

CHAPTER 8 IRRIGATION DEVELOPMENT PROGRAMME

8.1 Development Scenario for the Year 2017

The NIMP aims to achieve sustainable irrigation development through effective use of national resources resulting in an improvement of agricultural productivity and profitability. Thus, the development programme which implements the NIMP, target the establishment of sustainable irrigation development system by 2017.

The ASDS is a strategy report relating to the immediate short-term period of five years (2002 –2007). The ASDP which will implement the ASDS, is a five-year rolling programme (2002-2007). In view of the similarity of the ASDP with the NIMP, the development programme for the NIMP with the target year 2017 will utilize the following stage-wise development:

- Short Term : 2003 – 2007
- Medium Term : 2003 – 2012
- Long Term : 2003 – 2017

The ASDS mentions the need for three new critical interventions for innovative and practical actions toward the sustainable agricultural development including irrigation development. These are (i) focus on agricultural productivity and profitability, (ii) promotion of private sector/public sector partnership, and (iii) implementation of ASDS through DADPs. These interventions should be reflected in the development programme.

In Sub-clause 7.3.2 and Clause 7.10 of this Main Report, the investment amount for irrigation development is studied for three cases (high case, base case and low case) using the past actual expenditures and the assumption of increase in proportion of GDP growth rate. As a result, the high case is recommended from a viewpoint of full use of possibly available resource.

The basic plan of agricultural development discussed in Clause 7.6 of this Main Report as well as in the NIDP, proposes the irrigation development emphasizing increase of rice production from the economical and financial viewpoints, and also considering its beneficial double functions of staple food and cash crop production.

In due consideration of these viewpoints, necessary interventions and phasing, the JICA Study Team elaborates the stage-wise development scenario for subject-wise improvement and scheme-wise development focusing on improvement in quality and expansion in area respectively.

Stage-wise Irrigation Development Scenario

	Short Term (2003 - 2007)	Medium Term (by 2012)	Long Term (by 2017)
Development Target	To Establish Sustainable Irrigation Development System by 2017		
Key Issue for each Term	Reform	Decentralization	Self-reliance
Subject-wise Improvement			
Strategic Approach	<ul style="list-style-type: none"> - Reform of environment for promotion of decentralization and involvement of private sector - Establishment of appropriate technologies on irrigation development in cost-effective concept - Dissemination of concept of river basin approach - Establishment of irrigation development system by participatory approach 	<ul style="list-style-type: none"> - Actualization of irrigation development by LGA's initiatives under decentralization - Application of appropriate technologies on irrigation development in cost-effective concept - Establishment of environmental protection method on irrigation - Establishment of farmers-oriented irrigation development system 	<ul style="list-style-type: none"> - Establishment of easy access system from farmers on technical support - Spread of environmental protection method established - Establishment of self-reliant irrigation development by private sector-oriented with public sector partnership
Activities	Prepare and apply tailor-made improvement programme for project sustainability		
Scheme-wise Development			
Strategic Approach	Expand the irrigated area through development of irrigation schemes in effective use of national resources		
Activities	Give priority to rehabilitation of small-scale irrigation and water harvesting schemes		
Expected Annual Growth Rate of GDP	5.8 % to 6.0 %		

The Short Term (2003 – 2007) is regarded as “Reform” time toward establishment of self-reliant irrigation development. The enabling environment for decentralization and involvement of the private sector will be created. The irrigation development will focus on further effort for the establishment of irrigation development by a participatory approach system as the first step of self-reliant irrigation development. To fulfill these targets and also to realize the successful irrigation development under decentralization, a tailor-made improvement programme will be prepared and simultaneously executed in this period. The environmental issue is also important for irrigation development. The concept of river basin management is included in this improvement programme. The scheme-wise development will commence with rehabilitation of traditional irrigation schemes and development of water harvesting schemes.

The Medium Term (by 2012) will be crucial period for irrigation development. The Public Service Reform Program (PSRP) shows that the decentralization will be completed by 2011. The irrigation development will therefore be conducted by initiatives of local government. In addition, the irrigation development system will require gradual transfer from the farmers’ participatory approach to the farmers-oriented approach, to move toward the self-reliant irrigation development,

which is a final target in this development programme. The scheme-wise development will progress focusing on rehabilitation of traditional irrigation schemes and development of water harvesting schemes.

The Long Term (by 2017) program will focus on the establishment of self-reliant irrigation development in the partnership of private sector and public sector. For this, it is essential to create the enabling circumstances for involvement of the private sector and execution of public support function by that time, including attractive rates of lending interest, tax incentives, and desirable energy tariffs and oil prices to the private investors for agricultural development including irrigation development. The scheme-wise development will be accelerated, so that the rice production would meet its target by 2017 although allocation of required expenditures and support from other sub-sectors to irrigation development are essential.

8.2 Institutional Supporting Programme

8.2.1 Stage-wise Development

For the institutional development stage-wise programs are basically appropriate. The conformity to the LGRP is also essential. The programs basically have three steps for the short, medium and long terms based on the stage-wise development scenario. The basic objective of the institutional development for each term is as follows:

- Short term (2003-2007): To reform the existing institutional setting for better performance of participatory irrigation development responding to the decentralization policy.
- Medium Term (by 2012): To support actualizing farmers-oriented irrigation development through the LGAs' initiatives and assistance to the farmers.
- Long Term (by 2017): To support realizing self-reliant irrigation development through the PPP (Public Private Partnership).

8.2.2 Strengthening of Irrigation Section

(1) General Approach and Basic Components

The Institutional Strengthening of the Irrigation Section has the following three subcomponents:

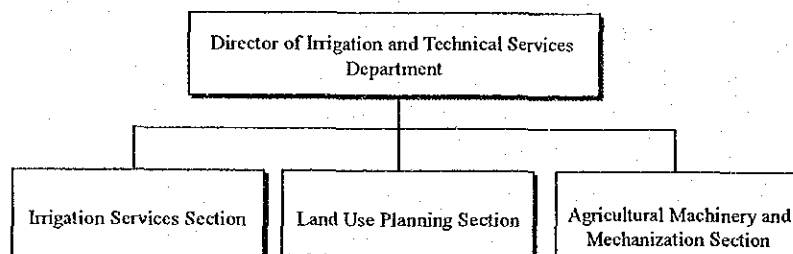
- Promotion of the Irrigation Section to a new Department
- Strengthening of Monitoring Function

- Reform of Zonal Irrigation Office conforming to the LGRP

Presently a possible reform plan is under consideration in the MAFS. It is to promote the Irrigation Section to a new department, i.e. the Department of Irrigation and Technical Services through combining the Irrigation Section, the Soil Conservation and Land Use Planning Unit and the Agricultural Mechanization Unit. In the reform plan, an assistant director should head each section under the supervision of director. Strengthening of the irrigation section by including this plan should be given serious consideration.

