

DEVELOPMENT OF IRRIGATED RICE FARMING IN NORTHERN TANZANIA  
-Present Status of Japanese Cooperation for Rice Farming  
in Kilimanjaro Region and Its Future Prospect in Tanzania-

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Agriculture plays an important role in Tanzania; about 90% of people, 60% of GDP and 80% of foreign exchange earning depend on agriculture. Although maize, millets, banana, root and tuber crops are widely planted for food crops in Tanzania, rice production has been increasing remarkably. The rice planted area has increased from about 70,000 ha in 1950s to 350,000 in 1990; it now becomes one of common food crops in Tanzania.

Japanese Government has been cooperating with Tanzanian Government on the development of agriculture, particularly on irrigated rice farming in Kilimanjaro Region. It is a long-term cooperation combined with technical and financial assistances.

1. Outline of Japanese Cooperation for Agricultural Development in Kilimanjaro Region

Japanese Government conducted a study and formulated the Integrated Development Plan for Kilimanjaro Region in 1978 in response to the request of Tanzanian Government. Based on the study report, both Governments agreed to concentrate the cooperation for the irrigated rice farming and several other projects (such as industry, electrification) in Kilimanjaro Region. Brief history of Japanese cooperation for agricultural development in Kilimanjaro Region is shown in Table 1.

Kilimanjaro Agricultural Development Center (KADC) Project was implemented from September 1978 to March 1986 under the scheme of Project Type Technical Cooperation of Japan International Cooperation Agency (JICA). The scheme consists of:

- (1) Dispatch of Japanese experts;
- (2) Acceptance of counterpart personnel for training in Japan;
- (3) Provision of machinery and equipment.

The purpose of KADC Project was to establish appropriate farming techniques under irrigation condition through the activities of:

- (1) Construction of the Trial Farm (2.4 ha of rice field and 7.2 ha of upland field) and the Pilot Farm (18.9 ha of rice field and 51.8 ha of upland field);
- (2) Cultivation trials of rice and upland crops at the Trial Farm;
- (3) Training of counterpart personnel in the fields of rice cultivation, upland crops cultivation, water management and agricultural machinery;
- (4) Extension of the improved farming methods in the Pilot Farm.

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In connection with the KADC Project and agricultural development in general, Japanese Government had cooperated, using its different schemes of assistance, with Kilimanjaro Region on the followings:

- (1) Construction of the headquarters (in Moshi town) and the field office (at Chekereni, Moshi Rural District) of the KADC Project (completed in 1981, under Grant Aid);
- (2) Conducting of studies (e.g. master plan, feasibility study) prior to implementing the development projects;
- (3) Construction of Lower Moshi Irrigation Project (1,100 ha of rice field and 1,200 ha of upland field together with irrigation facilities, completed in 1987 under a loan of Overseas Economic Cooperation Fund, Japan);
- (4) Construction of post-harvest facilities for rice (paddy) produced in Lower Moshi Irrigation Project (completed in 1989 under Grant Aid);
- (5) Construction of Ndungu Irrigation Project in Same District (680 ha of rice field with irrigation facilities and post-harvest facilities, completed in 1990 under Grant Aid);
- (6) Provision of 292 tractors and their implements (out of them 35 sets are for Lower Moshi Irrigation Project and 27 sets for Ndungu Irrigation Project, under Aid for Increase of Food Production).

Kilimanjaro Agricultural Development Project (KADP) has commenced, as the second phase of the project type technical cooperation, from March 1986 to March 1993. The purpose of KADP was to disseminate the irrigated farming techniques in Lower Moshi Irrigation Project and other areas in Kilimanjaro Region through the activities of:

- (1) Improvement, demonstration, training and extension of cultivation techniques of rice and upland crops (vegetable, soybean, etc.);
- (2) Improvement, extension and training of water management techniques, technical advice for operation and maintenance of irrigation facilities;
- (3) Adaptability test, technical advice for operation and maintenance, extension and training of agricultural machinery.

## 2. Output of the Cooperation on Irrigated Rice Farming

Lower Moshi Irrigation Project (Rau ya Kati Scheme) is located about 5 to 20 km south-east from Moshi (capital of Kilimanjaro Region). It covers 1,100 ha of rice field and 1,200 ha of upland field. Altitude of the area is about 730 m above the sea level and annual rainfall is about 600 mm (ranged from 400 mm to 900 mm, Figure 1).

Maize cultivation and livestock grazing were practiced before starting the project; some limited areas along the river were planted with banana and vegetables. Under the rainfed cultivation, maize production was not stable. There was almost no harvest in drought years.

