Chapter 5 Assessment of Regional Agriculture Characteristics and Zoning

5.1 Method of Assessment

The agricultural setting in Mizoram was assessed using village-wise data, which include census data, topographic data, meteorological data, geological data, and geographical data. Using statistical analysis with these various data, the results of assessments included various aspects of agriculture characteristics.

The villages having the same characteristics were classified together into one cluster. Using the data collected for clustering, it was found out that some data are not suitable without doing the necessary pre-processing, since the data sets had various units and standard deviations. Some data had strong correlation coefficient with other data while others do not have. Therefore, the first step was to standardize the 24 different data, and then execute principal components analysis (PCA) prior to performing the clustering analysis.

The effect of border trading, market accessibility and some agricultural production were difficult to assess with PCA because of the non-availability of village-wise data. Such data were loaded into GIS and considered in agricultural zoning steps by overlaying the output of cluster analysis on proper maps.

5.2 Village Clustering

5.2.1 Principal Component Analysis (PCA)

PCA is the main technique for dimensionality reduction. It can transform the data from high dimensional space into less dimensional space. The dimensions are converted in irreversible way while minimizing loss of information that the original data have. The variance of the original data represents the amount of information. The direction of the first new dimension (PC-1) is selected which maximises the variance of the original data in *n*-dimensional space. The direction of the second new dimension (PC-2) is selected which also maximises the variance of the original data from orthogonal direction to PC-1 in *n*-dimensional space. In the same way, PC-k is selected which maximises the variance of the original data from orthogonal direction from PC-1 to PC-(k-1). In this study, dimensions up to PC-6 were adopted in which variance was more than 1.0 for hierarchical clustering analysis.

5.2.2 Data Used for PCA

The data used for the analysis were shown in Table 5.2.1. Most of the data were processed into village-wise data through overlaying village boundary in GIS, because most of the data were not available in village-wise form.

Table 5.2.1 Data Used in the Assessment

Category	Item	Source	Format
Area	Village Area	Administrative Boundary Map from MIRSAC	Polygon
Census data	Selected data from census, which are considered to be related to agricultural settings: ・ Total population ・ Main agricultural labour ,person ・ Main agricultural labour, male ・ Main agricultural labour, female ・ Marginal agricultural labour, person ・ Marginal agricultural labour, male ・ Marginal agricultural labour, female ・ Marginal agricultural labour three to six months, person ・ Marginal agricultural labour three to six months, male ・ Marginal agricultural labour three to six months, female ・ Marginal agricultural labour zero to three months, person	Census 2011	Village-wise numerical data

Category	Item	Source	Format
	・ Marginal agricultural labour zero to three months, male ・ Marginal agricultural labour zero to three months, female		
Land use	Village-wise area of WRC, plantation, forest, and jhum.	Land use map from MIRSAC	Polygon data
Geographical feature	Mean elevation and slope degree in each village. Mean slope degree was calculated with GIS.	ASTER GDEM	Raster data
Road accessibility	The ratio of the area within one km from national, state, or district road in each village.	Road map from MIRSAC, modified by JICA Study Team	Polygon
Ground water accessibility	The ground water accessibility in villages according to the ground water potential map.	Ground water potential map from MIRSAC	Polygon
Rainfall during Rabi season	Average rainfall during Rabi season in the last ten years in villages.	26 weather stations in Mizoram	Point

Source: JICA Study Team

The village areas were calculated from the administrative boundary map obtained from MIRSAC using GIS. Although the data was prepared based on the villages' own studies, which included field surveys, their boundaries were not officially approved because some boundaries are under dispute with the neighbouring villages. Moreover, the names and the identification (ID) numbers included in the GIS attribute table were different from the village names and ID numbers of the 2011 census data. Specifically, there were 689 villages available in the source map and 727 village/towns were available in the census data. The unmatched villages between the administrative boundary map and census data were adjusted by checking their locations, names, geological data, and knowledge of governmental officers. The final number of villages for the analysis became 539.

Geographical data was calculated using GIS technique, and obtained from remote sensing images. Specifically, ASTER GDEM was used as data source for the analysis.

5.2.3 Result of PCA

In the PC analysis, six sets of PCA components that indicate the present setting of agriculture in Mizoram were obtained. The meanings of the resultant PCA components are shown in Table 5.2.2. Cumulative contribution of each variable ratio up to the sixth principal component (PC) was 80.51%. This means that 80.51% of the information that the original data have were described by the combination of the new aggregated variables.

Table 5.2.2 Meanings of Principal Components

No.	PC 1	PC2	PC3
1	High total population	High groundwater	High forest area
2	High various workers	Flat land	Low jhum area
3	Good road accessibility	Low elevation	High rainfall in Rabi
4	Large area	High WRC area	Large area
Meaning	Urbanization	Agricultural productivity	Permanent agriculture

No.	PC4	PC5	PC6
1	Low jhum area	High population density	High agricultural plantation
2	High forest area	Low jhum area	Good road accessibility
3	High marginal workers	High agricultural plantation area	Low population density
4	Low main agricultural workers	High WRC area	High marginal worker
Meaning	Forest conservation	Marketability	Utilization of agricultural land

Note: The standard deviations were decreased in order of PC No.1 to No.6.
The component loadings for each PC were decreased in order of No.1 to No.4.
Source: JICA Study Team

The first PC (PC1) had high loadings in the population aspect. The above Table 5.2.2 shows that the villages which have high population, high various workers, good road accessibility, and large area will have high PC1 score. From this perspective, PC1 means urbanization index. In a similar way, PC2 means agricultural productivity index, PC3 means permanent agriculture index, PC4 means forest conservation index, PC5 means marketability index, and PC6 means utilization of agricultural land index.

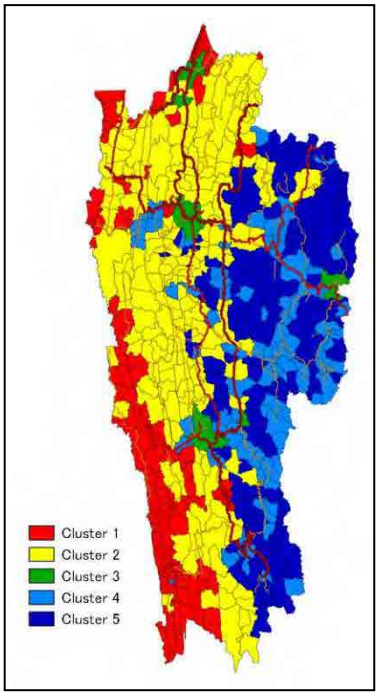
5.2.4 Clustering of Villages

In order to group the similar villages, hierarchical cluster method was used. As mentioned above, six PC scores with variance of more than one were used. In this study, *hclust ( )* function was used in R and Ward's method was selected for criterion.

5.3 Zoning of Agriculture Regions

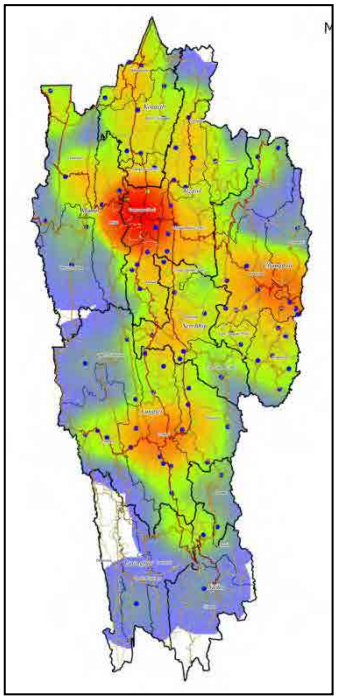
5.3.1 Factors Overlaying on Village Clustering

All villages were classified into five clusters in accordance with the six PC scores of each village using cluster analysis. The result of clustering is presented in Figure 5.3.1. The final zoning map was decided by overlaying some important factors such as actual agricultural production, horticultural production, market place, and connection to the border gates. These additional data were not available in village-wise data or inappropriate input data for PCA. The list of overlaid production data is shown in Table 5.3.1. The markets that were officially recognized were plotted into a GIS map and then a heat map was generated to understand the density of markets. The heat map is shown in Figure 5.3.2.



Source: JICA Study Team

Figure 5.3.1 Result of Cluster Analysis



Source: JICA Study Team based on T&C Department

Figure 5.3.2 Market Heat Map

Table 5.3.1 List of the Production Data

Categories	Type	Description	Source
Agriculture	WRC	Circle-wise WRC area in Kharif and Rabi	DoA, 2009
	Jhum, Maize, Wheat, Pulses, Oilseed, Cotton, Tobacco, Sugarcane, and Potato	Circle-wise area	DoA, 2009

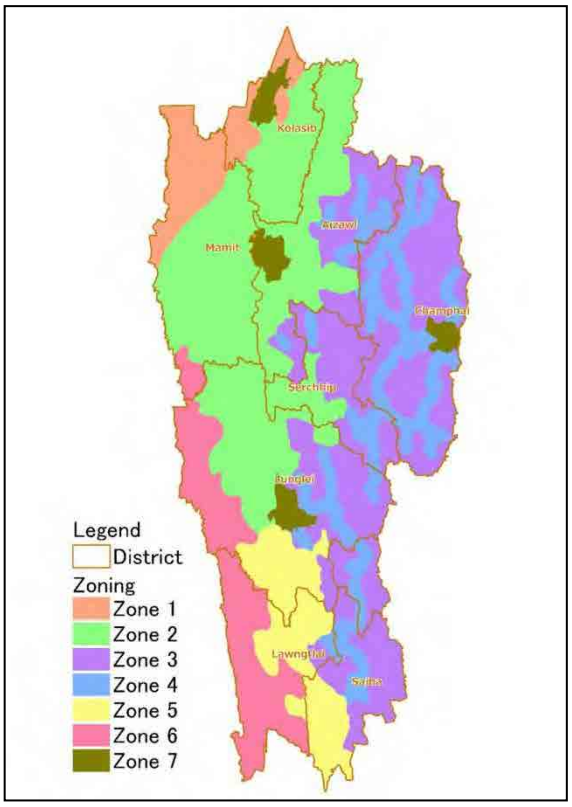
Categories	Type	Description	Source
Horticulture	Bitter Gourds, Cabbage, Chayote and Other Vegetables Ginger, Turmeric, Chilli, and Other Spices Banana, Grape, Pineapple, Lime Lemon, Mandarin Orange, and Other Fruits Flower	Circle-wise production area	DoH, 2012
Market Location	Rural Prime Market and Wholesale Market registered in Trade and Commerce	Village name where market is located	Trade and Commerce

Source: JICA Study Team

5.3.2 Regional Zoning

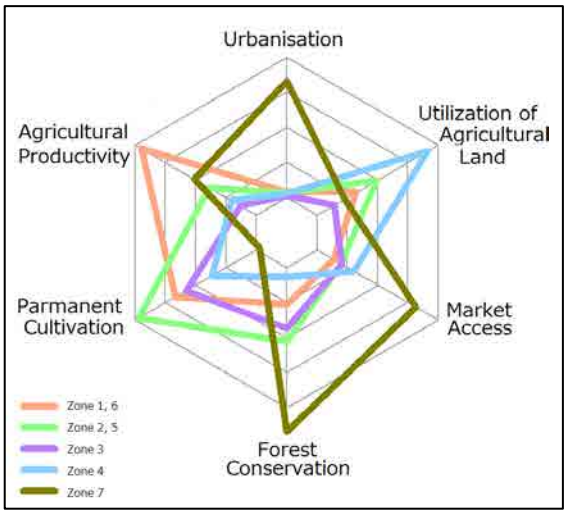
Based on the overlaying of additional data, Mizoram State was divided into seven agricultural zones obtained from five clusters. The map of regional zoning is shown in Figure 5.3.3.

Figure 5.3.4 shows the average PC score of villages in each zone. The main reason why Zone 1 and Zone 6, and Zone 2 and Zone 5 have the same PC score is that the four zones were split from the same two clusters. The detailed interpretation of the seven zones is presented in Table 5.3.2.