In addition, the Monitoring and Evaluation Unit and the Environmental Unit are presently seriously understaffed, even though their expected roles at the national level are quite crucial for the provision of effective feedback data and, moreover, to monitor socio-economic and environmental aspects of the effectiveness of irrigation development. The Section does not yet have an established firm monitoring mechanism and has not selected a list of necessary socio-economic, technical and environmental indicators to monitor and evaluate the irrigation development activities. Strengthening of those two units should be included in the strengthening of the Irrigation Section.

(2) Possible Institutional Strengthening Plan of Irrigation Section



Source: Irrigation Section, MAFS

The third subcomponent, Reform of Zonal Irrigation Office should be synchronized with the progress of LGRP. Presently the Zonal Irrigation Office still has a very influential role in irrigation development, in particular, in new development schemes, because the LGAs are presently not yet capable of performing their demarcated roles and functions. The constraints limiting the LGAs' capacity are already discussed at Sub-clause 4.3.7.

At least in the first stage of the NIMP up to 2007 the Zonal Office should maintain the present roles and functions. Gradually, however, their roles should focus on the inter-regional coordination in cooperation with the Regional Secretariat and provision of policy and technical guidance to the LGAs (DALDO) toward the end of third stage up to the year of 2017. Gradual withdrawal from direct supervision of irrigation schemes and transferring the function to the LGAs should be

undertaken from the first and second stages.

A task force of experts should be organized to make a reform plan for the Irrigation Section. The plan should be a stage-wise program responding to the short term (2003-2007), the medium term (by 2012) and the long term (by 2017). The promotion of the Section to the Department should be actualized in the short term, because it must be the important first step toward sustainable and self-reliant irrigation development and a trigger of other institutional developments.

8.2.3 Legal Framework Strengthening for Irrigation Development

(1) Background

A reliable legal framework is a prerequisite for successful farmers-oriented irrigation development. It should provide a secure legal environment for farmers and other private stakeholders to participate and invest in irrigation development. Legal status of irrigators' group, land tenure and water right, as well as ownership of and responsibility for irrigation infrastructure should be clearly defined for irrigation development. Presently these items are defined in a fragmented fashion by a number of separate laws, such as the Land Acts, the Water Act, the Cooperatives Act, the Societies Ordinance and etc.

(2) Establishment of Legal Framework for the Irrigators' Organization

The rights and obligations of the irrigators' group members cannot always be clearly and uniformly defined under the present legal framework. Neither present cooperatives nor associations are necessarily the optimum organizational form for the irrigators' group. The cooperative is primarily a business-oriented organization registered with the MAFS on the one hand, and the association, which is registered with the Ministry of Home Affairs can be applicable to any type of social activities on the other hand. A new legal framework exclusively for the irrigators' groups seems to be very important and necessary for securing their ownership and self-reliable irrigation development. The framework should cover and define the at least the following issues; ownership of the irrigation facilities, security of land tenure and water right, collection of water right charge, compulsory enrollment of all water users to the irrigators' group, establishment and dissolution of the irrigators' group.

A consultancy work for establishment of the legal framework, possibly a new Act, Ordinance or Regulations, should be undertaken through the initiative of the Irrigation Section in cooperation with the relevant governmental agencies, lawyers and technical specialists. The MWLD, however, will review the present Water Act for amendment based on the revised National Water Policy, and will provide the

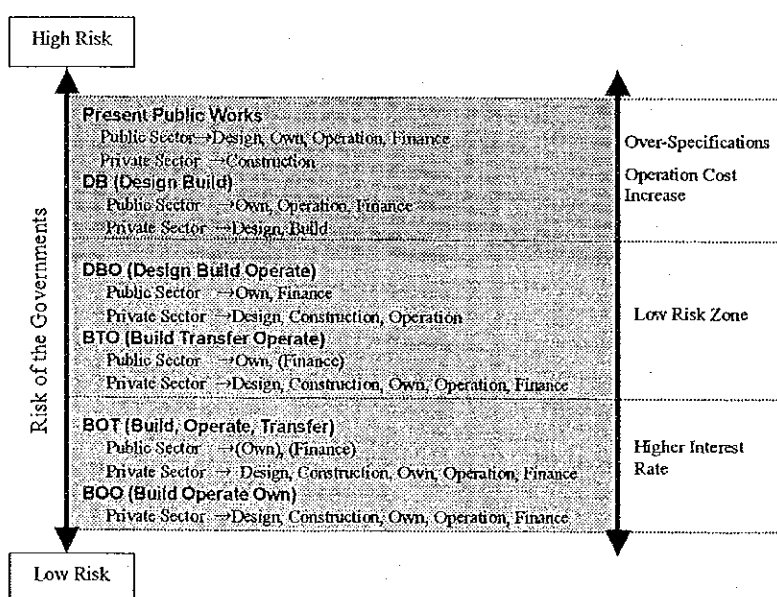
scope of activities and powers of water users' associations. The consultancy work should be undertaken in conjunction with the review of the Water Act.

(3) PPP (Public Private Partnership): Privatization Promotion

The institutional development target at the third stage of the NIMP is to support the realization of self-reliant irrigation development through the PPP (Public Private Partnership). The investment by the private companies in irrigated farming will be one of important alternatives in the future and play an important role for irrigation development. The MAFS in cooperation with relevant governmental agencies need to prepare favorable and attractive legal and institutional framework for the private investors.

The first step toward the PPP is to achieve a smooth privatization of NAFCO. The government has already established the Ministerial Committee for agricultural sector privatization. Under the supervision of this committee, a further in-depth study on privatization methods, strategy and implementation plan by the expert committee should be undertaken. For the PPP, there are several possible schemes. The applicability and feasibility of each privatization scheme such as DBO, BTO as well as BOT (see the next chart) should be carefully explored and compared based on the present situation of the parastatals. Furthermore, the investment guidelines for the private sector should be established for not only privatization of parastatals but also direct private investment for irrigation development.