There are 2 intakes of irrigation water for the irrigation project. The primary, secondary and tertiary irrigation canals are with concrete lining but the quarterly one (farm ditch) is with earth lining. Rice plots were leveled and the standard size of the plot is 0.3 ha (30 m x 100 m). But, not much construction work was done for upland field. There are about 3,000 farm families who have rice plots, ranging from less than 1 plot to more than 10 plots, in the project.

The extension package on irrigated rice farming was developed and improved through the applied research on rice variety, plant spacing and crop management (e.g. fertilizer application, weeding, insect control), and data collection on water management and tractor operation. It was disseminated to the project area through training of key farmers, monthly meeting of block leaders and KADC staff, and visiting of KADC staff on farmers' plots. There were 157 farmers trained on rice cultivation between 1982 and 1991 (including those of Ndungu Irrigation Project).

At the moment the farmers plant rice according to the rice cultivation calendar (Table 2) and the rice cropping pattern (Figure 1). Main steps of the rice farming are:

- (1) To decide the area (irrigation blocks) to be planted with rice based on observation of the amount of irrigation water available, record of water requirement, rice cultivation history of each irrigation block and discussion with farmer leaders;
- (2) To raise rice seedlings of recommended varieties (e.g. IR54), seed rate, seed and seedling treatments in group nursery plots;
- (3) To distribute irrigation water (0 day), prepare plot with machinery operation and fertilizer application (1 day after), and transplant the seedlings with recommended spacing (starting from 2 days after);
- (4) To irrigate rice plots according to the rotational irrigation schedule and to practice crop management following the recommended extension package (e.g. weeding, fertilizer application, insect-pest control).

At first, farmers in the Pilot Farm (communal farm of Chekereni village) did not pay attention to rice even after its construction was completed in 1983; it was managed by the project staff for the first season. After the farmers recognized high productivity (as food crop) and profitability (as cash crop), they became interested in rice farming.

Rice production in Lower Moshi Irrigation Project started in 1985 just after a partial completion of the construction. People were already very much anxious on rice farming by that time.

There were some troubles and problems of re-allocation of plots after the land consolidation work, water distribution and tractor operation in newly created rice plots, and management of water users' association especially during the initial stage of operation. Both KADP staff (including Japanese experts) and

farmer leaders tried to solve the problems.

As a result of comprehensive training and guidance, and the growing interest of farmers, the average paddy yield has been as high as about 6 to 7 tons per ha per season. It is a remarkable yield level comparing with the national average paddy yield of about 2 tons per ha.

The farmers in Lower Moshi Irrigation Project pay fees for irrigation water (facility maintenance), water users' association (water management) and land preparation (machinery use). The water users' association was organized at each irrigation block (44 blocks and Pilot Farm), village (4 villages) and for the full irrigation system (1,100 ha). It has played important roles in collection of the fees, distribution of water within the irrigation block and cleaning of the canals.

Ndungu Irrigation Project, which is located in Same District (about 150 km east from Moshi) and covers 680 ha of rice field, is one another project which received cooperation from Japanese Government. Construction work of the project was completed in 1990. It is planted with rice for 680 ha in main season and 240 ha in off-season. Project staff (agricultural extension, water management, agricultural machinery personnel) and key farmers were trained at KADP prior to starting the operation. The project has achieved a similar paddy yield level as Lower Moshi Irrigation Project.

The output of cooperation has been materialized not only because of the contribution of Japanese Government but more because of the commitment of Tanzanian Government. Tanzanian Government, through Kilimanjaro Region, has allocated counterpart personnel and funds for implementation of the cooperation project.

### 3. Impacts of the Irrigated Rice Farming

Results of farm economic surveys, conducted in 1987 and 1991 for Lower Moshi Irrigation Project, indicate that the irrigation development has contributed to the improvement of rural economy. Table 3 shows that most of the farmers feel that their living standards have been improved after the implementation of the project. Further, they reported that transportation, food, education, and house conditions are improved (Table 4). The project has not only changed the living standards of individual farmers but also developed the rural community.

For example, Chekereni village constructed a new village office in 1990 by the benefit of rice farming in the communal farm (Pilot Farm) and the contribution of rice growers in the village. The village spontaneously started the lining work of the quarterly irrigation canals with concrete in 1992 for minimizing conveyance loss of water in the canal. It also bought a mini-bus for transport service of the people.

Irrigated rice farming techniques developed and improved by the

Japanese technical cooperation are disseminated in northern Tanzania beyond the areas of irrigation projects constructed with Japanese assistance. Farmers in Mombo Irrigation Scheme (220 ha) in Tanga Region plant the same rice variety.

