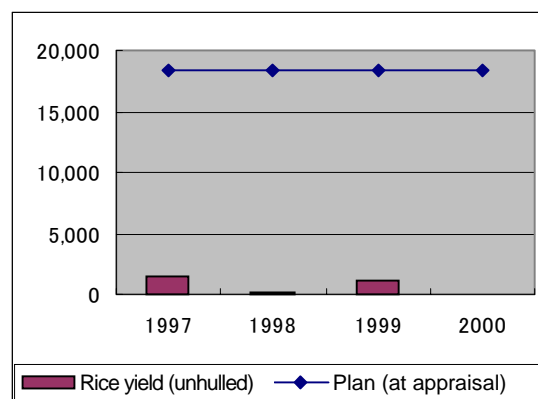


Figure 2 Comparison of Planned and Actual Yields (unhulled-rice)

The El Nino phenomenon caused extraordinarily heavy rains, and resulting flooding in the lower Tana caused flood protection banks that had been constructed by the Kenyan government and TARDA in 1989 to the east and west of the project site to collapse at various locations. In addition, the irrigation channels, drainage, control roads and farmland facilities were heavily damaged, rendering most of the irrigation facilities that had just been completed virtually unusable. This flood was of a scale comparable to those of a once-in-50-year probability and exceeded the design scope for the protection banks. Therefore TARDA was forced to suspend all project activities.

Under these circumstances, Japan Bank for International Cooperation (JBIC) undertook a survey on "Special Assistance for Project Sustainability of the Tana

Delta Irrigation Project (I)“ in July 1998 and proposed recovery plans and temporary measures to the Kenyan government and TARDA. In 1999, based on these proposals, TARDA began temporary construction, allowing production to be restarted in certain areas that had sustained relatively less damage. The Kenyan government meanwhile made a request to the Japanese government for an ODA loan to fund the Tana River Flood Damage Recovery Plan, which includes the rehabilitation of major structures and other full-scale recovery construction. Such ODA loan has not yet been granted, however. The Kenyan government continues to promote recovery work and allocated 155 million Kenya shillings to TARDA for recovery plans from its budget for 2000/2001.

As a result of the temporary construction work, in 1999 rice production gradually resumed in certain parts of farmland on the project site that had sustained relatively less damage. The reason the irrigation area was reduced in 2000 as compared to 1999 was that activities continued under the project on a smaller scale following the prolonged drought. Although agricultural production was resumed in 1999, it has not reached a scale that enables it to operate on a self-funding basis and financial support from the government will be essential for some time to come.

(2.3.2.) Effects on the Establishment of the New Agricultural Management Method/ Improvement and Establishment of Rice Production Technology in Kenya through the Introduction of Pilot Projects

Four pilot projects were implemented under the project: (1) the introduction of the large-scale estate management method, (2) introduction of agriculture using large-scale mechanization technology, (3) development of high-yield rice varieties suitable for coastal regions and adoption of a system of directly sowing seed in irrigated rice fields, and (4) double cropping of rice. Each of these projects represented a first attempt. With respect to the introduction of the large-scale estate management method, the TDIPO confirmed that the estate administration and management system was established during and after the project. Fully-fledged large-scale mechanization technology was also introduced. In order to develop high-yield rice varieties suitable for the geographical and climatic conditions, the number of varieties was narrowed down from 300 to five rice varieties that were selected for their (1) resistance to insects, (2) fast growth, (3) ability to meet the tastes and preferences of Kenyans, and (4) abundant yield. Furthermore, double-cropping and direct-sowing technologies have been firmly established. Moreover, the project is promoting activities to disseminate new rice production technologies to local communities. One example is to provide free seeds of new rice varieties to peasants living in the project site, though this is limited to certain areas.

(2.3.3.) Employment Creation Effects

In order to cope with the sharp reduction in operating income due to flood damage, TARDA reduced the number of personnel at the TDIPO from 233 in December 1997 to 68. It subsequently resumed rice production in relatively less damaged areas in 1999. Although the number of personnel directly hired by the executing agency to work on the project is expected to return to former levels and to increase in the future as recovery work progresses, it will take some time to return to the level planned at appraisal. Essentially, however, the project site³ is a newly developed area. It was formerly home to a few scattered villages of self-sustaining peasant farmers and there were practically no new employment opportunities. In addition, new employment opportunities were created in areas in which there were no such opportunities at all. Given these developments, the project has brought large employment creation effects to local communities in terms of the number of jobs created so far. Jobs were mainly offered to poor peasants and those of minority races living in the project area and its vicinities.

Table 3 Changes in Personnel Employed under the Project

	Plan (At appraisal)	1997 (Project completion date)	1998 (1 st year)	1999 (2 nd year)
Number of persons employed	2,855	1,047	195	833

Source: TARDA materials

Note: The number of persons employed refers to part-time laborers, temporarily hired peasants and workers; TARDA personnel are excluded.