Source: JICA Study Team

Figure 5.3.3 Result of Regional Zoning



Source: JICA Study Team

Figure 5.3.4 Average PC Score of Villages in Each Zone

Table 5.3.2 Agricultural Settings in Mizoram State by Regional Zones

Zone	PCA		Characteristic Features
	Components	Evaluation	
Zone-1 Northwestern part of Mizoram near Assamese border	Urbanisation	Low	**Agriculturally advanced region with high productivity and marketability where industrialisation of agriculture has progressed.** ・ The average elevation in this zone is 199 m which is the lowest among the seven zones. The average elevation in Mizoram is 614 m. ・ The average slope is 15 degrees, which is mostly gentle. (Average in Mizoram is 21 degrees) ・ 27% of WRC in Mizoram are developed; there are relatively many water storage tanks and pipes to irrigate horticultural crops. ・ Productivity of paddy rice is low. ・ Vegetables are cultivated during dry season in WRC, but their production is
	Agricultural Productivity	High	
	Permanent Cultivation	Medium	
	Forest Conservation	Low	
	Marketability	Low	
	Utilisation of Agricultural Land	Low	

Zone	PCA		Characteristic Features
	Components	**Evaluation**	
			limited. ・ Cultivated areas of oil seed crop/oil palm and areca nut are large. ・ Strong influences by Assam Economic Zone, e.g., traders from Assam to buy agricultural products and inflow of tenant farmers from Assam. ・ There is a dam for electric generation. ・ A cold storage facility and an oil palm mill are constructed. ・ 29% of fish farms in Mizoram are in this zone and fish farmers are active. ・ Many of cooperatives/associations/SHGs are not functional.
Zone-2 Northern side of Lunglei in the middle of Mizoram	Urbanisation	Low	**Transition from jhum to permanent cultivation has progressed; Semi self-sufficient and market-oriented region** ・ The elevation is around 480 m and the slope is average value in seven zones. ・ Mixed cropping of upland rice with vegetables and cereals is practised in jhum land. ・ Horticultural crops, especially spices, citrus, and bananas, are cultivated in upland areas converted from jhum land, but soil erosion and degradation are severe in these upland areas. ・ Maize and sugarcane are produced although their dry season cultivation is limited. ・ Relatively large land of moderate slope along the river is mainly utilised for upland cultivation. Development of WRC is limited. ・ There are relatively many water storage tanks and pipes to irrigate horticultural crops. ・ Cultivation of coffee is active, and a processing factory for coffee was constructed. ・ There are national road in the north-south direction and state road in the east-west direction; thus, road network is relatively developed. Road with more than district level density of 0.183 km^{-1} is more than the average of Mizoram State. ・ Since accesses to Assam and Aizawl are relatively good, many traders come from Assam to buy agricultural products. ・ Cash crops for markets in Aizawl and Lunglei are cultivated in the region with good conditions. ・ Conversion from WRC to fish ponds is observed. ・ Many of cooperatives/associations/SHGs are not functional.
	Agricultural Productivity	Medium	
	Permanent Cultivation	High	
	Forest Conservation	High	
	Marketability	Low – Medium	
	Utilisation of Agricultural Land	Medium	
Zone-3 East part of Mizoram away from main roads	Urbanisation	Low	**Self-sufficient agriculture region relying on jhum** ・ High elevation (883 m), steepest slope (24 degrees). ・ It includes Mara Autonomous District. ・ 29% of jhum in Mizoram is practised in this zone. ・ Mixed cropping of upland rice with vegetables is practised in jhum land. Temperate fruits are produced. ・ Self-sufficient farmers are predominant due to bad accessibility. ・ Rice, maize, and tobacco are produced during rainy season and pulse and sugarcane are produced during dry season. Their productivity is low. ・ The rainfall during Rabi season is only 518 mm. ・ Lands with moderate slope where water resources are utilised are limited. ・ Alluvial area along the river is small. ・ There are few water storage tanks and pipes to irrigate horticultural crops. ・ Potential of groundwater is low. ・ Accessibility to district road and higher-level roads is most severe. During rainy season, there are some areas whose accesses are blocked. ・ Many of cooperatives/associations/SHGs are not functional.
	Agricultural Productivity	Low	
	Permanent Cultivation	Medium	
	Forest Conservation	Medium	
	Marketability	Low	
	Utilisation of Agricultural Land	Low	
Zone-4 East part of Mizoram along the main roads	Urbanisation	Low	**Accessibility is relatively good and plantation crops are cultivated, together with jhum practice.** ・ Average elevation of 997 m is the highest in seven zones. Slope is 23 degrees which is quite high. ・ 60% of lands are covered by forest. ・ Mixed cropping of upland rice with vegetables is practised in jhum land. Maize and tobacco are produced during the rainy season. Productivity is low. Vegetable production during the dry season is limited. Sugarcane is partially cultivated. ・ Accessibility is relatively good. ・ In upland areas converted from jhum land, horticultural crops are cultivated. Cultivation during the dry season is limited because of limited rainfall, 505 mm during Rabi. ・ Lands with moderate slope where water resources are utilised are limited. ・ Alluvial area along the river is small. ・ There are relatively many water storage tanks and pipes to irrigate horticultural crops. ・ Potential of groundwater is average. ・ Although it is not near urban markets, many villages are located along the trunk roads. It has an advantage in terms of access to urban markets such as in Aizawl and markets outside of Mizoram. ・ Many of cooperatives/associations/SHGs are not functional.
	Agricultural Productivity	Low	
	Permanent Cultivation	Low	
	Forest Conservation	Low	
	Marketability	Medium	
	Utilisation of Agricultural Land	High	

Zone	PCA		Characteristic Features
	Components	**Evaluation**	
Zone-5 Southern side of Lunglei in the middle of Mizoram	Urbanisation	Low	**Transition from jhum to permanent cultivation has progressed. Remains to be self-sufficient agricultural region due to bad accessibility** ・ Middle elevation (445 m), middle-level slope (21 degrees). ・ It includes Lai Autonomous District. ・ Mixed cropping of upland rice with vegetables, cereals, pulse, and tobacco is practised in jhum land. Sugarcane is partially cultivated. ・ In upland areas converted from jhum land, horticultural crops, especially fruit trees and banana are cultivated. Cultivation during dry season is limited. Soil erosion and degradation are observed in these upland areas. ・ Although it belongs to the basin of the Kolodyne River, which is the biggest in Mizoram, the areas where water resources are utilised are limited. ・ There are few water storage tanks and pipes to irrigate horticultural crops. ・ There is a national road in the north-south direction; however, accessibility is bad. Road density is 0.09 km^{-1} (Average in Mizoram is 0.155 km^{-1}). ・ Number of markets is few. ・ Many of cooperatives/associations/SHGs are not functional.
	Agricultural Productivity	Medium	
	Permanent Cultivation	High	
	Forest Conservation	High	
	Marketability	Low - Medium	
	Utilisation of Agricultural Land	Medium	
Zone-6 Southwestern part of Mizoram near Bangladesh border	Urbanisation	Low	**Self-sufficient agriculture with focus on rice paddy** ・ Low elevation (211 m), moderate slope (15 degrees), abundant water resources. ・ Irrigation is underdeveloped, rain-fed rice paddy cultivation is predominant. ・ There are areas where double cropping is practised with utilising rainfall during dry season, but its productivity is low. ・ Chakma Tribe is regarded as earnest agricultural people. ・ While production of horticultural crops is low, high-quality mango is produced. ・ There are few water storage tanks and pipes to irrigate horticultural crops. ・ Cultivation of oil seed crop/oil palm and industrial crops such as tobacco has progressed recently. An oil palm mill is under construction. ・ Infrastructure for distribution is undeveloped. Market access is bad. Road density is 0.10 km^{-1}. ・ Agricultural production for self-sufficient and intra-regional market is practised. ・ Many of cooperatives/associations/SHGs are not functional.
	Agricultural Productivity	High	
	Permanent Cultivation	Medium	
	Forest Conservation	Low	
	Marketability	Low	
	Utilisation of Agricultural Land	Low	
Zone-7 City and its surroundings thereof	Urbanisation	High	**Land-intensive agriculture region in urban neighbourhood** ・ Middle elevation, middle-level slope. ・ It belongs to urban neighbourhood and has high population density (633 head / km^2). 38% of Mizoram people are living in this zone. ・ Vegetable production for Aizawl markets is active, and green houses are built. ・ Agricultural productivity is high. ・ Flowers for export purposes are produced. ・ Cultivation during dry season is also active in the areas with access to water sources (WRC and upland). ・ Development of WRC was completed in general. ・ There are many water storage tanks and pipes to irrigate horticultural crops. Since same water sources are used for urban areas and for irrigation, it is relatively difficult to ensure water resources especially in the dry season. ・ 51 markets are built. There are cold storage facilities, a turmeric processing facility, a livestock processing facility, a fruit juice processing factory, ice plants, a boom processing factory. ・ Road accessibility is good. Road density is 0.4 km^{-1}. ・ Many of cooperatives/associations/SHGs are not functional. ・ Basin of Champhai has high water resources comparatively.
	Agricultural Productivity	Medium	
	Permanent Cultivation	Low	
	Forest Conservation	High	
	Marketability	High	
	Utilisation of Agricultural Land	Low	

Source: JICA Study Team

Chapter 6 Basic Concept and Approach to Land and Water Resources Development and Management for Sustainable Agriculture

6.1 Development Needs and Surrounding Environment of Agriculture Sector

6.1.1 State-level Challenges in Agriculture Development

The rapid urbanization in the State causes deterioration of the living environment of the urban as well as the rural area. The central government of India and the state government emphasises in their 12th Five-Year Plan to increase the viability of the local economy and living environment of rural area. Since the growth rate of rural population is as high as 1.7% and 48,580 educated job seekers are registered in the towns of Aizawl, Champhai, Lunglei, and Saiha as of January 2013, any industry including agriculture absorbing the rural employment is needed. The poverty indicator shows a negative figure of 33.56, which is higher than the national average of 25.70, and the average income of the state is slightly lower than the national average. The state government, in its 12th Five-Year Plan, aims to mitigate those gaps. The prolonged deficit balance in the state finance is also one of the biggest challenges. The tax-to-gross state domestic product (GSDP) ratio is the second worse in all the states of India.

The self-sufficiency rate of rice, which is the staple food in Mizoram, is declined during past seven years from 53% in 2003/04 to 27% in 2010/11. As mentioned in the KVK Vision 2020, the increment of the food security level is also one of the state-level important challenges. Table 6.1.1 shows a summary of five major challenges at the state level.