The brand of rice in the market is called either after the variety name, production area, or other trade (nick) names in Tanzania. In Moshi market, rice produced in Lower Moshi Irrigation Project is popularly called as "Super-Japan".

Any development project faces difficulties or problems during preparation, implementation and post-implementation stages. Lower Moshi Irrigation Project has faced a problem of irrigation water shortage. Reasons for water shortage are:

- (1) More amount of water percolation than that expected in the initial plan;
- (2) Reduction of amount of water flow in rivers due to conversion of upland to rice field in the areas along the upper streams of the project. As the farmers became interested in irrigated rice farming, more than 500 ha of upland has been converted to rice field.

Shortage of irrigation water adversely affects the area of rice farming in Lower Moshi Irrigation Project. It has induced a trouble among people in the project area and in the areas of upper streams of intakes. The water right is not strongly controlled in Tanzania, thus the people having land along upper stream are in advantageous position for water utilization.

Management of irrigation facilities and agricultural machinery is also a key issue for sustainable development of the project. Tanzanian Government has gradually handing over the management of operation and maintenance of small-holder irrigation projects to the beneficiaries. The farmers in Lower Moshi Irrigation Project reorganized the water users' association to an agricultural cooperative in 1993. JICA has been assisting the movement with dispatch of 2 experts.

One another problem is water-borne disease which is always associated with the irrigation development. Irrigated rice farming has contributed to the increase of food and income for the people. The benefit of irrigation should be maintained with appropriate measures against water-borne diseases.

#### 4. Prospect of Future Irrigated Rice Farming in Tanzania

Rice is one of the four research priority crops under the National Agriculture and Livestock Development Plan which Tanzanian Government set in 1991 (others are commercial crops: coffee, tea and cotton). As it was mentioned earlier, the rice planting area is increasing, but the average paddy yield is only about 2 tons per ha in whole Tanzania. According to the food balance sheet for 1992/93, Tanzania required 409,000 tons of white rice, but only 295,000 tons was produced.

Development of appropriate technologies, training of personnel, participation of beneficiaries and target groups, and accumulation of knowledge and experience would be key factors for rural development. On the other hand, increase of wealth of target groups is also important for their active participation in rural development project.

Cooperation of Japanese government for irrigated rice farming in Kilimanjaro Region has shown one of the examples of rural development. Living standards of people have been improved through construction of facilities, improvement of technology package, and its extension service for better utilization of human and natural resources (water, land, solar energy, etc.).

Based on the rice farming technology and experience attained in Kilimanjaro Region, Tanzanian Government requested to Japanese Government for the establishment of new project called Kilimanjaro Agricultural Training Center (KATC) Project. The new project is to be implemented under the Ministry of Agriculture.

The purpose of KATC Project will be to improve the capacity of Tanzanian personnel on rice farming extension through the activities of:

- (1) Improvement of training manual, method and personnel in the fields of rice cultivation, water management and agricultural machinery;
- (2) Training of government personnel for and key farmers in irrigated rice farming areas.

Lessons of the irrigated rice farming learned in Kilimanjaro Region will be applicable to any irrigated rice growing areas. However, irrigated rice farming in Tanzania is diversified because of the differences in topography, climate, soil condition, availability of irrigation water, marketing access, and so on. Active participation of the people working in rice research and in irrigated rice farming areas is expected to cover the diversified rice farming environment in the country.

For further development of irrigated rice farming in Tanzania, the people working under KADP Project may be required both sympathy to the farmers and efforts to find site-specific problems or components for the improvement of the existing extension package and to disseminate the package to the farmers.