Typical Development Schemes of PPP



Source: Original source written in Japanese is, Motoji Muraoka, "Outline of the PFI Business in Japan", Business Research Institute of NTT DATA

8.2.4 Smallholder Support for Self-reliance

Extension services for irrigators' group through the DALDO should be continuously given a high priority for actualization of self-reliant irrigation development. The present situation of availability of training for irrigators' groups obtained through the inventory survey is shown in the next table. "Available and Satisfactory" accounts for slightly less than 10% and "Not Available" ranges between 30% and 65%. The present situation is unfortunately far from satisfactory. For the future requirement, training needs will be very high among the irrigator's groups, in particular, for operation & maintenance, but also for administrative, financial and technical management skills. The following subcomponents should be emphasized in the training programs for the irrigators' groups.

- Strengthening of Operation, Maintenance Skill
- Strengthening of Administrative, Financial and Technical Management Skills

Strengthening of Farmers' Access to Micro Credit and Finance Mechanism is also pointed out as an important subcomponent of smallholder supporting activities. This subcomponent, however, should be integrated into a comprehensive rural development strategy and plan for effective implementation. Therefore, the NIMP recommends the relevant agencies to explore this in an integrated manner.

Present Situation and Future Requirement of Training for Irrigators' Groups

Present Situation

Training Item	Available and Satisfactory	Available but Unsatisfactory	Not Available	No Answer
Operation & Maintenance	6.0%	34.4%	46.7%	12.9%
Accounting System	2.3%	18.2%	64.6%	14.9%
Water Management	4.6%	45.0%	38.7%	11.6%
Paddy Production	7.3%	35.8%	31.5%	25.5%
Upland Crops Production	10.6%	58.3%	19.2%	11.9%

Sample Size: 302

Future Requirement

Training Item	Necessary	Not necessary	No Answer
Operation & Maintenance	95.0%	1.0%	4.0%
Accounting System	96.4%	1.3%	2.3%
Water Management	95.7%	1.7%	2.6%
Paddy Production	70.9%	14.9%	14.2%
Upland Crops Production	90.7%	3.3%	6.0%

Sample Size: 302

Source: Inventory Survey by the JICA Study Team, 2002

8.2.5 Monitoring and Evaluation of NIMP at Each Development Stage

The NIMP itself should be carefully monitored and evaluated on its performance at each development stage, just the same as an irrigation development scheme needs good operation and maintenance for satisfactory performance. Feedback through a reliable monitoring and evaluation mechanism should be promptly

given so that the NIMP can be revised. The role of monitoring and evaluation of the NIMP should be assigned to the Irrigation Section.

8.2.6 Supporting Programme

The supporting programme for institutional development is included in the Subject-wise Improvement Programme, which is discussed in Clause 8.3

8.3 Subject-wise Improvement Programme

8.3.1 Contents of Subject-wise Improvement Programme

The Subject-wise Improvement Programme is a series of management activities for software-like improvement, which are in various fields related to irrigation and irrigated agriculture. The Subject-wise Improvement Programme consists of several components related to the important subjects, which closely affect irrigation development in the Mainland. The components in the Subject-wise Improvement Programme are categorized as follows:

- Support scheme implementation directly,
- Strengthen management system and management of scheme implementation,
- Enhance benefit of irrigation more,
- Sustain implemented irrigation, and
- Restore irrigation practice when hindered

The components of the Subject-wise Improvement Programme were each formulated systematically and comprehensively, in the light of significance of the programme in the future irrigation development in the Mainland.

8.3.2 Formulation Procedure of Subject-wise Improvement Programme

“Demand driven” and “Consistency in the whole undertakings” are put as the basic principles for the formulation of the Subject-wise Improvement Programme in the NIMP. To attain the “Consistency in the whole undertakings”, a rational task flow and close linkage between interested parties for irrigation development are considered. A general view of the task flow and linkage between parties concerned was shown in the figure “Required Good Performances in Whole Circumstances Surrounding” in Clause 4.4. Consistency in the series of components proposed herein is carefully secured continuously keeping the conceptual feature shown in the figure in mind.

To attain the “Demand driven” principle soundly and to achieve the formulation without any substantial omissions, all valid results obtained through investigations inquired into problems and constraints are to be carefully analyzed. In the NIMP Study, several investigations and activities have been undertaken to investigate substantial constraints and inner meaning behind the outward signs. The series of

PCM workshops were typical. In addition, the "Problem Analysis on Selected Existing Irrigation Schemes" and "Inventory Survey" also gave noteworthy results on the problems and constraints concerning irrigation development.

Formulation of Subject-wise Improvement Programme is done through the process of; (i) identifying the problems and constraints of irrigation development, (ii) classifying the problems and constraints clarified, (iii) integrating problems and constraints into themes in consideration of their textures, (iv) formulating components so that signified problems and constraints are reflected without unnecessary omissions.

8.3.3 Formulation of Subject-wise Improvement Programme

The formulation of the Subject-wise Improvement Programme was carried out through the general process mentioned above.

(1) Arrangement of Problems and Constraints

Results of investigations related to the formulation of the Subject-wise Improvement Programme were arranged systematically in the courses of those investigations. Results of the Inventory Survey and PCM workshops and other studies were analyzed and presented in Figures 5.3.1 to 5.3.6.

(2) Classification of Problems and Constraints

Problems and constraints identified in those investigations are seemingly complicated and are sometimes duplicated. In order to reduce complexity, all significant problems and constraints identified were classified into several advancing directions of subjects, namely, "for good technology held in IS", "for good decision done by IS", and so on.

(3) Integration of Problems and Constraints into Themes

The advancing directions are subdivided into several themes at the process of irrigation development, namely, "Investigation and Survey", "Scheme Selection", "Planning", "Designing" and so on. In this respect, many numbers of themes are distributed on the texture between the directions and the developing processes as shown in Figure 8.3.1. Relationships between the themes and significant problems and constraints are summarized into Tables 8.3.1 and 8.3.2.

(4) Formulation of Components

Taking completed relationships of themes into consideration, components were formulated so as to relieve and improve the problematic situations. Generally, a project shall succeed under the conditions of "good organization (including good resources)", "good rules", "good tools", "good information" and "good

motivation”, etc. Concepts of these five aspects of conditions were introduced for identifying and formulating of components.

As shown in Figure 8.3.2, a total of 29 groups of components were identified to cover all requirements of improvement, and were categorized alphabetically from A to E by the aspect of conditions. However, some groups of components are not able to fulfill the objectives by themselves, and require the integrated approach with other similar components. Consequently, re-grouping of components was made, and finally 37 components were formed by the conceptualized aspects as shown in Tables 8.3.3 and 8.3.4. A linkage between the problems/constraints raised in the PCM workshops and 37 components of Subject-wise Improvement Programme is given in Figure 8.3.3.