Table 6.1.1 Summary of Major State-level Challenges

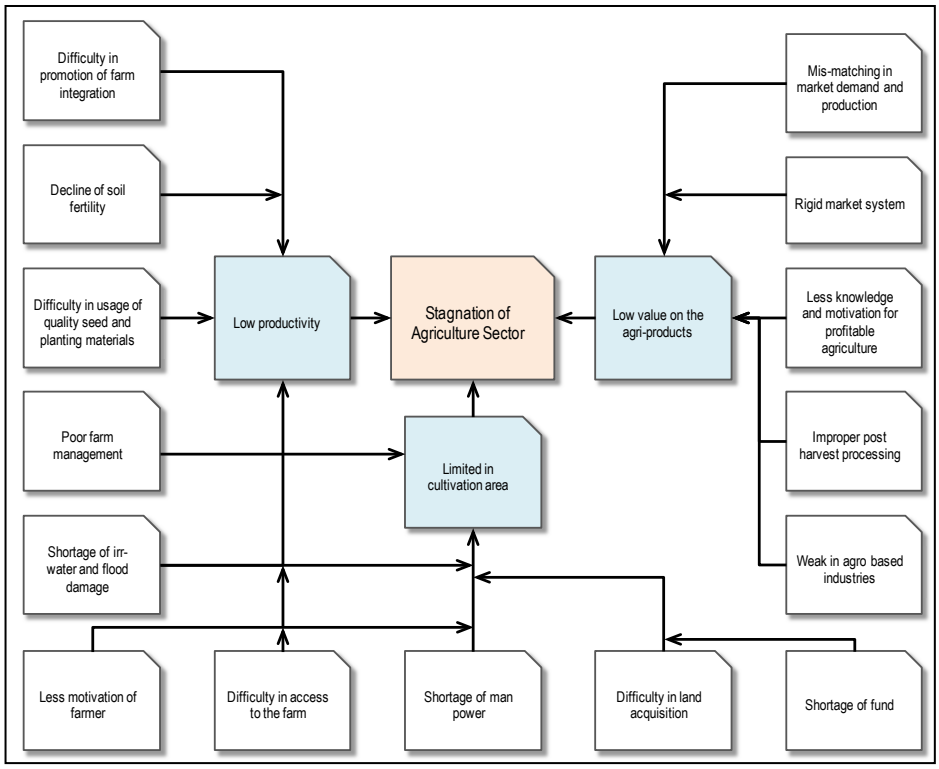
Major Challenge	State-level Indicators	Related Policy and/or Plan
Viability of the local economy and environment	Rural population is 49% with a growth rate of 1.7% per annum[1]	12th Five-Year Plan, India 12th Five-Year Plan, Mizoram New Land Use Policy
Increase income of the state population	Average income per capita of the state population is Rs.61,732, which is lower than the national average of Rs.66,747[2]. The estimated poverty indicator in rural area is 33.56[3].	12th Five-Year Plan, Mizoram Farmer Policy, 2007 New Land Use Policy
Improvement of tax revenue status of the state	75% of the amount received is grant-in-aid from the Government of India (GOI) and contribution. Tax-GSDP ratio is 1.5	12th Five-Year Plan, Mizoram
Increase employment opportunities	The unemployment rate is 10.3%[4] (2011, Census of India). 48,580 of educated job seekers are registered in five townships	North Eastern Region Vision 2020
Increase food security	Self-sufficiency rate of rice is 27% (2012)	National Agriculture Policy, 2001 North Eastern Region Vision 2020 Krishi Vigyan Kendra (KVK) Vision 2020, Mizoram

Source : JICA Study Team

1 *Census of India 2011*
2 *Economic Survey of Mizoram 2012-13, Economic Survey of India 2012-13*
3 *James L.T. Thanga, Rural Poverty: A Socio-Economic Dimension in Mizoram*
4 *JICA Study Team calculated based on the figures of the Census of India 2011*

6.1.2 Structural Problem Analysis of Mizoram Agriculture

In order to overcome the state-level challenges as mentioned above, vitalisation of the agriculture sector is important since the sector absorbs 60% of the state employment and contributes nearly 20% to GSDP. By looking at the growth rate of the agriculture and allied sectors of GSDP, the overall agriculture and allied sectors achieved an average of 5.1, and the agriculture subsector achieved 8.8% per annum from 2005 to 2011 at a constant price[5].



Source : JICA Study Team

Figure 6.1.1 Structural Problem Analysis in the Agriculture Sector of Mizoram

Although the government's rapid effort such as the New Land Use Policy (NLUP) seems to give a positive impact on such physical figures, the potential threat to stagnate the agriculture sector is observed in present agricultural practices, and the necessary measures to uplift the real agriculture sector are very important to support the fundamentals of the state economy.

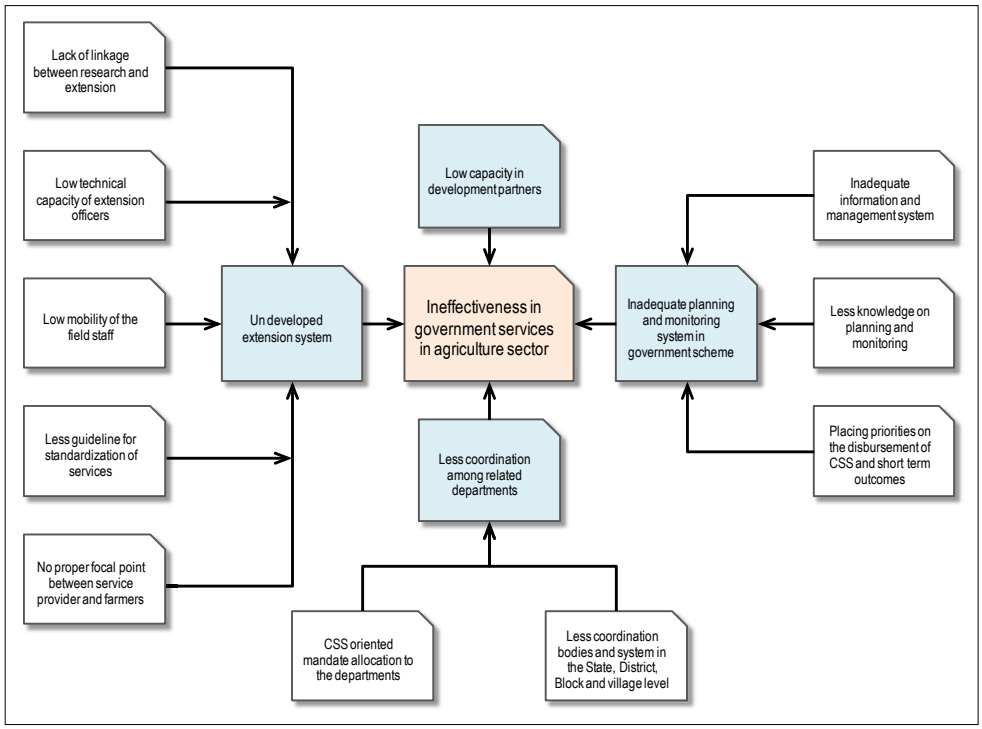
Figure 6.1.1 shows the structural problem analysis in the agriculture sector of Mizoram which was prepared based on the issues identified in previous chapters.

The main issue of the structural problem analysis was set as the "stagnation of the agriculture sector". The main causes of the problem are low productivity, limited harvesting area, and low value of agricultural products. Conversely, the analysis shows that the vitalisation of the agriculture sector could be achieved through improving productivity, expanding harvest area, and increasing the value added on agricultural products.

The main causes of low productivity are: (1) decline in soil fertility, which is mainly due to soil loss/erosion; (2) difficulty in using quality seeds and planting materials due to farmers' insufficient knowledge, inadequate support services, and lack of funds; (3) poor farm management due to little knowledge and poor access to extension services; (4) shortage of irrigation water and flood damage; and (5) low motivations of the farmers.

[5] Final estimate of the state domestic product from 2004–2005 to 2010-2011 Mizoram, Directorate of Economic and Statistics, Planning and Implementation Department, Government of Mizoram

With regard to the problem on limited cultivation area, the main causes are: (1) difficulty in land acquisition; (2) insufficient manpower; (3) poor farm management; (4) shortage of irrigation water and flood damage; (5) shortage of funds; (6) difficulty of access to the farms; and (7) low motivation of the farmers.



Source : JICA Study Team

Figure 6.1.2 Structural Problem Analysis of Government Services in the Agriculture Sector of Mizoram

As to the problem on low value of agricultural products, the main causes are: (1) mismatching in the market demand and production; (2) consolidated market system and value chain; (3) less knowledge and motivation for profitable agriculture; (4) improper post-harvest processing; and (5) weak in agro-based industries.

On the other hand, Figure 6.1.2 shows the structural problem analysis of government services in the agriculture sector. The figure shows the main causes and sub causes of ineffectiveness of government services in the agriculture sector, which are attributed to the human resources of the present government.

The main causes of the ineffectiveness of government services are the following: insufficiency in technical extension services, little coordination among related departments, inadequate planning and monitoring system in the government scheme, and low capacity of development partners, such as community-based organisations (CBOs) and non-governmental organisations (NGOs).

The main causes of the undeveloped extension system are the following: (1) lack of linkage between extension and research institutions such as KVK, Indian Council of Agricultural Research (ICAR), or university; (2) low technical capacity of extension officers; (3) low mobility of field staff; (4) little or no guideline for standardisation of government extension services suitable for the state; and (5) no proper focal point between service providers and farmers.

Furthermore, the main causes for the little coordination among related departments are summarised into two points, namely, the centrally sponsored scheme (CSS) oriented mandate allocation to each department, and little coordination between bodies and systems in the state, district, block, and village levels.

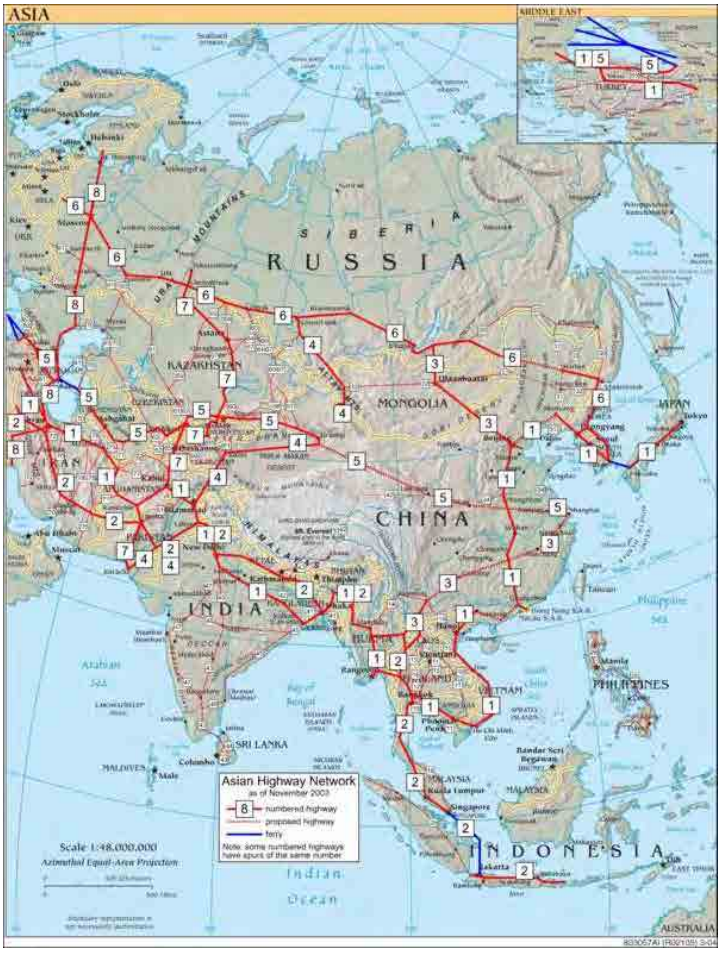
With regard to problem on inadequate planning and monitoring system in the government scheme, the causes are: (1) inadequate information and management system; (2) less knowledge in planning and monitoring in the government officers; and (3) placing priority on the disbursements of CSS and short-term outcomes.

6.1.3 Considerable External Environment of Mizoram Agriculture for Planning

Before discussion of the basic concept of the master plan, the considerable external environment for planning is discussed in this section. Since Mizoram State is located in the landlocked area and shares 404 km of international border with Myanmar, and 318 km with Bangladesh and has the interstate border of 123 km with Assam, 66 km with Tripura, and 95 km with Manipur, the encouragement of international and national border trade is very important for the development. The present encouragement of the connectivity improvement among three countries under the East Policy initiated by the Government of India and North Eastern Council will have positive and/or negative effects to the state's agriculture in the future. The remarkable government policies and plans considered for preparation of the master plan are as follows:

(1) Trans-Asian Highway Initiative

The North Eastern Region of India is landlocked from the sea, and informal border trading is dominant even facing Bangladesh, China, and Myanmar. The region is composed of hinterland away from commercial activities. However, the movement for the expansion of formal border trade in the region has been recently emphasised by the central government, one of which is the Trans-Asian Highway (TAH) initiative which plans to foster logistics movement from ASEAN countries to Turkey through the North Eastern Region of India. The route of the TAH (No. 1) is the longest route of the Asian Highway Network running 20,557 km from Tokyo via South Korea, China, Southeast Asia, India, Pakistan, Afghanistan, and Iran to the border between Turkey and Bulgaria, where it joins with European route E80 (Route No. 1 in Figure 6.1.3). In ASEAN, standardisation of regulations and simplification of international trade procedures had been promoted by targeting free trade in member countries. The Japanese government recently had an agreement with the Myanmar government for support in the establishment of advanced and simplified custom management system for international trade in Myanmar. If the Indian government will diplomatically adapt this ASEAN Big Free Trade trend the corridor between India and the ASEAN countries will appear. The key principle of the Asian Highway Project has been the promotion of international and bilateral trade and tourism to encourage regional economic and social development.