#### References

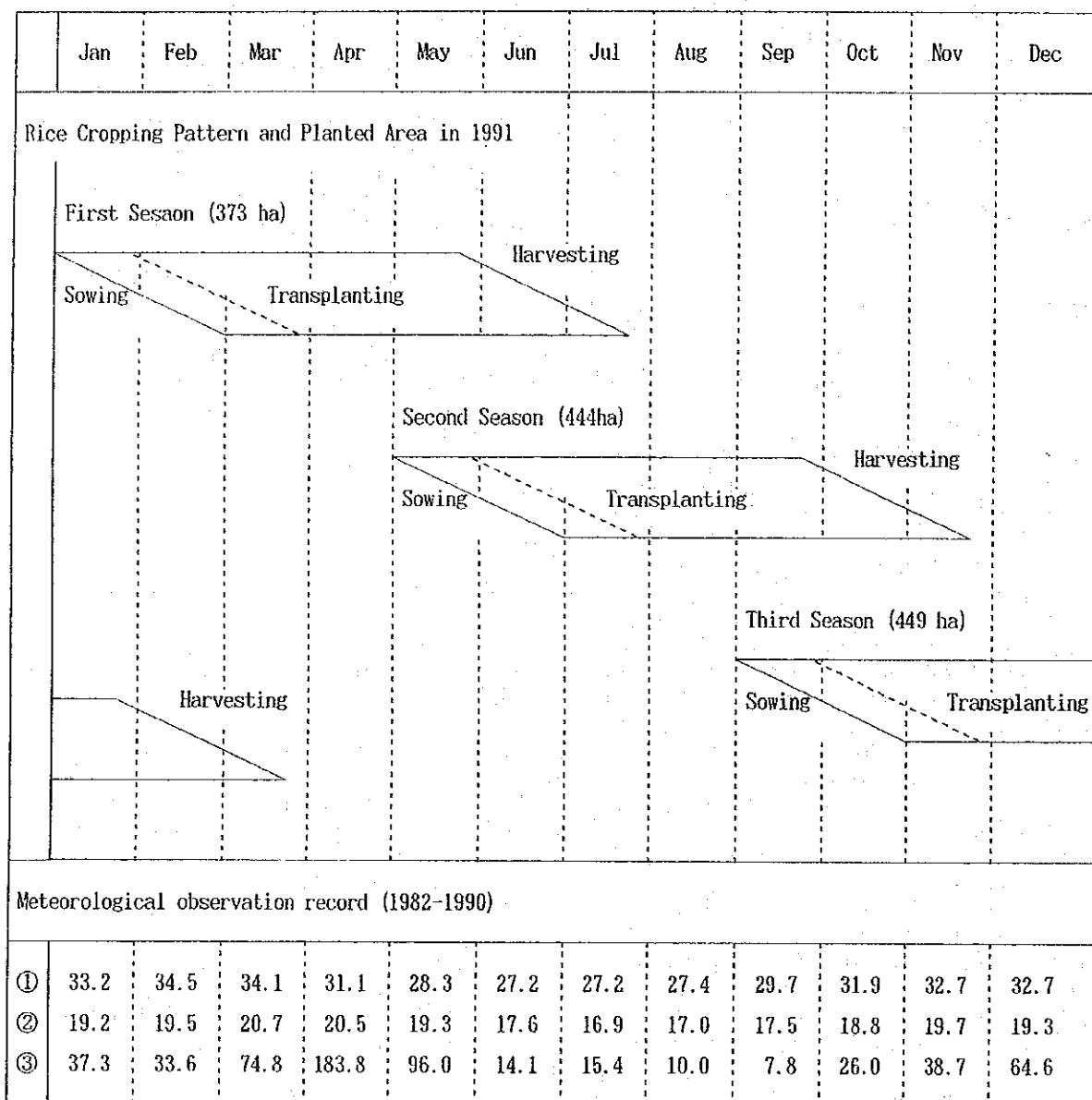
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Table 1. Japanese cooperation for agricultural development in Kilimanjaro Region since 1978.

Year	Project Type Technical Cooperation	Year	Major Contributions of Other Cooperation Schemes
1978	Kilimanjaro Agricultural Development Development Center (KADC) Project 1982: Construction of Trial Farm 1983: Construction of Pilot Farm	1978	Complete Kilimanjaro Integrated Development Plan
		1979	Provide 60 tractors and implements
		1981	Complete KADC facilities
1986	Kilimanjaro Agricultural Development Project (KADP)	1985	Provide 205 tractors and implements
		1987	Complete Lower Moshi Irrigation Project (LMIP)
1993		1988	Provide tractor spare parts
1992	Receive a request for cooperation on Kilimanjaro Agricultural Training Center (KATC) Project (in September)	1989	Complete paddy post-harvest facilities of LMIP
		1990	Complete Ndungu Irrigation Project
1993	Preliminary survey on KATC Project	1990	Feasibility study on Hai and Rombo Districts
1993	Long-term survey on KATC Project	1991	Provide 27 tractors and implements
1994	Implementation survey on KATC Project (in January)	1993	Dispatch 2 individual experts for KADP
1994	Start KATC Project (expecting July)		To present

Table 2. Rice cultivation calendar for Lower Moshi Irrigation Project, Kilimanjaro Region.