(2.3.4.) Calculation of the Economic and Financial Internal Rates of Return (EIRR, FIRR)

At appraisal, EIRR for the project based on international rice prices and FIRR based on domestic rice prices were predicted at 8.4% (11.3% if Phase 2 was included) and 11.9% (15.1% if the same is included), respectively. The conditions for calculation were as specified below.

(Preconditions)

- Project life: 30 years after project completion
- Benefits: Income from the sale of polished rice, rice bran and crushed rice
- Costs: Civil engineering and construction work costs (including equipment procurement), consulting costs and operation/management costs

Due to the flood damage, an accurate comparison of EIRR and FIRR is not possible

³ The Tana delta has an annual rainfall of 700 mm or less. In terms of land production classifications, it is categorized as an agricultural boundary area in which only livestock breeding and the production of millet and other cereals are possible.

at this time. Therefore, recalculation of the two indicators will not be performed.

2.4. Impact

(2.4.1.) Environmental Impact

Since coastal forests in the Tana delta include red colobus habitats⁴, a rare primate, measures were adopted to prevent decreases in the population and to protect the species during project implementation. Measures included minimizing deforestation for the development of farmland and planting trees. At completion, trees had been planted in a 323-ha area.

In addition, an environmental monitoring office⁵ was established within the TDIPO to monitor changes in the red colobus population in the project area and its vicinity. Based on the project's monitoring records, there were no marked reductions during the period from 1991 to 1997, the project completion year, although there were fluctuations between observation periods. No particular negative effects on rare animals have been reported.

2.5. Sustainability

TARDA set up the TDIPO to manage and administer the project. The TDIPO had 233 employees when the project was completed in December 1997, but the number was reduced due to the enormous damage caused by floods that followed El Nino phenomenon and the ensuing financial difficulties at TARDA. By December 1999, it had been reduced to 68. Of these, 6 were employed for the Project Manager's Office, 12 for the Engineering Division, 8 for the Production Division, 8 for the Rice Processing Division, 29 for the Administration Division and 5 for the Accounting & Financial Division, and all were collectively responsible for the operation and maintenance of the project. Recovery work is currently in progress and the project is not operating at full capacity. Accordingly, even the current number of employees is sufficient to operate and maintain the existing facilities and equipment. TARDA is also implementing organization-wide plans to reduce employees from the current 405 (in the year 2000) to 208 in 2002. Thus the executing agency is working hard to achieve greater organizational efficiency.

As described above, TARDA initiated emergency recovery work for destroyed

⁴ Tana River red colobus (*Colobus badius rufomitratu*s) are a species of primates, which is registered with the Washington Convention and the African Convention on the Conservation of Nature and Natural Resources. Red colobus are indigenous to Kenya and are legally protected because of their rarity and importance as a national heritage.

⁵ The environmental monitoring office was established by TARDA to focus on environmental conservation in the Tana delta and its sustainable development. It will monitor vegetation, wild animals and birds, livestock breeding and grazing lands, agricultural production and population, health and sanitation, water quality and fish, hydrological and climatic conditions, and other environmental elements according to environmental monitoring indicators.

irrigation channels/banks and other major structures on the project site. In addition, repairs were made to damaged construction equipment, agricultural machinery, rice-polishing mills and other facilities to prepare for full-scale resumption of the project. These self-help efforts for recovery deserve to be highly evaluated. The major prerequisite for effective and sustainable development of the project, however, is to advance the recovery work in earnest.

Comparison of Original and Actual Results

Item	Plan	Results
1. Project scope		
(1) Development scale	Total irrigation area: 2,180 ha	Total irrigation area: 2,126 ha
(2) Facility plan	Head works: Floating removable dam	Head works: Floating removable dam (rubber dam)
· Development of irrigation facilities	Irrigation channel: Trunk line, 13.1 km; branch lines, 9.8 km Drainage: Trunk line, 10.2 km; branch lines, 11.0 km O/M equipment: Motor graders and other heavy machinery; transport vehicles, etc.	Irrigation channel: Trunk line, 13.4 km; branch lines, 64.0 km Drainage: Trunk line, 10.9 km; branch lines, 64.1 km O/M equipment: Same as left
· Development of farmland facilities	Personnel housing, maintenance workshops, warehouses, etc. Rice-processing mill (processing capacity: 7.5 t/h) Agricultural equipment: 31 tractors, 13 combine harvesters and other agricultural machines O/M equipment: Vehicles, repair workshop equipment and a whole set of spare parts Other	Same as left Agricultural equipment: 30 tractors, 10 combine harvesters and other agricultural machines Same as left
(3) Consulting services	444 M/M	467 M/M
2. Implementation schedule	June 1990 to October 1996 (76 months)	June 1990 to December 1997 (88 months)
3. Project cost		
Foreign currency	¥4.128 billion	¥4.732 billion
Local currency	¥417.2 million	N.A.
Total	¥7.096 billion	N.A.
ODA loan portion	¥6.031 billion	¥6.025 billion
Exchange rate	KES1.00 = ¥7.11	KES1.00 = ¥2.067