From these formed components, a Project Design Matrix (PDM), or a Logical Framework, were individually prepared. All PDMs of the components were compiled in Appendix I.

Identification of redundancy between the proposed components and on-going (or planned to be implemented) projects is important and inevitable in order to avoid duplication of investments. The following on-going projects replace some related components.

List of Proposed Components Related to On-going Projects

No.	Proposed Component	Related On-going Projects	Status
B2	Contract Management System Improvement programme	RBMSIIP, ASPS-IC	To be updated and systematized.
C2.1	Planning Guideline Establishment Programme	RBMSIIP, ASPS-IC, PIDP	To be systematized.
C2.2	Designing Guideline Establishment Programme	RBMSIIP, ASPS-IC, PIDP	To be systematized.
C3.1	O&M Guideline Establishment Programme	ASPS-IC	To be systematized.
C4	Farmers' Participation in Irrigation Development Programme	SPFS, PIDP	To be generalized.
D3	Information and Database Improvement Programme	SUA ^{*1} , UDS ^{*2}	Partly related.
D4	Irrigation Development Contractors and Consultants' Listing Programme	RBMSIIP, ASPS-IC	To be updated and improved.
E1.6	Study of River-Basin Approach in Irrigation Development	RIPARWIN ^{*3}	Partly related.
E6.1	Irrigated Agriculture Training Programme for Rice Production Increase	JICA-KATC	Filled.
E7	Integrated Irrigation Development Model establishment Programme	JICA-SCSRD ^{*4}	Closely related.

*1: SUA (Soil-Water Management Research Group of the SOKOINE Univ. of Agr.) has prepared databases on water harvesting technology.

*2: UDS (IRA of the Univ. of Dar es Salaam) has established GIS database system which is convenient for the tasks in irrigation development.

*3: RIPARWIN (Project for Raising Irrigation Productivity and Releasing Water for Inter-Sectoral Needs) has been carried out by SUA.

*4: JICA SCSRD (JICA's Project on SUA Centre for Sustainable Rural Development) has focused the integrated rural development which relate closely to irrigated agriculture development.

8.3.4 Improvement Programme for the Year 2017

(1) Development Target

The subject-wise improvement aims at the creation of a foundation for the establishment of self-reliant irrigation development by a public sector and private sector partnership. Accordingly, the Subject-wise Improvement will be mostly executed in Short Term and Medium Term to be ready for the other projects of the Long Term. In Short Term, the executed programme focus is on fundamental themes such as institutional aspects and technical matters for the central government and farmers. In Medium Term, consideration is to be given to strengthening of LGAs on irrigation development in the light of decentralization.

(2) Stage-wise Development

Thirty-seven components are proposed in the Subject-wise Improvement Programme. These components will be implemented step by step based on the following aspects:

- Common components for all irrigation schemes,
- Fundamental issues for irrigation schemes,
- Co-ordination with the Stage-wise Development Scenario,
- Sound linkage with future transition of the scheme implementation types, and
- Orderly association of each component in consideration of whole context of the Subject-wise Improvement Programme

As a result, 29 components will be executed or started in the Short Term, and the remaining 8 components in the Medium Term as shown below:

List of Subject-wise Improvement Programme in Short Term

No.	Ref.	Components
1	A1	IS Institutional Improvement Programme
2	B1	IS Working Mandate Formulation Programme
3	B2	Contract Management System Improvement programme
4	B5	Cooperation Channeling within Irrigation-Sector Establishment Programme
5	B6	Sub-sectors Coordination System Establishment
6	C1	Survey and Investigation Guideline Establishment Programme
7	C2.1	Planning Guideline Establishment Programme
8	C2.2	Designing Guideline Establishment Programme
9	C3.1	O&M Guideline Establishment Programme
10	C3.2	Monitoring & Evaluation Guideline Establishment Programme
11	C4	Farmers' Participation in Irrigation Development Programme
12	C6	Farmers' O&M Manual Establishment Programme
13	C7	Establishment of DADP Formulation Guideline for Irrigated Agriculture Development
14	D1	Web-site and Networking Establishment Programme
15	D2	Technical Manuals Handling Guideline Establishment Programme
16	D3	Information and Database Improvement Programme
17	D4	Irrigation Development Contractors and Consultants' Listing Programme
18	D7	Existing-scheme Monitoring System Establishment Programme
19	E1.1	Irrigation Technology Research Center Establishment Programme

20	E1.2	Perennial Irrigation Method Improvement Programme
21	E1.3	Flood Irrigation Development Programme
22	E1.4	Small Dam Technology for Irrigation Development Establishment Programme
23	E1.5	Environmental Assessment Study for Irrigation Practice in Tanzania
24	E1.6	Study of River-Basin Approach in Irrigation Development
25	E3	IS's Equipment Management Programme
26	E4	Irrigation Development Contractors and Contractors' Training Programme
27	E5	Farmers' Participation Training Programme
28	E6.1	Irrigated Agriculture Training Programme for Rice Production Increase
29	E6.2	Irrigated Agriculture Training Programme for Cash Crops Production Increase

List of Subject-wise Improvement Programme in Medium Term

No.	Ref.	Components
1	A2	LGA Institutional Strengthening Programme for Irrigation Development
2	B3	Regulatory Networking System Establishment between LGAs and IS
3	B4	NGOs' Intervention in Irrigation Development Encourage Programme
4	C5	Village Irrigation Development Guideline Establishment Programme
5	D5	LGAs' Data Organization Programme
6	D6	LGA Networking System Establishment Programme
7	E2	Hydraulic Experimental Center Establishment Programme
8	E7	Integrated Irrigation Development Model Establishment Programme

Figure 8.3.4 shows the details of implementation schedule. Recently, a village irrigation scheme, sized less than 30 ha was observed under development. The scheme was being implemented on the basis of farmers' initiative without public intervention. To promote this scheme, the preparation of "Village Irrigation Development Guideline Establishment Programme" and "Integrated Irrigation Development Model Establishment Programme" is included in the Subject-wise Improvement Programme.