Day	Activity
-5	Seed selection: Select good quality seeds of 10 kg per plot (1 plot = 0.3 ha).
-4	Seed treatment: Disinfest the seeds from fungal diseases by fungicide treatment.
-3	Seed soaking: Soak the seeds in water for 24 hours.
-2~0	Seed incubation: Place the after-soaked seeds on floor and cover with cloth or sack.
-2~1	Nursery plot preparation: Cut and clean the group nursery plot. Land preparation by tractor.
-1~0	Seedbed making: Make 3 seedbeds (1.5 m width, 27 m length) each for a main plot.
0	Seed sowing: Sow seeds, press by hand after sowing to prevent drying and floating of seeds.
1~25	Water management: Dry the seedbed until the seedling becomes 2 leaf-stage.
15	Fertilizer application: Apply 500 g of urea per seedbed (1.5 m x 27 m).
15	Insecticide application: Spray insecticide (e.g. Diazinon) if necessary.
15~23	Main plot cleaning: Cut and burn grass in the plot to be transplanted with rice seedlings.
24±5	Land preparation: Tilling and puddling is done by tractor hire service.
24±5	Fertilizer application: One bag (50 kg) of urea (or 2 bags of ammonium sulfate) and 1/2 bag of triple super phosphate per plot.
25±5	Transplanting: Plant the seedlings in straight rows at the spacing of 20 cm between rows and within rows and 2-3 seedlings per hill.
~140	Water management: Follow the irrigation schedule (irrigate every 5 days). Drain water away from the plot one week before expecting date of harvesting.
40±5	Weeding: Conduct hand weeding (herbicide is not recommended).
40±5	Fertilizer application: Apply 1/2 bag of urea (or 1 bag of ammonium sulfate) per plot after weeding and under flooding condition.
40±5	Insecticide application: Spray insecticide (e.g. Diazinon) on rice plant if necessary.
80±5	Weeding: Conduct hand weeding (herbicide is not recommended).
80±5	Fertilizer application: Apply 1/2 bag of urea (or 1 bag of ammonium sulfate) per plot after weeding and under flooding condition.
80±5	Insecticide application: Spray insecticide on rice plant, if insects persist, spray weekly.
145	Harvesting: Harvest when about 80% of grains of the panicle have turned yellow (about 35 days after flowering).
	Threshing, cleaning, drying: Thresh, clean and dry grains to 14% moisture content.
	Storage: For keeping long time, the grain should be dried to 13% moisture content.



Notes: ① for maximum temperature (°C), ② for minimum temperature (°C), ③ for rainfall (mm).

Annual rainfall was 797.4 mm (1982), 417.3 mm (1983), 509.9 mm (1984), 567.5 mm (1985), 597.0 mm (1986), 401.1 mm (1987), 545.5 mm (1988), 656.8 mm (1989), 932.8 mm (1990), respectively.

Figure 1. Rice cropping pattern and planted area (in 1991) of Lower Moshi Irrigation Project and meteorological observation record at Kilimanjaro Agricultural Development Center (1982-1990).



Table 3. Farmers' feelings on their living standards in Lower Moshi Irrigation Project  
(total samples: 81 farmers).

	No. of farmers interviewed	Living standard (1987)			Living standard (1991)		
		Improved	Deteriorated	Others	Improved	Deteriorated	Others
<b>Area (Village)</b>							
Upper Mabogini	26	14	10	2	24	1	1
Lower Mabogini	13	8	5	0	13	0	0
Rau ya Kati	18	11	6	1	18	0	0
Chekereni	24	20	4	0	24	0	0
<b>Rice plots/farmer</b>							
More than 10	5	2	3	0	5	0	0
4 to 10	16	10	5	1	15	1	0
2 to 4	19	15	4	0	19	0	0
1 to 2	17	9	7	1	17	0	0
Below 1	16	13	2	1	15	0	0
None (0)	8	4	4	0	8	0	0
<b>Total</b>	<b>81 (100%)</b>	<b>53 (65%)</b>	<b>25 (31%)</b>	<b>3 (4%)</b>	<b>79 (98%)</b>	<b>1 (1%)</b>	<b>1 (1%)</b>

Note: Question for 1987 was "Comparing to 10 years ago your living standard is improved or .....?"  
Question for 1991 was "Comparing to before starting the project your living standard is ...?"

Table 4. Farmers' feelings on socio-economic changes in Lower Moshi Irrigation Project in 1991  
(total samples: 81 farmers).

	Improved	Deteriorated	Others	No answer
Transport	81 (100%)	0	0	0
Food	75 (93%)	3	1	2
Education	63 (78%)	1	6	11
Housing	60 (74%)	4	11	6
Crime	54 (67%)	4	18	5
Availability of labor	54 (67%)	6	17	4
Health	52 (64%)	17	12	0
Economic activities other than agriculture	50 (62%)	1	6	24

## Kilimanjaro Agricultural Development Project (KADP)

**K**ilimanjaro Agricultural Development Project stands as a model for the successful cooperation between the Government of the United Republic of Tanzania and the Government of Japan. *Rural Tribune* is pleased to present this project to its readers as a success story in the field of rural development.