Source: Wikipedia

Figure 6.1.3 Asian Highway Networks

More importantly, it means that economically backward regions can now become the gateway of India to the fast developing ASEAN region.

(2) Enhancement of Indo-Myanmar and Indo-Bangladesh Border Trade under the Look East Policy

The Government of India is enhancing India's connectivety with Southeast Asian countries under the Look

East Policy. There are two major border gates between Mizoram and Myanmar at Zokhawthar (Champai District) and Zorinpui (Lawngtlai District) respectively. Development of the access to the Southeast Asian countires will be provided by the Kaladan Multimodal Transit Transport on both inland and water through Aizawl to Sittwe Port in Myanmar via Lawngtlai, Zorinpui, Kaletwa, and Paletwa. This project will cover the two-lane road from Silchar to Sittwe Port. The government expects to export forest and agricultural products to Myanmar such as bamboo, spices, chilles, ginger, squash, passion fruit, sesame, banana, cotton yarn, and all types of citrus fruits. It also expects to import cattle, pigs, processed meat, electronic goods, readymade garments, textile articles, and textile fabrics.

Source : "Kaladan Multi-Modal Transit Transport Project", the Arakan Rivers Network (ARN), November 2009

Figure 6.1.4 Kaladan Multi-Modal Transit Transport Project

There is one major border gate between Mizoram and Bangladesh at Kawrpuichhuah (Lunglei District). The Trade Facilitation Centre was already constructed at Tlabung and an 18 km truckable road from Tlabung (Demagiri) to Kawrpuichhuah through the rugged hills is being constructed by the state government.

There is a considerable potential to boost exports from Mizoram from the agriculture, horticulture, and floriculture sectors besides forest-based products like bamboo and teak. There is also a sizeable demand for quarry stones and stone chips from Mizoram in Bangladesh which can be tapped to earn dividends for this resource-starved region.

(3) Strengthening Infrastructure and Connectivity among the North Eastern Region

In the North Eastern Region, Vision 2020, the Ministry of Development of the North Eastern Region and the North Eastern Council stated that a good transportation network is necessary to interlink potential growth centres, promote tourism, connect to border trade points, and support for socioeconomic, social, and security needs. The Vision 2020 emphasised roads and railways, waterways, and power improvement, which are the major constraints for connectivity improvement.

The railway line extends to Mizoram at Bairabi, near the Assam border, which is about 1.5 km from Katakal Junction. Passengers and goods arrive at this station once a day. Railways also plays a vital role in carrying essential commodities to the state. Since all major towns are far off from Bairabi, the role of railways in the economy of Mizoram until today is almost negligible. However, the new railway line project from Bairabi to Sairang having a length of 51.38 km is on track. The 'Task Force on

Source: JICA Study Team

Photo 6.1.1 Sidetrack of Bairabi Railway Station

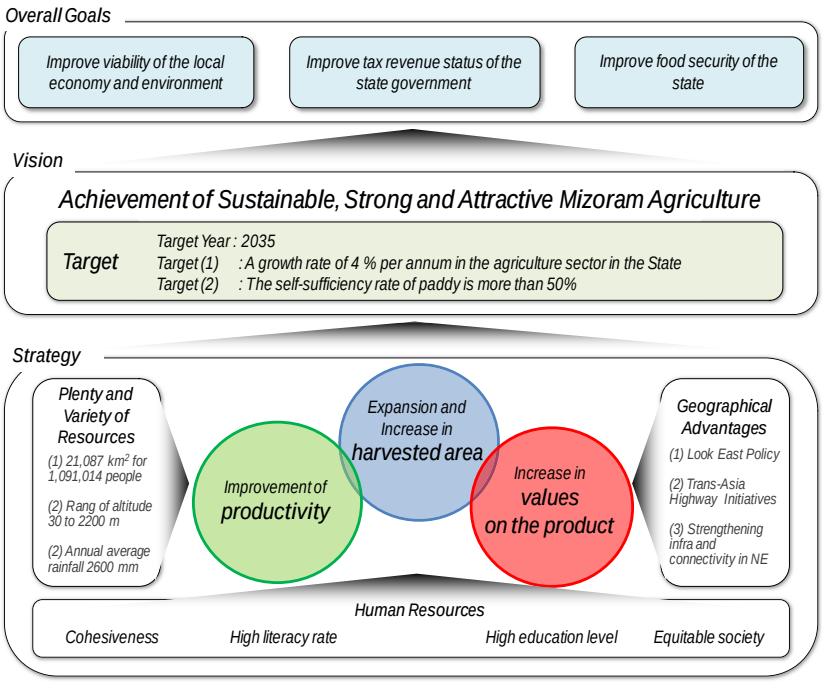
National Railway Project' has also been constituted to function as a mechanism of continuous interaction between railway officials and the state government, and land acquisition is in progress aiming at the completion of the work by December 2017[6].

6.2 Basic Concept

6.2.1 General

Figure 6.2.1 shows the basic framework of the master plan. As described in the above section, the agriculture sector in the state should be strengthened to provide fundamentals for the state economy. The proposed vision or objective of the master plan is the "achievement of sustainable, strong, and attractive Mizoram's agriculture". The basic strategies to materialise the objectives of the master plan are summarised into three main strategies, namely, (i) improvement of the productivity of agricultural crops through improvement of farm management and irrigation development, (ii) expansion and increase of the harvested area through irrigation development and improvement of farm accessibility, and (iii) increase the value of products through promotion of market-oriented farming, enhancement of postharvest technologies, and promotion of agro-industrialisation. The strategies will be achieved through proper utilisation of natural resources such as land and water, geographical advantages supported by the government policies, and good human resources supported by the high literacy rate and education level.

Among various indicators considered to measure the achievement of the objectives of the master plan, the two indicators, namely, agriculture GSDP and self-sufficiency rate of rice as main food crop, are proposed. The master plan covers the holistic actions related to the agriculture sector of the state. The GSDP is one of the most applicable factors to measure and monitor the achievement of the master plan. With respect to the strong initiatives of the central government, it is proposed to set the self-sufficiency rate as an indicator or as a target of the master plan.



Source : JICA Study Team

Figure 6.2.1 Basic Concept and Framework of the Master Plan

Five overall goals that are related to the state-level challenges are proposed in the framework of the master plan. After achieving the objectives of the master plan, it is expected that it will contribute, to some extent, in the achievement of the overall goals.

6.2.2 Vision, Objectives, Overall Goals, and Target

The vision, objectives, overall goals, and targets of the master plan are proposed as follows:

(1) Vision and Objectives

Considering the present roles and importance of the agriculture sector in the state, the vision of the master plan is set as the "achievement of sustainable, strong, and attractive Mizoram's agriculture".

[6] https://capex.cmie.com/

(2) Overall Goals

The overall goals of the master plan are to:

- Improve viability of the local economy and environment;
- Improve tax revenue status of the state government; and
- Improve food security of the state.

(3) Targets

The target year is set at 2035. The physical targets of the master plan are proposed as follows:

Target 1: A growth rate of 4% or more per annum in the agriculture subsectors of the state

There is no target growth rate for the agriculture GSDP of the state. Therefore, the master plan sets a growth rate target of 4% or more per annum in the agriculture subsectors along with the National Agriculture Policy and the 12th Five-Year Plan of the central government of India.

Table 6.2.1 Direction of the Crop Production

Crop	Cropping System	Production Area	Way to Improve Productivity	Major Strategic Crop/ Target Yield (in 2010 > in 2035)
Paddy	Jhum	The traditional Jhum practice is important cultural activities in the Mizoram rural community. It is securing the income of subsistence farmers in the rural area. Keeping the present decrease rate without positive intervention	Improvement of farm management such as quality seed multiplication, measurement against soil erosion, and enrichment and extension of the fallow period	Paddy 1.66 t/ha > 2.0 t/ha
	WRC	Promote more positive development for effective resources utilization and management Aiming at 43,000 (ha) new WRC development in 20 years out of	Upgrading of farmers skills with better government extension system, increment of input of compost, and improvement of replacement ratio of seed paddy	Paddy 2.9 t/ha > 3.5 t/ha
Vegetable and Spice	Jhum	Keep the present decrease rate without positive intervention (Forecast: 25,437 ha in 2012 to 9,700 ha in 2035)	Introduce improved Jhum practices Introduce appropriate varieties	Chilli (dried) 0.9t/ha > 1.2t/ha Brinjal 7.1t/ha >9.0t/ha
	Rainfed Upland	Expand area by converting from Jhum land Expand area by reclaiming new land with sustainability of environment and economy	Implement soil and water conservation measures such as terracing, mulching Introduce new varieties Introduce Integrated Nutrient Management (INM)	Ginger 3.9t/ha >7.0t/ha Turmeric 3.8t/ha >7.0t/ha
	Irrigated Upland	Expand irrigation area by installing small irrigation system and constructing water conservation facilities Expand total cultivation period per year by introducing appropriate technologies and practices on cultivation timing diversification	Implement soil and water conservation measures such as terracing, mulching Introduce new varieties Introduce INM	Cabbage 13.3t/ha >30.0t/ha Okra 6.8t/ha >12.0t/ha Tomato 9.2t/ha >25.0t/ha
	Irrigated WRC	Develop WRC area with irrigation facilities Cultivate vegetables mainly during dry season	Disseminate quality seeds Introduce appropriate technologies such as water saving/efficient systems Introduce INM	Potato 12.6t/ha >20.0t/ha Onion 9.2t/ha >16.0t/ha

Fruit	Upland	Expand area by converting from Jhum land Expand area by reclaiming new land with sustainability of environment and economy	Introduce new varieties Introduce appropriate technologies such as training/ pruning of fruit trees and management of undergrowth Implement soil and water conservation measures such as terracing, mulching Introduce INM	Banana 12.1t/ha >25.0t/ha M. Orange 2.6t/ha >10.0t/ha Lemon 3.2t/ha > 9.0t/ha Grape 8.7t/ha >12.0t/ha Pineapple 7.3t/ha >15.0t/ha

Note: Data of GSDP at constant prices on horticulture sector are calculated by multiplying the quantity of production in each year with the base year price. Therefore, the table shows only the direction for increase in production of horticulture crops. Meanwhile, since market prices of horticulture crops fluctuate widely, producers should consider selecting crops and varieties and preparing the plan of production and sales based on the supply and demand trend of the market.

Source: JICA Study Team

Target 2: Self-sufficiency rate of rice is more than 50%

The trend of the self-sufficiency rate of rice, which is the staple food in Mizoram, is shown in Table 6.2.2. It shows that 73% of the main food is dependent on other states in year 2010/11 though the rate was kept nearly 50 % before *Mautam* started in 2006. The master plan targets to increase the self-sufficiency rate of paddy to more than 50% from present 27% recovery to the level of before *Mautam*.