8.4 Scheme-wise Development Programme

8.4.1 Irrigation Development at National Level

As discussed in Clause 7.10, the possible irrigation development areas by 2017 are estimated at 405,400 ha under the "High Case" of financial resources. This area is the result of developing 626 irrigation schemes which are selected from the "A" and "B" Groups and Part of "C" Group as discussed in Clause 7.9 of this Main Report. The breakdown of 626 irrigation schemes is as follows:

Irrigation Development Areas by 2017

Type of Development	Nos.	Total Irrigation Area
Rehabilitation of Traditional Irrigation Schemes	462	274,600 ha
Rehabilitation/ New Construction of Water Harvesting Schemes	122	68,200 ha
New Construction of Smallholder Irrigation Schemes	42	62,600 ha
Total	626	405,400 ha

Source: JICA Study Team

8.4.2 Irrigation Development at Regional Level

The irrigation development programmes by each development type and Region are shown in the following table:

Irrigation Development Areas by 2017

Unit: ha

Region	Rehabilitation of Traditional Irrigation Schemes	Rehabilitation/New Construction of Water Harvesting Schemes	New Construction of Smallholder Irrigation Schemes	Total
Arusha	62,200	800	1,100	64,100
Coast	900	400	6,900	8,200
Dar es Salaam	0	0	0	0
Dodoma	1,800	11,400	200	13,400
Iringa	13,200	0	800	14,000
Kagera	600	0	0	600
Kigoma	11,000	1,600	0	12,600
Kilimanjaro	68,600	0	13,400	82,000
Lindi	6,200	1,200	1,900	9,300
Mara	0	2,800	100	2,900
Mbeya	52,100	0	7,100	59,200
Morogoro	25,800	3,800	24,500	54,100
Mtwara	2,100	2,700	0	4,800
Mwanza	400	12,900	2,300	15,600
Rukwa	7,000	400	1,200	8,600
Ruvuma	2,100	1,600	1,200	4,900
Shinyanga	900	10,900	100	11,900
Singida	0	8,500	0	8,500
Tabora	2,200	8,800	1,500	12,500
Tanga	17,500	400	300	18,200
Total	274,600	68,200	62,600	405,400

Source: JICA Study Team

8.4.3 Development Programme for the Year 2017

Based on the results of prioritization of irrigation schemes and possibly available development budget in High Case scenario, that is US\$ 454 million for 15 years, the irrigation development areas for 3 terms are determined as follows:

Accumulated Irrigation Development Area

Type of Irrigation Schemes to be Developed	Short Term	Medium Term	Long Term
	2003 - 2007	by 2012	by 2017
(a) Rehabilitation of Traditional Irrigation Scheme	179,800 ha	216,100 ha	274,600 ha
(b) Development of Water Harvesting Schemes	41,600 ha	57,200 ha	68,200 ha
(c) New Smallholder Schemes	43,800 ha	51,600 ha	62,600 ha
Total	265,200 ha	324,900 ha	405,400 ha

Source: JICA Study Team

Details of scheme-wise development are mentioned in Appendix G

8.5 Future Paddy Production

As discussed in Clause 7.10, irrigation development area of 405,400 ha would contribute to achievement of rice self-sufficiency by 2017 at national level. As well, rice status at regional level should also be examined taking into consideration the policy of "suitable product in suitable land" as mentioned in Clause 7.7. The comparison of projected demand of rice and development of

selected priority schemes indicates the following surplus and shortage of rice in 2017 at regional level.

Rice Status in 2017 at Regional Level

Region	Cultivated Area (ha)		Production (ton)			Demand (ton)	Balance (ton)
	Rainfed	Irrigated	Rainfed	Irrigated	Total		
Arusha	6,100	9,500	3,100	18,600	21,700	78,900	-57,200
Coast	37,500	8,900	54,800	35,700	90,500	32,200	58,300
Dar es Salaam	0	0	0	0	0	86,900	-86,900
Dodoma	1,100	1,400	500	1,000	1,500	64,100	-62,600
Iringa	6,400	4,500	6,700	14,900	21,600	64,500	-42,900
Kagera	1,700	200	2,600	600	3,200	72,600	-69,400
Kigoma	2,700	7,200	4,100	22,500	26,600	45,800	-19,200
Kilimanjaro	1,800	12,900	1,700	31,000	32,700	76,700	-44,000
Lindi	8,600	8,000	11,600	36,000	47,600	32,400	15,200
Mara	700	1,400	1,100	6,400	7,500	52,700	-45,200
Mbeya	18,700	71,200	18,800	260,700	279,500	81,600	197,900
Morogoro	48,600	43,300	52,000	122,900	174,900	66,400	108,500
Mtwara	23,700	2,100	24,700	8,000	32,700	42,200	-9,500
Mwanza	67,600	19,900	102,200	78,300	180,500	99,300	81,200
Rukwa	25,200	9,200	48,200	40,100	88,300	42,400	45,900
Ruvuma	13,600	2,400	29,400	4,100	33,500	44,100	-10,600
Shinyanga	94,300	9,900	42,300	22,900	65,200	96,200	-31,000
Singida	5,800	6,200	2,000	15,100	17,100	41,500	-24,400
Tabora	45,000	9,400	41,100	10,200	51,300	53,800	-2,500
Tanga	7,500	19,300	5,900	59,800	65,700	66,200	-500
Total	416,600	246,900	452,800	788,800	1,241,600	1,240,500	1,100

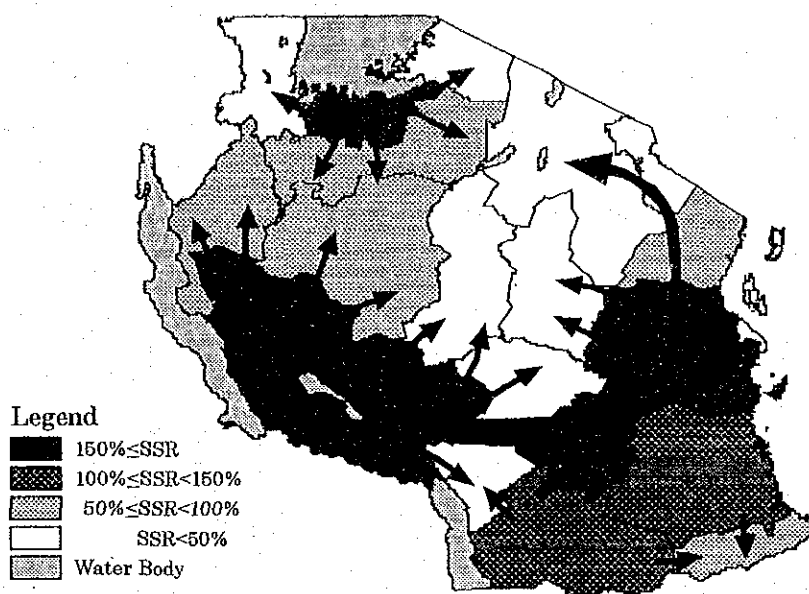
Source: JICA Study Team

As can be seen in this table, rice surplus in 2017 would occur in 5 regions out of 20 regions. Judging from the surplus amount of rice and road condition, the following distribution plan is recommended:

- Surplus rice in Mwanza region will be supplied for surrounding areas only because of poor road condition.
- Surplus rice in Rukwa region will be supplied for its northern and eastern areas and also for Dar es Salaam through national road.
- Surplus rice in Mbeya region will be supplied for its eastern areas and also for Dar es Salaam through national road.
- Surplus rice in Morogoro region will be supplied for its northern areas and also for Dar es Salaam and Kilimanjaro and Arusha regions via national road.
- Surplus rice in Coast region will be supplied for Dar es Salaam and Kilimanjaro and Arusha regions through national road.