Kilimanjaro region is located in the Northern part of the United Republic of Tanzania. It occupies 1.4% of the national land area (945,100km<sup>2</sup>) with about 1.1 million of people (5% of the national population).

The project is based on a feasibility study undertaken jointly by the two governments prior to the project which showed that the cultivated land in the project could be expanded from 5000 ha. at the time, to 10,380 ha. after the project, due to increased supply of irrigation water. This was seen as a great step forward as irrigating these additional areas was seen to increase crop production as well as developing the low lands as a measure to reduce population density around Mt Kilimanjaro and hence, to increase the farm size per individual farmers.

The technical cooperation in the project covers the following areas:-

### 1. Crops production

#### a) Paddy cultivation

Which involves the selection of appropriate varieties and the establishment of cultivation techniques, which enabled farmers in the Lower Moshi Irrigation Project to increase their production up to 6-7 tons per hectre per season. The Operation and Maintenance office of Lower Moshi Irrigation Project (LMIP) and water users Association work together with the farmers for proper irrigation, water distribution, land preparation and field management.

#### b) Upland crops cultivation

Proper cultivation techniques were established for growing vegetables, soya beans and fruits, water melon has been introduced.



*Promising yields in this paddy rice field- KADP*

#### c) Extension services

This involves the demonstration and extension of cultivation techniques.

### 2. Irrigation and drainage

New soil and water management techniques were established to control water discharge, conveyance loss, area water requirement and unit water requirement. Modern irrigation farming system was introduced in this semi-arid region for better production.

### 3. Agricultural machinery

This involves the technical assistance and maintenance of the agricultural machinery besides advices on the operation of the same machinery with special consideration to the receptability of the different soil conditions so as to overcome the problems of land leveling and soft plough layers which affects the irrigation water supply in paddy plots.

### 4. Training

It is mainly the training of counterparts, agricultural extension workers, irrigation officers, tractor operators and farmers in Kilimanjaro region. The training is of two types:

- Training of Tanzanian personnel in Japan on agricultural machinery

maintenance, irrigation drainage, vegetable production and paddy cultivation. That was during the year 1986-89.

- Training courses under KADP which are organized locally. It is on agricultural machinery irrigation, paddy cultivation and upland crops cultivation.

### Impact and benefits from the KADP

It is worth mentioning that the project was established for more effective utilization of natural resources for farming and for the improvement of rural life.

There is no doubt that the Community in Kilimanjaro region benefited from KADP by improving their crops production level, maintaining the environment and controlling diseases in addition to the improvement of the nutritional level as well as health services. The community witnesses the improvement of the standard of living, housing beside the improvement of the standard of living, housing beside the improvement of the social services and the establishment of cooperatives.

The electrification of the villages is among the remarkable development feature which could be observed clearly.

## TECHNOLOGY

Prior to the implementation of the project, the major cropping pattern depended mostly on rainfall and the availability of water for irrigation. The weather was characterised by insufficient rainfall, sometimes forcing farmers to change their cropping pattern. But after the implementation of the project, modern irrigation systems can be seen in paddy fields (Lower Moshi, irrigation project) sugar cane plantations, animal pasture fields (Kahe Estate) and maize fields.

The success in irrigation influenced the expansion of the area for cultivation due to the ample supply of water.

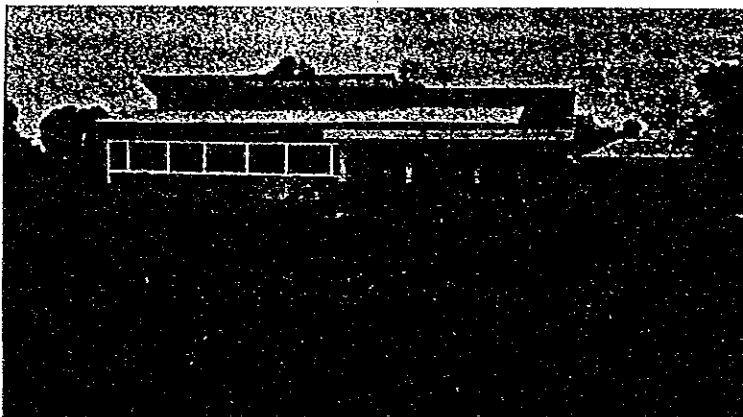
The impact of KADP project on the development of the region is observed clearly. The idea of replicating the same experience in other regions under similar conditions in Tanzania is now under consideration.

The *Rural Tribune*, by printing this article, intends to give the chance to

other CIRDAFRICA member States to learn the lessons and benefits from the experience gained by the Tanzanians.

We propose the exchange of visits as an approach to be followed for realizing the proposal.