Table 6.2.2 Trend of Self-sufficiency Rate of Rice

Item	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11
Rice Production (t)	80,241	75,363	75,418	29,464	10,982	48,242	46,292	47,200
Rice Demand (t)	151,815	154,958	158,168	161,447	164,796	168,216	171,711	175,280
Self-sufficiency Rate (%)	53%	49%	48%	18%	7%	29%	27%	27%

Source: JICA Study Team, calculated based on the data from the Department of Agriculture (DOA)

Potential WRC area development

The potential area of WRC has already been assessed in the past with the Irrigation Master Plan carried out by the Water and Power Consultancy Services (WAPCOS) in 1995, and by the Mizoram Remote Sensing Application Centre (MIRSAC) in 2013, as shown in Table 6.2.3.

Table 6.2.3 Past Assessments of WRC Potential Area

	Implementation	Year	Identified Area (ha)	Methodology
Irrigation Master Plan	WAPCOS	1995	49,420	Topography map analysis
Potential Area Survey	MIRSAC	2013	74,644	GIS data analysis and sample site survey

Source: JICA Study Team

The JICA Study Team analysed the WRC potential area using the same GIS data of MIRSAC with ASTER GDEM version 2, which has a more detailed resolution than the one MIRSAC used. Using those data, the JICA Study Team assumed the potential area of WRC of 100,500 (ha) in gross based on the following conditions with aspect of land and water resources availability.

The condition of WRC potential area :

(1) Area slope is less than 25%

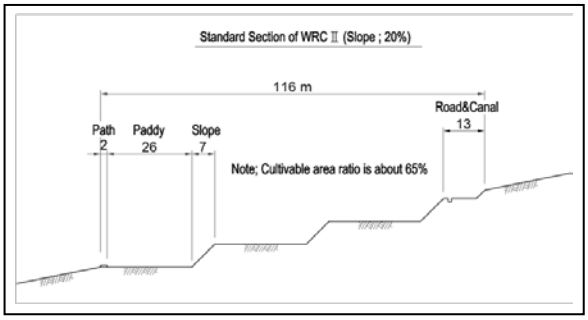
(2) Area locates within 500 m away from perennial river which has more than 1km^2 catchment

(3) Area does not locate within an urban area

(4) Area does not locate within protected forest and/or riverine reserved forest area

(5) Area has more than 50 (ha)

Including the existing WRC and employing a conversion rate of 65% from the gross to net cultivation area (See Figure 6.2.2), the final WRC area is figured out at nearly 65,300 ha.



Source : JICA Study Team

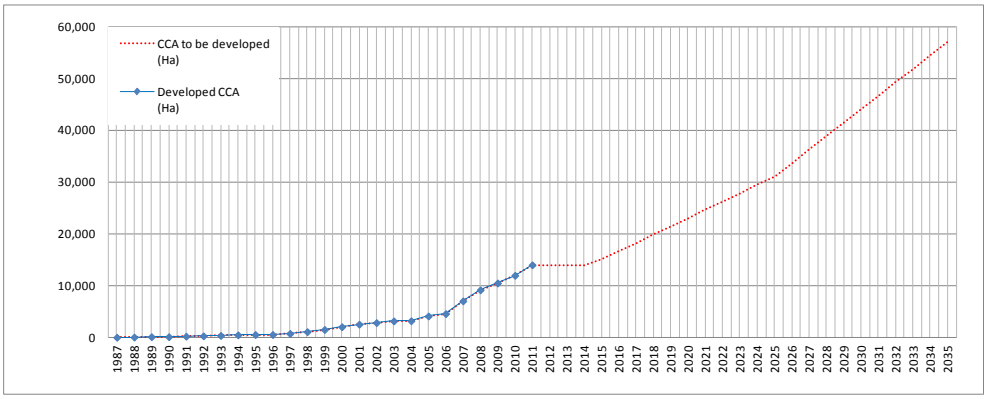
Figure 6.2.2 Conversion Rate to Net Cultivation Area

The developed cultural command area (CCA) of WRC is nearly 18,228 ha as of March 2012 according to the statistical handbook of Mizoram 2012. However, the average 23% of CCA was not properly developed as planned according to the inventory survey carried out by the Minor Irrigation Department (MID) in 2013. Considering such ground situation, the total developed CCA as of March 2012 was recalculated as nearly 14,000 ha.

Although MID's 12th Five-Year Plan (2012 to 2017) targets to achieve 2,600 ha of CCA development per annum, the WRC development area is conservatively proposed at 1,600 ha (60% of 2,600 ha) per annum for the initial ten years (2016 to 2025), and 2,600 ha per annum for the next ten years (2026 to 2035) with the following reasons:

- The new development plan review (DPR) procedure that will be applied from 2015 is a time consuming procedure and requires the necessary capacity development of the field staff at the initial stage.
- The proposed project on the "improvement of water resource utilisation of the existing minor irrigation schemes" is also one of the major tasks of MID. Some resources will be spent for this project, and the resources for the WRC potential area development will be decreased.
- Some of the WRC potential areas are located in the western part of the state and the accessibility to those areas is poor at the moment. The access road construction will be a precondition for such potential area development.

Considering the above and recent delay in budget implementation in minor irrigation development, the irrigation potential area development is estimated as shown in Figure 6.2.3. The total developed area of CCA will be 57,000 ha in 2035/36.



Source: JICA Study Team

Figure 6.2.3 WRC Potential Area Development Scenario

Assessment of paddy cultivation area in jhum

Looking at the recent trend, the decreasing rate of the jhum cultivation area is -4.1%. Taking the same decreasing rate of the jhum area, the jhum area is estimated at 9,716 ha in 2035.

Table 6.2.4 Jhum Land Forecast

Indicator	Unit	Year				
		2001-02	2012-13	(Rate per annum)	⇒	2035-36
Paddy cultivated area in jhum land	ha	40,306	25,437	(-4.1%)	⇒	9,716

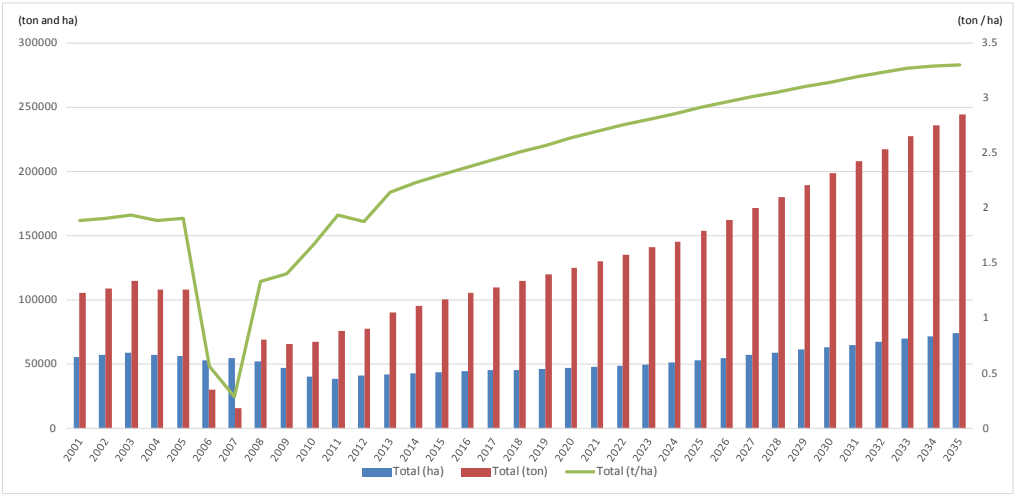
Source: JICA Study Team, calculated based on the Agriculture Statistic 2012, DOA

Paddy yield target

Productivity of paddy in the jhum area is estimated to increase up to 2.0 t/ha at 2035 from the present 1.66 t/ha with the improvement of farm management such as quality seed multiplication, measurement against soil erosion, and enrichment and extension of the fallow period. Since the available records from the Department of Agriculture (DOA) also show a maximum yield of 2 t/ha in the early 1990s, the proposed figure is considered feasible in the state.

Rate of increase of paddy productivity in WRC is planned at 0.03 t/ha/year and achieving a yield of 3.5 t/ha by 2035 from the present 2.90 t/ha due to the upgrading of farmers skills with better government extension system, increment of input of compost, and improvement of replacement ratio of seed paddy. In the past 20-year data of DOA, the yield of 3.0 t/ha was achieved in the early 1990s. Considering this fact and land conditions of Mizoram, the maximum yield of 3.5 t/ha is realistic.

The yearly targeted production, harvested area, and yield are shown in Figure 6.2.4.



Source: JICA Study Team

Figure 6.2.4 Yearly Targeted Production, Harvested Area, and Yield of Paddy

Paddy consumption forecast

The rate of population increment is 2.1% per annum during the period of 2001 to 2011. Taking the same growth rate of 2.1% for the coming 20 years, the population will continue to grow, reaching 1,795,789 by 2035 as shown in Table 6.2.5.

Table 6.2.5 State Population Forecast

Indicator		Unit	Year				
			2001-02	2011-12	(Rate per annum)	⇒	2035-36
Population	Total	Head	888,573	1,091,014	(2.1%)	⇒	1,795,789
	Rural	Head	447,567	529,037	(1.7%)	⇒	790,302
	Urban	Head	441,006	561,977	(2.5%)	⇒	1,005,487

Source: JICA Study Team, calculated based on the Census of India 2011

The annual consumption of rice in Mizoram at present is 164 kg/capita (261 kg/capita in paddy) according to the Agriculture Statistical Abstract 2011-2012 of DOA. Due to the change of lifestyle in the state and diversification of calorie intake in dietary life, it is assumed that rice consumption will decline to some extent in the next 20 years (2016-2035). Figure 6.2.5 shows the worldwide forecast of rice consumption up to 2050. The figure shows that the trend of rice consumption will decrease to at least 0.93% per annum as shown in Scenario 1. In view of the decreasing rate of rice consumption at 0.93% per annum, the annual consumption of rice in 2035/36 will be 137 kg/capita (217 kg/capita in paddy).

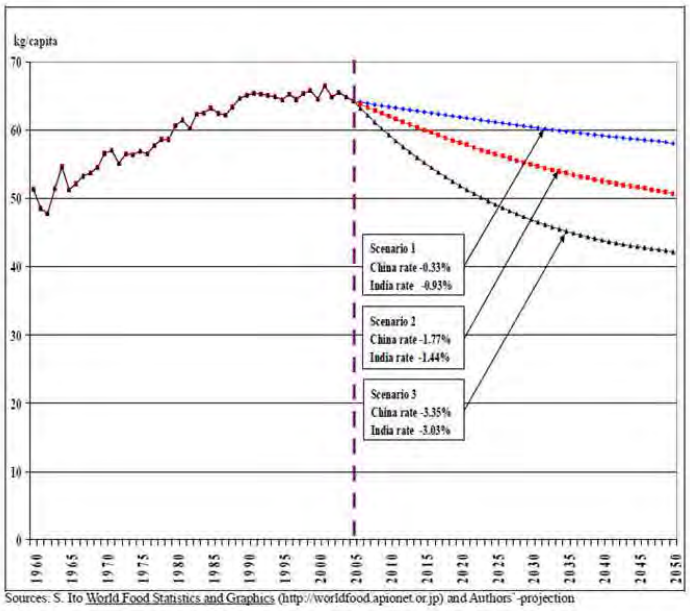


Figure 6.2.5 World Per Capita Rice Consumption

Target of self-sufficiency rate of paddy production

Considering the above discussions, the realistic self-sufficiency rate target of paddy in 2035 is proposed at more than 50%. The summary of the calculation is shown in Table 6.2.6

Table 6.2.6 Summary of Calculation of Self Sufficiency Rate of Paddy

Main Indicator			Year 2012/13	Year 2035/36
Demand	(1) Population	(Head)	1,113,900	1,795,700
	(2) Rice Consumption	(kg/head)	164	137
	(3) Total Consumption = (1) x (2)	(ton)	182,600	246,000
Supply	(4) jhum Area	(ha)	25,400	9,700
	(5) jhum productivity	(ton/ha)	1.66	2.00
	(6) Production in jhum = (4) x (5)x0.63	(ton)	26,500	12,200
	(7) WRC Area	(ha)	14,000	57,000
	(8) WRC productivity	(ton/ha)	2.90	3.50
	(9) Production in WRC=(7) x (8)x0.63	(ton)	25,500	125,600
	(10) Total Production = (6) + (9)	(ton)	52,000	137,800
(10) Self Sufficiency Rate =(3) / (10) x 100		(%)	27	55

Source: Prepared by the JICA Study Team

6.3 Zonal Development Direction and Major Challenges

The state is the diverse area in terms of availability of natural resources, geological and geographical conditions. In order to take advantage of diversity of the state land and resources, the development direction should be discussed with regional-wise which has the similar characteristics. As we discussed in the Chapter 5, the State land can be divided into 7 zones in the view point of urbanization, agriculture productivity, progress of settle agriculture, forest conservation and utilization of the farm land. Carefully assessing the strengthening, opportunity and weakness of each zone, the development direction of each zone is proposed as follows.