The following figure presents the flow of surplus rice:

Flow of Rice on Regional Basis



Note: SSR (Self-sufficient Ratio) is the ratio of "Rice Production" to "Rice Demand".

The irrigation potential map which is prepared from viewpoints of water resources potential, land resources potential and socio-economic potential as explained in Clause 6.5, clarifies the extent of irrigation potential areas, out of which high potential areas extend over Mwanza, Arusha, Kilimanjaro, Morogoro, and Mbeya. New irrigation schemes should be therefore selected by referring to this irrigation potential map.

8.6 Cost Estimate on NIMP Implementation

(1) Subject-wise Improvement

Costs and programme period were estimated on the basis of the general plan as designed in the PDMs attached in Appendix I. Total required cost for implementation of all components (excluding the component of E6.1 in Table 8.3.3, because similar project JICA-KATC Phase-II has been commenced), was preliminarily estimated at US\$ 23.0 million as shown in Table 8.6.1. The required implementation period of the components are also shown in the same table. The annually required cost is estimated based on the implementation period.

Annually Required Cost

Item	'03	'04	'05	'06	'07	'08	'09	'10	'11 - '17	Total
Subject-wise Improvement	2.5	4.0	4.3	4.6	4.7	1.4	0.9	0.6	-	23.0

Unit : million US\$

(2) Scheme-wise Improvement

The project cost for irrigation schemes is estimated by referring to the guidelines

on irrigation development level discussed in Clause 7.4. The estimated project costs for 626 irrigation schemes selected in Sub-clause 8.4.3, are shown below:

Annually Required Cost for Scheme-wise Development

Items	'03	'04	'05	'06	'07	'08	'09	'10	'11	'12	'13	'14	'15	'16	'17	Total
Total	6.1	15.4	23.5	27.6	30.8	34.3	36.0	36.7	37.7	41.4	47.2	49.5	52.6	55.5	58.9	553.1
GOT ¹	4.9	12.3	18.8	22.1	24.6	27.4	28.8	29.4	30.1	33.1	37.8	39.6	42.1	44.4	47.1	442.5
Farmers ²	1.2	3.1	4.7	5.5	6.2	6.9	7.2	7.3	7.5	8.3	9.4	9.9	10.5	11.1	11.8	110.6

Unit : million US\$, 1 : 80 % of project cost, 2 : 20 % of project cost

(3) On-going Irrigation Projects

Currently, the following projects are being executed with donors' assistance:

Budget for On-going Irrigation Projects

Project	Duration	Budget (US\$ million)				Remarks
		2003	2004	2005	Total	
ASPS-IC	1998 - 2002	-	-	-	-	IC is not planned
PIDP	2000 - 2006	6.0	6.0	2.6	14.6	by 2005
RBMSIIP	1996 - 2002	3.0	-	-	3.0	Up to June 2003
SPFS	2002 - 2004	0.07	0.07	-	0.14	Irrigation only
Total		9.07	6.07	2.6	17.74	Irrigation only

The budget for these projects is regarded as a committed cost for the required cost estimate for irrigation development.

(4) Total Implementation Cost

The total implementation cost for the NIMP is estimated at US\$ 593.9 million (including US\$ 110.6 million of Farmers' contribution), is broken down to US\$ 23.0 million for the subject-wise improvement, US\$ 553.1 million for the scheme-wise development and US\$ 17.8 million for on-going irrigation projects. The table below shows the comparison of the required cost for NIMP implementation (excluding farmers' sharing cost) with the projected development expenditures:

Annually Required Cost for Scheme-wise Development

Items	'03	'04	'05	'06	'07	'08	'09	'10	'11	'12	'13	'14	'15	'16	'17	Total
Project Development Budget (High Case)																
	18.7	20.0	21.4	22.8	24.4	26.0	27.8	29.8	31.8	34.0	36.4	38.9	41.7	44.6	47.7	466.0
Government Shared Cost																
Scheme	4.9	12.3	18.8	22.1	24.6	27.4	28.8	29.4	30.1	33.1	37.8	39.6	42.1	44.4	47.1	442.5
Subject	2.5	4.0	4.3	4.6	4.7	1.4	0.9	0.6	-	-	-	-	-	-	-	23.0
On-going	9.1	6.1	2.6	-	-	-	-	-	-	-	-	-	-	-	-	17.8
Total	16.5	22.4	25.7	26.7	29.3	28.8	29.7	30.0	30.1	33.1	36.4	39.6	42.1	44.4	47.1	483.3
Balance	2.2	-2.4	-4.3	-3.9	-4.9	-2.8	-1.9	-0.2	1.7	0.9	-1.4	-0.7	-0.4	0.2	0.6	-17.3

Unit: Million US\$

The comparison shows that the required cost would be slightly higher than projected development budget for some years, therefore these deficits are expected to be arranged by the GOT. In addition, participation of private sector in

irrigation development would mitigate this financial load on the government.