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*Better housing as an indicator to community development*



## Japan extends rice farming project

TANZANIA and Japan have signed an agreement under which the Japanese Government, through the JICA, will extend a new project on technical co-operation from Kilimanjaro region to cover the whole of Tanzania by strengthening of institutional capability of training extension personnel and key farmers in irrigated rice farming.

The project is set to start on July 1, this year, covering five years. The project follows achievement of the Kilimanjaro Agricultural Development Centre Scheme from 1978 to 1986, and the Kilimanjaro Development Project from 1986 to 1993.

ABOVE: Leader of a Japanese implementation survey team Michio Sakayagi and Agriculture and Livestock Development Ministry Principal Secretary Raphael Mbagama signing the agreement in Dar es Salaam.

DAILY NEWS : 25th Jan 1994

## 添付資料 8. KADP 関連資料

### 主要項目の概要説明

#### 1. 調査及びプロジェクト時代

1970年から開始された綿密な現地調査をベースとして、1981にスタートしたキリマンジャロ農業開発計画（以後KADPと称す）は、1993年3月に終了した。1981年～1993年までの12ヶ年の技術協力期間、稲作栽培、灌漑技術、施設管理、農業機械及び知作等々、各部門において、調査、実証試験及び訓練が実施され、大きな成果を上げて来た。特に稲作栽培については、適性品種の選定、その栽培技術の確立、普及員及び農民への訓練から、タンザニア平均の3倍以上の収量が1993年現在も継続している。調査段階から既に、気候、土壌及び灌漑水が友好利用されていなかった当時の状況から、稲作の有望性が指摘されていた。当初の実証試験結果においても、7トン/ha程の高収量が記録され、その事が実証された。これらが、日本からのローンによる、ローアモシ地区の基盤整備事業の実施に関連し、1986年～1993年までの、第2フェーズ（KADP、フォローアップを含む）の主要項目（ローアモシ農民への技術普及、定着）として引き継がれて来た。

##### 1) KADPローアモシ地区、水田1,100haの生産基盤の確立

ンジョロ及びラウ河へのインテイクの設置、キャナル、圃場の均平工事等々、1,100haの稲作栽培基盤が日本からのローン貸付けにより施工され、ローアモシ地区の生産基盤が確立された。また、灌漑、施設管理、農業機械及び知作各部門が調査及び実証試験成果等をベースとして実施した訓練、セミナーと、日本へのカウンターパート研修は、KADPスタッフのみならず、関係普及員と農民間への技術普及と定着に大きな成果をもたらした。また、ローアモシ地区稲作栽培の成功は、特に灌漑施設の整備と、耕起手段を持たない現地農民へのKR-I Iによる農業機械、部品等援助等もあり、安定した高収量が記録されている。キリマンジャロ農業開発計画は、日本からの技術協力、無償援助（建物、KR-I I等）及びローンの貸付け等々が効果的にプロジェクトサイトに結合した好例と考える。これらがプロジェクト成功の大きな基盤を形成してきた。

#### 2. 稲作栽培の優位性

キリマンジャロ州では、稲作は、これまでの換金作物、コーヒーを凌ぐ、第1キャッシュクロップの性格をおびて来ている。

コーヒー及び水稻(KADPo-アモシ) 収量及び収入比較表

項目	収量/ha	単価/kg	粗収入/ha
コーヒー	750 kg	300 Tsh	255,000 Tsh
稲作	6,500 kg	90-100 Tsh	585,000 Tsh

Oct, 1993.

タンザニア平均の約2トン/haのレベルではコーヒーの優位性は在るが、KADPが実施した、適性品種の選定、栽培技術及び灌漑施設等生産基盤の確立、関連技術の指導をベースとする、6.5トン/haの高収量では、稲作の優位性は歴然としている。高収益を上げているローアモシプロジェクト農家(プロジェクト傘下農家、約1,900軒)はそれまでの、日干しレンガ、草葺きの屋根の家から、コンクリートまたは、焼きレンガと、当地のステイタスシンボルのトタン屋根を上げた新築ブームが続いている。高収益がもたらす周辺からの雇用拡大及び物流を含めた活動等、経済的インパクトは大きいと考えられる。

### 3. プロジェクト終了、現地側への移管、稲作組合の活動

1993年3月プロジェクト終了に伴い、夕側にプロジェクトが移管された。プロジェクト時代から、窮屈な夕側財政事情と、高収益が続いているローアモシプロジェクト地区の状況から、1993年4月、キリマンジャロ州開発会議で、ローアモシに設立された稲作組合(1993年3月17日登録)によるランニングコストの全面的負担により、ローアモシを運営する事が決定された。実際的には1993年第2シーズン(5月)から支払いが開始され、現在に至っている。ローアモシプロジェクト農家には稲作栽培の成功から、ランニングコストを支払い出来る十分な経済基盤が備わっている。どのプロジェクトでも、移管後の運営をどうするかが大きな問題である。移管の前提といわれる、