Zone-1 is covering Northwestern part of the State near Assamese border. The area is the most advanced area for agriculture development in the state having rather flat land, better water resources and good accessibility from other state. The bigger investment to the industrial crop processing and WRC development can be observed in this area. It is therefore that the development direction in Zone-1 is considered as the progressing of the present production and processing of industrial crop as well as wet rice cultivation with utilization of the better land and water.

The development direction of Zone-2 covering Northern side of Lunglei in the middle of the State is production of various products needed for main habitants in the state through enhancement and upgrading of settled agriculture. The Zone-2 is the main food basket of the state and the conversion from *jhum* to settle agriculture is progressed. The direction of the Zone-2 is supporting the conversion to sustain the settle agriculture in this area.

Zone-3 is covering the east part of the State but away from main roads. The area has high altitude and land is steep. The *jhum* are still remained and subsistence farming is practiced due to the low accessibility to the market. Considering these situation, the direction of Zone-3 is considered as improvement of productivity of subsistence agriculture through improved *jhum* practise and perennial crop cultivation by introducing the agro forestry.

Zone-4 is covering the same area as Zone-3 but having good accessibility to the market. The temperate fruit production such as grape, kiwi and oranges is progressed and having the advantage of differentiate vegetable and fruit production from the middle and western side of the State. Taking advantage of situation, the development direction of the Zone-4 is considered as production of market-oriented differentiated horticulture and fruits production suitable for high altitude.

Zone-5 is covering the Southern side of Lunglei in the middle of the State. The area has the middle altitude nearly 450 m in average with moderate slope. The subsistence farming is practices without proper market channel at present. However there is the possibility to improved the accessibility of this area to Aizawl and/or Myanmar through road rehabilitation of NH54 and Kaladan Multi-Modal Transit Transport Project in the future. It is therefore that the development direction of this area is considered as production of regional required products at first and shifting to export-oriented industrial or other crop production.

Zone-6 is covering the Southwestern part of the State near Bangladesh border. The most of the part is located in the Chakma Autonomous district. The area is recognized as one of the high potential area for agriculture development supported by the rather flat land and good water resources. The farmers are dedicated and having the potential for double cropping of wet rice cultivation. Considering the resources availability and the geographical location of this area, the development direction is considered as increase in production of Mizo rice and export-oriented products with utilization of better water resources and land.

Zone-7 is the town area namely Aizawl, Lunglei, Champai and Kolasib. Observing the present consumers' trend in town area to seek for the Mizo food which is believed in the safe and healthy, the area classified in Zone-7 will have a role to supply the enough quantity of the safe and quality food to urban population with enhancing the organic farming or faming with minimum chemical.

The major challenges exist in each zone are also assessed and identified. Those challenges are classified into three aspects namely production, marketing and infrastructure. The major constraint in the institutional aspect is also observed in each zone. The items are almost similar among 7 zones which is summarized in Figure 6.1.2. The zonal development direction and observed major challenges are summarized in Table 6.3.1.

Table 6.3.1 Zonal Development Direction and Major Challenges

Zone	Development Direction	Major Challenges	
Zone-1	Progressing of production and processing of industrial crop (oil palm, rubber, areca catechu, areca nut) and wet rice through development and effective management of better land and water resources	Production aspect	(1) Expansion of cultivation area and improvement of productivity of industrial crops. (2) Hedging farmers' risks and improvement of productivity of land and water through promotion of agriculture diversification with fisheries. (3) Promotion of agriculture mechanization in the low land (4) Enhancement of winter crop production in WRC area
		Marketing aspect	(1) Diversification of market channels which is controlled by Assam traders. (2) Effective usage of available storage facilities and processing plants. (3) Enhancement of border trade information management system and its effective utilization. (4) Improvement of post-harvest technologies of industrial crops (5) Incubation and/or strengthening of business manager or enterprise for agricultural industries

Zone	Development Direction	Major Challenges	
		Infrastructure aspect	(1) Improvement of accessibility to farm. (2) Improvement and rehabilitation of irrigation facilities for WRC. (3) Construction of water preservation facilities. (4) Enhancement of railway transportation, border trade infrastructure, and power supply.
Zone-2	Production of various products needed for main habitants in the state through enhancement and upgrading of settled agriculture	Production aspect	(1) Improvement of productivity in upland field converted from jhum. (2) Expansion of winter crop cultivation in WRC and upland field. (3) Year-round production of various horticulture crops and fruits based on market needs. (4) Hedging farmers' risks through promotion of agriculture diversification with animal husbandry.
		Marketing aspect	(1) Diversification of market channels which is controlled by Assam traders.
		Infrastructure aspect	(1) Improvement of traffic capacity of part of major roads and accessibility to farm. (2) Development of irrigation facilities for WRC and upland and procurement of micro-irrigation kit. (3) Land development to prevent soil erosion and construction of water preservation facilities. (4) Steady implementation of the railway project to Sairang and construction of interchange trading complex in the station.
Zone-3	Improvement of productivity of subsistence agriculture through improved jhum practise and perennial crop cultivation	Production aspect	(1) Improvement of jhum productivity. (2) Improvement of productivity and expansion of cultivated area in upland field converted from jhum. (3) Promotion of agro forestry with temperate fruit trees and others (4) Improve the productivity through integration of crop and animal husbandry
		Marketing aspect	(1) Diversification of regional market channels. (2) Construction of storage facilities and their effective utilization.
		Infrastructure aspect	(1) Improvement of accessibility to farm. (2) Development of irrigation facilities for WRC and upland and procurement of micro irrigation kit. (3) Land development to prevent soil erosion and construction of water preservation facilities.
Zone-4	Production of market-oriented differentiated horticulture and fruits production suitable for high altitude	Production aspect	(1) Expansion of temperate tree crop cultivation area and improvement of quality of production. (2) Improvement of productivity and quality of horticulture product and expansion of Rabi cultivation area. (3) Improvement of jhum productivity. (4) Hedging farmers' risks through promotion of agriculture diversification with animal husbandry.
		Marketing aspect	(1) Promotion of food industry based on fruit processing. (2) Diversification of market channels to improve the market system. (3) Construction of storage facilities and effective utilization. (4) Establishment of signature agricultural product. (5) Mizoram branding and promotion.
		Infrastructure aspect	(1) Improvement of accessibility to farm. (2) Development of irrigation facilities for WRC and upland and procurement of micro irrigation kit. (3) Land development to prevent soil erosion and construction of water preservation facilities. (4) Strengthening power supply.
Zone-5	Production of regional required products at first and shifting to export-oriented industrial or other crop production	Production aspect	(1) Improvement of productivity and expansion of cultivated area for horticulture, fruit, and industrial crops. (2) Improvement of the quality of the product. (3) Hedging farmers' risks through promotion of agriculture diversification with animal husbandry.
		Marketing aspect	(1) Diversification of market channels. (2) Construction of storage facilities and their effective utilization. (3) Improvement and enhancement of Myanmar border trading system. (4) Mizoram branding and promotion.
		Infrastructure aspect	(1) Development of major road with steady implementation of the Kaladan Multi Modal Transit Transport Project and improvement of accessibility to farm. (2) Development of irrigation facilities for WRC and upland and procurement of micro irrigation kit.

Zone	Development Direction	Major Challenges	
			(3) Land development to prevent soil erosion and construction of water preservation facilities. (4) Strengthening of power supply.
Zone-6	Increase in production of Mizo rice and export-oriented products with utilization of better water resources and land	Production aspect	(1) Extension of rice cultivation area, improvement of rice productivity, and promotion of vegetable cultivation during Rabi season in WRC paddy land. (2) Increasing and improvement of production of tropical tree crop cultivation area. (3) Hedging farmers' risks through promotion of agriculture diversification with fisheries. (4) Promotion of farm mechanization in lowland area.
		Marketing aspect	(1) Diversification of market channels. (2) Improvement on post-harvest technologies of rice. (3) Improvement of Myanmar and Bangladesh border trading system and information management system. (4) Mizoram branding and promotion. (5) Incubation and/or strengthening of business manager or enterprise for agricultural exportation
		Infrastructure aspect	(1) Rehabilitation and widening of roads running north and south and improvement of accessibility to farm. (2) Development of irrigation facilities in WRC paddy area. (3) Land development to prevent soil erosion and construction of water preservation facilities. (4) Improvement of water transportation facility. (5) Development of infrastructure for border trade.
Zone-7	Supply of safe and traceable quality agriculture product to urban population	Production aspect	(1) Year-round production of quality horticulture crops. (2) Increase in traceability of the product. (3) Increase in production and improvement of quality of flower industry. (4) Production of necessary organic fertilizer. (5) Improvement of rice productivity and promotion of winter cultivation. (6) Farm mechanization.
		Marketing aspect	(1) Diversification of market channels. (2) Efficient use of existing storage and processing facilities. (3) Mizoram branding and promotion for flowers and others. (4) Improvement on post-harvest technologies of rice. (5) Incubation and/or strengthening of business manager or enterprise for flower industries.
		Infrastructure aspect	(1) Development of irrigation facilities for upland and procurement of micro irrigation kit. (2) Strengthening of power supply.

*Source: JICA Study Team***Development Approach**

6.4.1 General

In order to overcome the identified major challenges in each zone, three development approaches namely (1) Institutional Development for Effective Agricultural Development Planning and Implementation, (2) Enhancement of Sustainable Agriculture Production through Proper Resources Utilisation and Management to mainly target the production and infrastructure aspect and (3) Establishment of Good Agriculture Value Chain to target the market aspect are proposed. Overview of three approaches are summarised in the following section.

6.4.2 Approach 1: Institutional Development for Effective Agricultural Development Planning and Implementation

(1) General Description

Although the agriculture and rural area development needs holistic approach with corroboration of various stakeholders, the system to facilitate the corroboration among the government stakeholders and corroboration between government and farmers are weak in Mizoram. The State agriculture-related government department is divided into a number of departments such as Minor Irrigation, Agriculture, Horticulture, Fisheries, Animal Husbandry and Veterinary, and Sericulture. Those departments are handling CSS with their own circle office without close coordination and

communication with other departments though development committees are organised at state, district and village levels in some CSSs. The lack of collaboration among the concerned departments has impeded their respective inputs to generate synergetic effects at each state, district and village levels. Moreover, although the KVK Vision 2020 was prepared by the DOA covering the wide subjects in the agriculture sector, the government does not have sufficient and qualified staff to prepare the micro or regional plans and monitoring of those.

On the other hand, many farmers and producers' organisations such as cooperative societies, associations and SHGs organised at village level are functioned as recipients for government' assistances such as subsidies, loans and trainings. Although they are empowered in the selection of the beneficiaries and monitoring of village level activities, the majority of these organisations and their members are lacking capacities (skill and knowledge) to fulfil those tasks.

By looking at the government supporting services for agriculture activities, despite the State has the common issue of low accessibility and connectively due to the severe topographical situation, the existence of different operational arrange of each department makes farmers more difficult to access to the extension services. The farmers are not exposed to the supporting services provided by the private sector such as agro machinery, post harvest facilities and input either since the agriculture shops are mainly exist in the town area.