(4) Operation and Maintenance Cost

As discussed in Sub-clause 7.3.2, the projected operation and maintenance budget is estimated at US\$ 9.01 million (Tsh. 85.9 billion equivalent) for 15 years, of which breakdown is given below:

Annual Operation and Maintenance Budget for High Case

Unit	'03	'04	'05	'06	'07	'08	'09	'10	'11	'12	'13	'14	'15	'16	'17	Total
Tsh. ¹	3.4	3.7	3.9	4.2	4.5	4.8	5.1	5.5	5.9	6.3	6.7	7.2	7.7	8.2	8.8	85.9
US\$ ²	0.36	0.39	0.41	0.44	0.47	0.50	0.54	0.58	0.62	0.66	0.70	0.75	0.81	0.86	0.92	9.01

1 : Billion Tsh., 2 : Million US\$

The operation and maintenance cost is assumed to be US\$ 15/ha, consisting of US\$ 5/ha for government and US\$ 10/ha for farmers. From this, the government's shared cost would be estimated at US\$ 1.79 million (Tsh 17.0 million equivalent) in 2017 and its annual sharing cost would be as follows:

Annual Operation and Maintenance Cost for High Case

Unit	'03	'04	'05	'06	'07	'08	'09	'10	'11	'12	'13	'14	'15	'16	'17	Total
Projected Government Budget																
US\$ ²	0.36	0.39	0.41	0.44	0.47	0.50	0.54	0.58	0.62	0.66	0.70	0.75	0.81	0.86	0.92	9.01
Government Shared Cost																
US\$ ²	0.97	0.99	1.02	1.09	1.16	1.21	1.24	1.34	1.38	1.42	1.49	1.56	1.64	1.72	1.79	20.02
Balance																
US\$ ²	-0.61	-0.60	-0.61	-0.65	-0.69	-0.71	-0.70	-0.76	-0.76	-0.76	-0.79	-0.81	-0.83	-0.86	-0.87	-11.01

1 : Million US\$

From this comparison, the projected government budget for operation and maintenance are nearly half of the required ones. These deficits should be allocated from the local fund of the government.

8.7 Appropriateness of Investment to Irrigation Development

The implementation of the NIMP consisting of 37 components of Subject-wise Improvement Programme and 626 irrigation schemes of Scheme-wise Development Programme, and will require about US\$ 503.8 million for 15 years (government portion only). This implementation would produce a possibility of self-sufficiency of rice by 2017. In addition, the NIMP implementation would also bear the following other benefits to Tanzania:

(1) Creation of Job Opportunity

The implementation of irrigation schemes will promise stable water resource for irrigation. This will bring about a possibility of increase in agricultural production, which will encourage farmers to invest of capital to agricultural inputs such as purchase of seeds, fertilizers, agricultural chemicals and labour employment,

aiming at higher production. As a result, agricultural labour would increase 176 man-day/ha by 62 man-day/ha, and would additionally need 38 million man-day at full-development at 2017. This is big job opportunity creation in rural areas, which will lead to other growth in the rural area also.

(2) Poverty Reduction of Smallholders by Increase of Farm Income

Smallholders account for about 80 % of all farmers in the Mainland, and most are below the poverty line. Average farm income per one crop season for smallholder is estimated at US\$ 143/ha (Tsh.136,000/ha) without irrigation development, increasing to an estimated US\$ 450/ha (Tsh.427,000/ha) with irrigation development. Such a farm income improvement, approximately three times of current farm income would be highly expected to contribute to poverty reduction.

(3) Saving of Foreign Currency for Rice Import

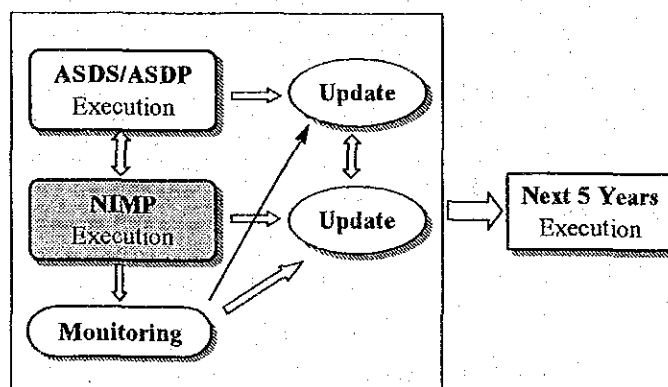
According to demand projection as mentioned in Sub-clause 7.3.3, demand of rice is estimated at 1,239,000 tons at 2017. The NIMP implementation would bring about a possibility of self-sufficiency of rice by 2017. If the NIMP were not implemented, rice shortage would occur every year, amounting to some 300,000 tons at 2017. This rice shortage at 2017 would require the foreign currency of about US\$ 69 million for import of rice at 2002 current price (Tsh.220/kg). The NIMP implementation would therefore largely contribute to saving of such foreign currency.

With the above study result, it is judged that investment of US\$ 503.8 million to the NIMP implementation would be appropriate from national viewpoint.

8.8 Need of Updating of NIMP

The NIMP provides the overall framework and strategies for irrigation development toward the year 2017, and is generally consistent with the ASDS. The ASDS only represents a time slice of 5 years from 2002 to 2007. As well, the ASDP is defined as a five-year rolling

Monitoring and Update of NIMP



programme targeting the same period with the ASDS. This means that the ASDS

and ASDP require to be updated every 5 years. The NIMP also requires to be updated in conformity with the updated ASDS and ASDP, and in view of the actual progress of scheme-wise development and subject-wise improvement. In order to control the actual progress accurately, monitoring is essential. In particular, the monitoring shall focus on the effect of subject-wise improvement, and its results shall be reflected upon the update of the NIMP. The monitoring and update of the NIMP will be carried out by the central government, namely Irrigation Section of the MAFS in cooperation with the LGAs.

8.9 Tentative PDM for Implementation of NIMP

Based on the study results mentioned above, a tentative PDM for implementation of the NIMP was prepared as shown in Table 8.9.1.

CHAPTER 9 CONCLUSIONS AND RECOMMENDATIONS

9.1 Conclusions

The Study presents the framework and strategies for sustainable irrigation development for the Mainland with the target year of 2017, aiming to contribute to the creation of an enabling and conducive environment for improving productivity and profitability of the agricultural sector.

In order to achieve this aim, the Study selected “*Sustainable Irrigation Development*” as the primary purpose of the NIMP with emphasis on comprehensive measures through “*Effective Use of National Resources*”, and prepared the development programme toward the year 2017 considering five elements: Economically Sound, Technically Appropriate, Sociologically Sustainable, Environmentally Friendly and Institutionally Reliable. The development programme consists of 37 components for a Subject-wise Improvement Programme and 626 irrigation schemes for a Scheme-wise Development Programme, including 29 on-going projects selected from the inventorized 1,426 irrigation schemes.

These proposed components and schemes were grouped by implementation horizon, namely Short Term (2003–2007), Medium Term (by 2012) and Long Term (by 2017), taking into account the need for urgent execution of the Subject-wise Improvement Programme and a priority ranking for the Scheme-wise Development Programme.