1. 予算の確保
2. 機材の確保及び保守管理体制の確立
3. スタッフの確保
4. 運営能力(知識、技術)
5. 財務管理(現地では特に汚職防止)

等が在るが、ローアモシの場合、1~3の項目は現地当局者の尽力も在り、ある程度確立している。また4については、KADPスタッフの指導が継続している(将来的には稲作組合の自立運営が期待されている)。夕側の説明によれば、稲作組合の運営状況により、プロジェクトを徐々に稲作組合に移管する方針といわれている。稲作組

合の今後の運営が良好であれば、将来の機材更新、補充部品の調達、灌漑施設管理を含めて十分運営出来る可能性がある。ただ、設立もない状況と、関係者の知識、経験不足もあり、継続した指導が望まれる。

#### 4. 機材関係

唐鍬以外に耕起手段を持たないローアモシプロジェクト農民の状況と、水の有効利用、栽培面積の拡大の上で、トラクター及び作業機は重要な存在である。機材は灌漑施設と共にKADP、ローアモシ稲作栽培のベース的存在にある。補充部品、及び更新機材はJICA及びKR-II等、日本からの購送によって賄われて来た。今後は稲作組合がこれらの責任を負う事になるが、機械費の値上げ、将来の部品補給、機材更新等については今後の課題である。機械関係スタッフは、これまでの訓練、及び経験からある程度理解を持っているが、そのレベルは高いとは言えない。現地の組織運営体制の未整備もあり、オペレーターに起因する故障も多い。機材運行がKADPローアモシのベースを支えている現実もあり、継続した指導が望まれる。

#### 5. 水問題

稲作栽培の高収益は、次第にプロジェクト周辺農家にも波及している。特にKADPローアモシの上流地区にKADPと同一品種、同一栽培方法により拡大し、1993年現在、プロジェクト外で2,660ha/年（KADPは1,100ha/年）の栽培面積が報告されている。タンザニアでも水利権は設定されている。またKADPでは、水稻栽培の前提として水利権を取得している。只、タンザニアの現状は水利権に基づく実質的な行政指導による規制は現在のところ皆無に等しい。このため、上流地区の勝手な取水が行われている。この状況が、下流に位置するKADPローアモシ地区の水不足に直結し、栽培面積の減少をきたしている。KADPとしては、プロジェクト時代から関係当局に取水規制を要請してきたが、未だ機能していない。1993年10月に入り、KADP農民代表、上流地区農民代表及び現地関係当局者の話し合いが端緒に着いたとの夕側からの報告がある。水問題は難しい問題と理解しているが、関係者の英知と、自助努力で調整及び対応策が機能する事を期待している。

#### 6. マラリヤ及びビルハウゼア（住血吸虫）

現地で淡水から発生するこれら病気は、水稻の灌漑水利用と密接な関係が指摘されている。このため、フォローアップ時代、JICA派遣マラリヤ専門家をお願いし、KADPで関係農民を対象としてセミナーを実施した。風土病的なこれら病気の知識、対応策の普及に努めて来た。また、現地アリュエシヤにあるTPRI

(Tropical Pesticide Reserch Institute) 共、良好な関係を維持し、助言をうけている。稲作栽培の成功から、ローアモシ農民は、これら病気の対応策としての、カヤ及び薬剤等を購入出来る経済基盤がある事が上げられる。また、マラリヤのポーフラが羽化するためには、25度C前後の水温で連続1週間の滞水が必要である、とのアドバイスから、羽化以前に滞水が無くなるような、代掻方法及び配水に心がけ対応している。水不足の問題は、代掻回数の増加によりある程度の緩和が期待出来るが、マラリヤ対策を優先した方が良く、との関係農民の強い意見もある。ビルハウゼアについては、TPRIで中間宿主の貝の天敵試験がKADP圃場近くの試験分場で実施されている。また、ロータリーによる土壌攪拌で中間宿主から出たビルハウゼアの幼虫が切断されるような情報もあり、代掻後、新しい灌漑水を導入しないで田植えを実施するような方法も指導されている。現地では、マラリヤ、ビルハウゼアとも、水稻栽培を実施する上で避けて通れない問題である。薬剤駆除等も含めた抜本的対策は、未だ実施のメドが立たない現地状況下で、今後共TPRIとの密な連携と、作業体系を含めた注意深い対応が必要となっている。

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JICA