Considering above, proper institutional development for effective agricultural development through enhancement of government planning and implementation capacity, convergence planning and provision of the one stop quality supporting services to the farmers. The expected outcomes in this approaches are summarized as follows.

(2) Programmes

Programme 1-1 : Stakeholders' capacity development and convergence planning

The programme aims to establish the institution for effective agriculture development through strengthening capacity of stakeholders such as officers of concerned government departments, NGOs, village-based organisations (CBOs), farmers in terms of planning, implementation, and monitoring on agriculture-related schemes as well as through facilitating collaboration among these stakeholders.

Regarding preparation of agriculture policy and vision, an *agriculture development committee* will be organised where representatives from the concerned departments could participate in for discussing these issues, which might facilitate collaboration among these departments.

It is planned that capacity of the stakeholders will be strengthened not only by providing seminars and trainings on the related fields (project cycle management, farming, agriculture technology, marketing information, etc.) to them but also supporting them to actually implement agriculture-related schemes such as ATMA Scheme.

For preparing policy and vision as well as planning the project, data and information on present situation of Mizoram are required. Thus, the system for appropriately collecting and compiling necessary data/information is planned to be established.

The expected outcomes are:

- An organisation with participation of concerned departments for discussing Mizoram agriculture vision and policy will be established.
- Mizoram agriculture vision and policy with reflecting reality and features of Mizoram will be prepared.
- Capacity of officers of concerned government departments (Minor Irrigation, Agriculture, Horticulture, Fisheries, Animal Husbandry and Veterinary, and Sericulture, etc.) will be strengthened in terms of planning, implementation and monitoring of the agriculture development schemes.
- Collaborative relations among the concerned government departments will be established.
- State-wide system for collecting and managing agriculture-related data and information will be established.
- Village based self-reliant organisations, which should take key roles for agriculture development, will be strengthened.
- Village convergence plan for agriculture development based on the proper land use plan is formulated.

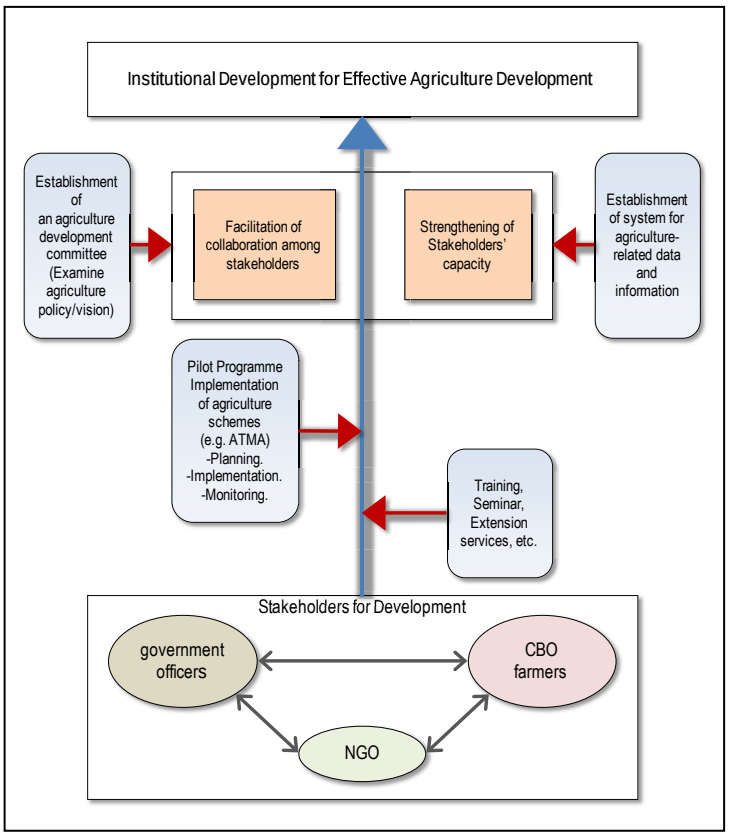


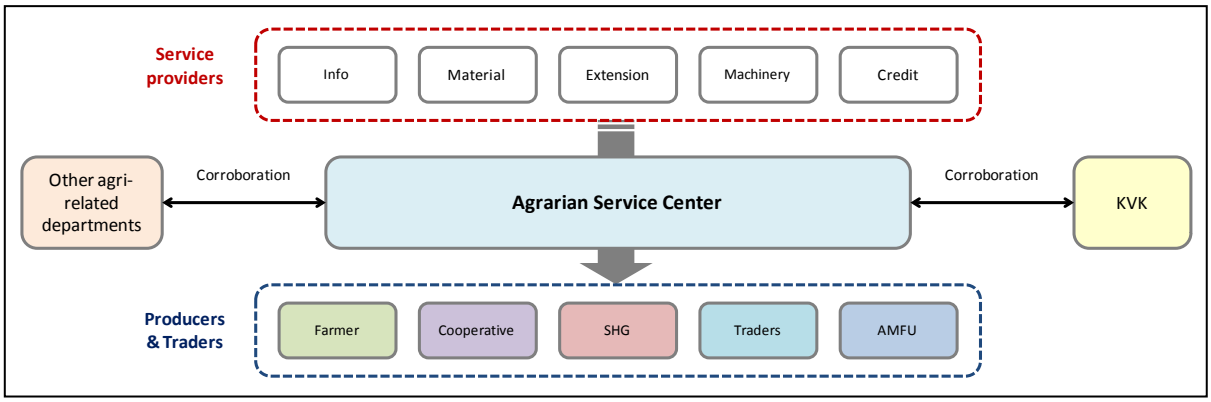
Figure 6.4.1 Concept of Strategies

Programme 2-2 : Enhancement of Basic Agriculture Supporting Services

Programme aims to establish agriculture extension system suited to Mizoram. The strategy proposes to unite the circle office for each concern department into Agrarian Service Centre (ASC) which to be established in each Block. ASC will act as interface of the agriculture supporting services to the farmer, group of farmer, SHG and other stakeholders and expected to link to the research institution such as KVK and other government organizations. Service providers are not only providing the services but also getting the necessary information on farmers and other service providers. Through those bilateral information exchange, the quality of the services will be brushed up.

The various extension functions for supporting farmers, who are operating in poor geographical conditions, shall be concentrated to ASC and comprehensive services including cultivation skills, agriculture credit, marketing, and so on shall be provided at the ASC. The ASC can be collaborating with the roadside shop and strengthening of marketing networks and in the future.

The programme includes enhancement of extension services namely quality seed production, production and distribution of organic fertilizer and introduction of proper farm mechanization to the farmers with corroboration of research institutions, private sector and villagers.



Source: JICA Study Team

Figure 6.4.2 Basic Concept of Agrarian Service Centre and Supporting Services

The expected outcomes in this programme are:

- Agrarian Services Centre (ASC) is established in the area to coordinate all concerned agencies relating agriculture and rural development and providing the necessary agriculture supporting services.
- The service providing Production and marketing of agriculture inputs, such as seeds, saplings, shall be established in the area.
- Farmers carry out the group management of agriculture machinery. Utilization of tractors and power tillers for transportation purpose would improve manual hauling of inputs and products.

(3) Proposed Projects

The proposed project under this approaches are eight as described in Table 6.4.1.

Table 6.4.1 Proposed Project under Approach 1

No.	Project Name
Programme 1-1 : Stakeholders' capacity development and convergence planning	
1-1	Establishment of an "Agriculture Development Committee"
1-2	Establishment of State-wide System for collecting and managing agriculture-related data and information
1-3	Capacity Strengthening Government Officers for planning and Good Agriculture Extension
1-4	Preparation of Regional Agriculture Development Plan
1-5	Strengthening of village based self-reliant organisations for taking key roles for agriculture development
Programme 1-2 : Enhancement of Basic Agriculture Supporting Services	
1-6	Establishment of agrarian services centre
1-7	Production of Appropriate and Quality Seed Paddy
1-8	Rehabilitation and upgrading of existing fish farms for sustain fingerlings production

Source: JICA Study Team

6.4.3 Approach 2: Enhancement of Sustainable Agriculture Production through Proper Resources Utilisation and Management

(1) General Description

The Mizoram is the forest land in principal and people are used to live within the capacity of ecosystem. However looking at the recent rapid conversion from jhum to permanent cropping system, many of the lands are newly allocated to farmers without considering the proper land use planning or without awareness of proper resources management and environmental conservation measures. It can be a threat of disruption of ecosystem, declining of the agriculture production and productivity and destabilization of the farm economy.

Source: JICA Study Team

Photo 6.4.1 Banana Cultivation on Sloping Land

Although the State has more than 20,000 km^2 of land and average 2,600 mm of annual precipitation, the exploitable resources are limited due to the geographical and geographical conditions of the State. To uplift the agriculture production and productivity, more sensitive management of natural resources through promotion of settled and intensive agriculture is needed. Although there are many possibility to utilise available natural resources into the crop production without high agriculture input, those possibility and resources are not extracted yet without proper guidance, awareness and technologies transfer.

Fundamental infrastructure is needed to utilise the available resources fully especially in Mizoram where geological condition is severe. However the necessary infrastructure such as irrigation facility, road and terrace are still lack and some of the existing facilities are not utilised in the full scale.

Considering such situation, promotion of sensitive resources managed low input agriculture is required supported by proper planning, technologies transferring and basic infrastructure development.

(2) Programme

Programme 2-1 : Enhancement of Resources Managed Farming System

The programme starts with the preparation of the land use and water resources development and conservation plan, which will be base of the regional agriculture development plan (proposed under programme 1-1), with community's initiative under proper government guidance. The plan is prepared with aspect of sustainability, effectiveness and acceptability of agriculture development.

The strategy is planning to propose the guidelines constituting the base for land management for the elaboration of the land use plan (see Table 6.4.2). They are essentially classified according to slopes and guideline shows the necessary soil and water conservation measures as well as the respective farming systems to different moisture regimes. On steep sloping lands exceeding 70%, essentially, afforestation accompanied by agroforestry is recommended. In the suburban vegetable growing areas where a large investment will be able to assure high returns, the application of costly measures for soil and water conservation will enable its use as agricultural land.

Table 6.4.2 Basic Guidelines for Land Management (proposed example)

Slope (%)	Soil and Water Conservation Measures	Water Condition	Farming System Recommended	Remarks
0-25	Water control/ management	Rainfed	Paddy or summer crop (+winter crop on river bank)	WRC-I: 0%-10% slope WRC-II: 10%-25% Crop-fishery integration
		Irrigated	Double cropping: paddy + winter crop	

Slope (%)	Soil and Water Conservation Measures	Water Condition	Farming System Recommended	Remarks
25-35	Bench terracing Counter Trenching Hedgerow Mulching	Rainfed	Fruit tree + summer crop	Crop-livestock integration Rain-shelter cultivation
		Irrigated	Double cropping: paddy + winter crop Year-round cultivation (cereals, root and tuber crops, vegetables) Fruit tree and cover crop + winter crop	
35-70	Bench terracing with stone wall Half-moon terracing (individual terracing) Cover crop planting	Rainfed	Tree crop and cover crop	Crop-livestock integration
		Irrigated	Tree crop and cover crop + winter crop Year-round cultivation (cereals, vegetables)	
70-	Afforestation	Rainfed	Agroforestry	Crop-livestock integration
	Bench terracing with stone wall Half-moon terracing (individual terracing) Cover crop planting	Irrigated	Tree crop and cover crop + winter crop Year-round cultivation (cereals, vegetables)	

Source: JICA Study Team

The programme optimise the local resources not depending on outside resources with high cost, and easy and efficient sustainable implementation methods for environmentally-balanced farming system for jhum, sloped, and flat land agriculture and introduce the farm integration with livestock and fishery into crop cultivation. In terms of promotion of environmentally balanced farming practices,

To consider environmentally-balanced agriculture by optimizing local resources such as bamboo, useful plants, and trees, farmers should learn the best complementary measures from agronomic, vegetative, and structural methods as shown in Table 6.4.3. One of the most applicable methods to build terrace for subsistence farmers is the natural vegetative strip (NVS) system without high cost civil works through it takes years. From a NVS system, by-products such as firewood, pole, fodder, and green manure are also obtained.