It is expected that completion of the proposed Scheme-wise Development Programme supported by the Subject-wise Improvement Programme will increase the rice production from the current 785,000 tons to 1,239,000 tons by 2017. This increase would likely meet the future demand for rice by 2017, provided that inter-sectoral coordination is successfully executed. The increase would also bring about the saving of about US\$69 million that is estimated to be required for rice imports by 2017. It would also result in an increase in the farm income of smallholders. The income increase per crop season would be estimated at US\$ 450 for smallholders, about three times the present income. Furthermore, it would contribute to the creation of job opportunities. The additionally required farm labor would be estimated at 38 million man-days at the national level. From these impacts, it can be seen that investment in the implementation of the proposed Scheme-wise Development Programme supported by the Subject-wise Improvement Programme would be in the national interest.

In preparation of the development programme, the Study established a prioritization system for the implementation of many irrigation schemes, and conducted a ranking for implementation using the data and information obtained through inventory survey. The availability of data and information on the schemes largely affected the priority ranking, and therefore it is essential to check the availability of data regularly, and to review and modify the selected schemes for early implementation using the updated data and information.

9.2 Recommendations

(1) Urgent Commencement of NIMP Implementation

The food shortage poses a serious problem in the Mainland. The increasing population pressure will further aggravate the situation if appropriate countermeasures are not taken on time. Irrigation development is a key factor to improve the productivity in agriculture. It is therefore recommended that the NIMP be implemented as early as possible.

(2) Urgent Need of Strengthening the Irrigation Section

The Study presents the needs of implementation of 37 components in the Subject-wise Improvement Programme and 626 irrigation schemes in the Scheme-wise Development Programme. The Irrigation Section of MAFS shall be responsible for smooth implementation of the programme, as a coordination agency for the different organizations involved. However, the present constitution of the Irrigation Section of MAFS, unfortunately, makes it unable to achieve the demarcated roles of coordinating and harmonizing the different organizations pertaining to irrigation development and, more importantly, unable to make prompt decisions. The Section also needs stronger mandates of the personnel administration and budget allocation and generally requires a stronger institutional and organizational position.

The Institutional Strengthening of the Irrigation Section has the following three subcomponents:

- Promotion of the Irrigation Section to Departmental status
- Strengthening of Monitoring Function
- Reform of Zonal Irrigation Office conforming to the LGRP

The plan should be a stage-wise programme responding to the Short Term (2003-2007), the Medium Term (by 2012) and the Long Term (by 2017). In order to smoothly implement the stage-wise reform plan of the Irrigation Section, it is essential to organize a task force of experts as an important first step toward sustainable and self-reliant irrigation development and a trigger of other institutional developments.

(3) Legal Framework Strengthening for Irrigation Development

A sound legal framework is a prerequisite for successful farmers-oriented irrigation development, empowering farmers and the other private sectors to enable them to secure ownership and to take full responsibility for all decisions and matters involved in development, operation and management of the irrigation schemes. Legal status of irrigators' groups, land tenure and water right, as well as ownership of and responsibility for irrigation infrastructure should be clearly defined for irrigation development. Presently these items are defined disconnectedly by a number of separate laws, such as the Land Acts, the Water Act, the Cooperatives Act, the Societies Ordinance, etc. In particular, a new legal framework exclusively for the irrigators' groups appears to be very important and necessary for securing their ownership and self-reliable irrigation development.

A consultancy work for establishment of the legal framework, possibly a new Act, Ordinance or Regulations, should be undertaken through the initiative of the Irrigation Section in cooperation with the relevant governmental agencies, lawyers and technical specialists. The consultancy work should be coordinated with the amendments of Water Act.

(4) Arrangement of Financial Resource for NIMP Implementation

The inadequate financial resource is one of major constraints which may hinder the satisfactory implementation of the NIDP. In this Study, the financial resource envelope for irrigation development was assessed using past actual development expenditures allocated to the irrigation development and assuming an increase in the government budget in proportion to GDP growth rate, through the sensitivity analysis on three cases (High Case, Base Case and Low Case). The sensitivity analysis for the High Case projects the financial resource envelope at US\$454 million for 15 years from 2003 to 2017, and would enable implementation of 37 components of the Subject-wise Improvement Programme and 626 Scheme-wise Development Programme projects (including 29 on-going projects with the slight possibility of deficit for operation and maintenance costs). This NIMP implementation for the High Case would also bring about the possibility of meeting the future demand of rice by 2017. It is therefore recommended that the GOT should arrange the necessary budget for the NIMP implementation, noting the study results mentioned above.

(5) Irrigation Development in River basin Management

Recently, a focus has been put on a river basin management approach from the viewpoint of effective use of water resources among many different stakeholders. This approach is considered reasonable and acceptable but it is important to

evaluate the effective use of water resources without a prejudice view such as consideration of economic return only. Over 70% of the total labor population is engaged in agricultural activities, and water is required both for domestic and agricultural purposes. Over 87% of all poor people live in rural areas where agriculture is a mainstay in livelihood. Under such situations, the effective use of water resources should be evaluated from an overall viewpoint, not just an economic viewpoint. On the other hand, irrigation also should be required to reduce water loss and more efficient overall water use.

(6) Need of Inter-sectoral and Inter-ministerial Coordination

Irrigation provides an effective environment for stability and increase of agricultural production. There is no doubt that while irrigation itself directly links with the stability of agricultural production, improvements to irrigation become a major factor for creating the physiological suitable environment for enhancing the agricultural production. Irrigation by itself could not realize the remarkable increase of agricultural production without assistance from other sub-sectors such as agricultural inputs and extension services. It is therefore recommended that other sub-sectors for agricultural inputs and agricultural extension services should be developed under the close inter-coordination with the irrigation sub-sector to enhance the respective effects on agricultural production.

In addition, a stable water resource is essential for irrigation development. In order to create sound watershed conditions required for stable water resource, it is important to keep in close communication with other sectors such as the forestry sector.

(7) Need of Updating of NIMP

The NIMP provides the overall framework and strategies for irrigation development toward the year 2017, and is based on the ASDP and the ASDS. The ASDP, which is defined as a 5-year rolling programme, will require updating every 5 years. The NIMP also needs to be updated at least every 5 years in conformity with the ASDP. If actual progress of scheme-wise development and subject-wise improvement are not satisfactory, and/or additional data on the irrigation schemes become available, the NIMP should be updated without waiting for the five-yearly review.

In order to grasp the actual progress accurately, monitoring is essential. In particular, the monitoring should focus on the effect of subject-wise improvement, and its results should be reflected in an update of the NIMP. The monitoring and update of the NIMP should be carried out by the central government, namely Irrigation Section of MAFS in cooperation with LGAs.