Table 6.4.3 Complementary Measures for an Environmentally-balanced Farming System

Complementary Measure	Protective Cover	Soil Structure	Less Runoff	Applicable Land
Agronomic	Cover crop, Mulch, Mixed/Intercropping	Minimum/zero tillage, increasing organic matter	Contour cropping, mix perennial crops/relay cropping for the soil is kept covered throughout the year	Jhum land, sloping land, and flat land area
Vegetative	A strip of slope covered with grass during the entire period such as vetiver grass	Utilise the nitrogen-fixing trees and shrubs; also utilize them as green manure and fodder	A strip planted with grass, shrubs, and trees (hedgerow)	Sloping land, flatland hills, and partially for jhum land
Structural	Flagstones		Stone lines, contour ridge and cross-ties, terrace (soil ridge, bench, half-moon), and placement of poles/bamboo along contour	Sloping land and flatland hills, partially for jhum land: poles and bamboo placement

Source: JICA Study Team

Traditional prominent technology, utilizing bamboo by placing them along the contour in jhum agriculture for soil and water conservation practiced by farmers who are living in similar circumstance in surrounding states such as Nagaland.

It is important to increase crop intensity by integration of paddy and plantation crops in flatland/hills area. Improving land use efficiency could be achieved by the introduction of integrated farming for paddy cultivation with subsidiary crops, and plantation with economically- and

environmentally-balanced intercrop, agroforestry system, etc. In order to increase agricultural production in the area and income of plantation farmers, the project/the state government will assist agro-processing activities by promoting investment to plantation farmers.

The programme promotes more to integrate fish and livestock farming into crop cultivation for stabilisation of the farm economy. The programme motivates and empowers the fish farmers and farmers to learn and acquire techniques of aquaculture practices through demonstration activities and awareness campaign. In addition strengthening the capacity of DOF' fisheries staff on knowledge, skills, and techniques, and the rehabilitation of the existing fish seed farms are the prerequisites for the promotion of fishery integration in agriculture. Therefore, the development strategy conceived in this programme is to create a practical and effective institution (DOF) that will be dedicated to improve aquaculture technology and extension/training services for the development of aquaculture using the available resources. It is expected that the development of aquaculture would continue along the approach from the existing stage (low input-low output fish farmer) to small-scale commercial fish farming operations to some extent. Fish farmers and farmers will be encouraged to form groups (group-oriented approach), although they will be operating and managing their individual fishponds. The advantages of forming groups are : (i) members can discuss and share their knowledge and experiences, and (ii) divisional forest officers (DFOs) can provide extension and training services that are cost effective and time saving to groups. Further, it is convenient for the groups to purchase farm inputs such as fingerlings, feeds, and manure in bulk at a reasonable price.

It is appropriate to diversify agriculture and to increase farmers' income by introducing combination of livestock farming and women's activity, although substantial portion of household economy is protected by subsidised schemes in rural areas such as the National Rural Employment Generation Scheme (NREGS)[7]. To strengthen subsistence farmer's household economy, it is necessary to diversify their income sources by introducing small-scale livestock farming utilizing local resources. In addition, it may be suitable to strengthen women's groups along with group saving activities, which may raise funds in order to attend to emergency requirements, and further sustainable income generation activities like small-scale livestock.

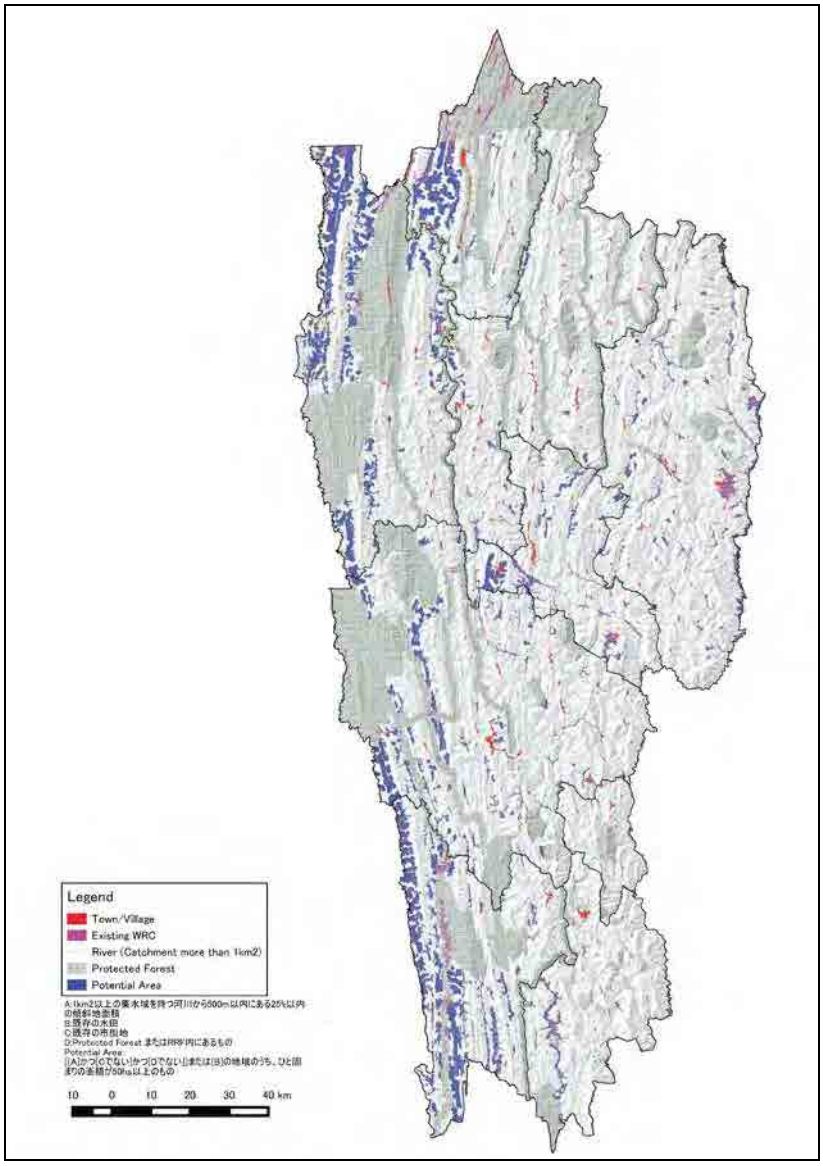
The expected outcomes are as follows:

- Preparation of proper land use and resources management plan in each village
- Realisation and capacity development of the community on resources management
- Preparation of guidelines and recommendation, and technologies transferring of environmentally balanced agriculture for jhum, slop and flat/WRC area
- Integrate fish farming (aquaculture) and livestock farming into rural livelihood and agriculture

[7] NREGS: Mahatma Gandhi National Rural Employment Guarantee Scheme aims to enhance livelihood security in rural areas by providing at least 100 days of guaranteed wage employment in a financial year to every rural household willing to do manual unskilled work.

Programme 2-2 : Enhancement of Fundamental Infrastructure

The 2nd programme targets at construction or rehabilitation of the irrigation and drainage facilities, agriculture link and access road and soil and water conservation facilities. The irrigation rehabilitation work includes (1) development of the impounding capacity of the minor irrigation scheme such as reservoir or regulation ponds in WRC as well as upland cultivation area, (2) improvement of irrigation efficiency through rehabilitation of the canal system and providing necessary water regulation and control facilities, (3) introduction and enhancement of micro irrigation facilities, and (4) development of agro-wells or lift irrigation facilities in some cases. The agriculture link and access road improvement or development includes mainly formation of the road and installation of drainage facilities such as side drains and culverts can improve road condition and enhance durability of farm roads longer with minor cost. The soil and water conservation facilities are mainly check dam, water harvesting tank, river bank protection and small scale intake structure. The programme focuses on the extracting the existing potential of available infrastructure through rehabilitation of upgrading work at principal and development the new infrastructure needed.



Source: JICA Study Team

Figure 6.4.3 WRC Development Potential Map

Since the state government is empowering O&M of irrigation facilities and agricultural link road to WUA and VC, the programme aims to develop the technical and financial capacity of WUA and VC on O&M as well as their sense of ownership for the facilities. The programme proposes to involve CBOs in the planning process to reflect their preference and ideas for better O&M and giving them the basic knowledge, tasks, and responsibilities against the facilities. Although the present planning procedure requires the preparation of the O&M plans and formulation of WUA or other organisation for O&M, the necessary awareness of the O&M activities and responsibilities of the organisation and necessary technical development assistance have not taken place. The programme proposes preparation of the guidelines and manuals of (1) O&M of irrigation facilities and agricultural link road, (2) Strengthening the technical capacity of existing CBOs for O&M and (3) Strengthening of financial capacity and management skills of the existing CBOs for training of CBOs during planning, before and/or after construction of the respective facilities.

(3) Proposed Projects

Ten projects are proposed under Approach 2. The title of those project are shown in Table 6.4.4.

Table 6.4.4 Proposed Project under Approach 2

No.	Project Name
Programme 2-1 : Enhancement of Resources Managed Farming System	
2-1	Improvement of Jhum based agriculture
2-2	Enhancement of environmentally balanced slope area cultivation
2-3	Enhancement of WRC Cultivation and Promotion of Winter Crop
2-4	Integration of Livestock Farming into Crop Cultivation
2-5	Integration of fish farming into crop cultivation
Programme 2-2 : Enhancement of Fundamental Infrastructure	
2-6	Irrigation and Command Area Development for WRC Potential Area
2-7	Improvement of Water Resource Utilization for Existing Irrigation Schemes
2-8	Construction of Soil and Water Conservation Facilities
2-9	Improvement of Farm Accessibility and Transportation
2-10	Capacity Development of O&M of Fundamental Infrastructure

Source: JICA Study Team

6.4.4 Approach 3: Establishment of Good Value Chain for Agriculture Product

(1) General Description

The values on the agriculture product produced in Mizoram is still low and there is room to be improved in the supply chain from production to retailing. By looking at the production side, although the consumers in the town demand Mizoram products, the production is insufficient or mismatching to the market needs and a large quantity of vegetables are imported from other states, particularly during the dry season due to (i) difficulty of access to irrigation water (ii) low motivation cased by low profit; (iii) insufficient of quality seeds and seedlings and (iv) underdevelopment technologies adapted to sloping lands that enable labour savings and cost reduction and of machinery.

The inferior condition of economic infrastructure such as inadequate road network and rigid market system controlled by traders in Assam and associations formed in each stage of distribution channel within the state give unnecessary loss of values in the distribution system. Since projects on the construction of international roads and railroads are on the drawing boards and such projects will improve the transport conditions, it is required to enhance the marketing capability in this occasion.

Although post harvest and agro processing are still in the low level, there is a sign for new initiatives shown by the operation of winery managed by a group of grape growers, offering the prospect of development of such food industry based on local products and with a key part played by the farmers' organisation. Some enterprises such as the Community Development Action and Reflection (CIDAR), a ginger processor, and Hnamchhantu Pawl (HCP), a broom processor, are developing their own procurement network for raw materials and supply chains out of the existing market system. Moreover, one can observe signs of floricultural industry such as investment by a private flower exporting enterprise and organisation of an independent marketing network by the flower growers' association. However, regarding the growers' association, the linkage with market is still weak and they suffer from difficulties even in obtaining packaging materials. The approach aims establishment of good agriculture value chain which extracts potential value of the agriculture products without loose unnecessary values, which gives proper profit distribution among the stakeholders, which facilitates good information flow and good communication among the stakeholders.

(2) Programme

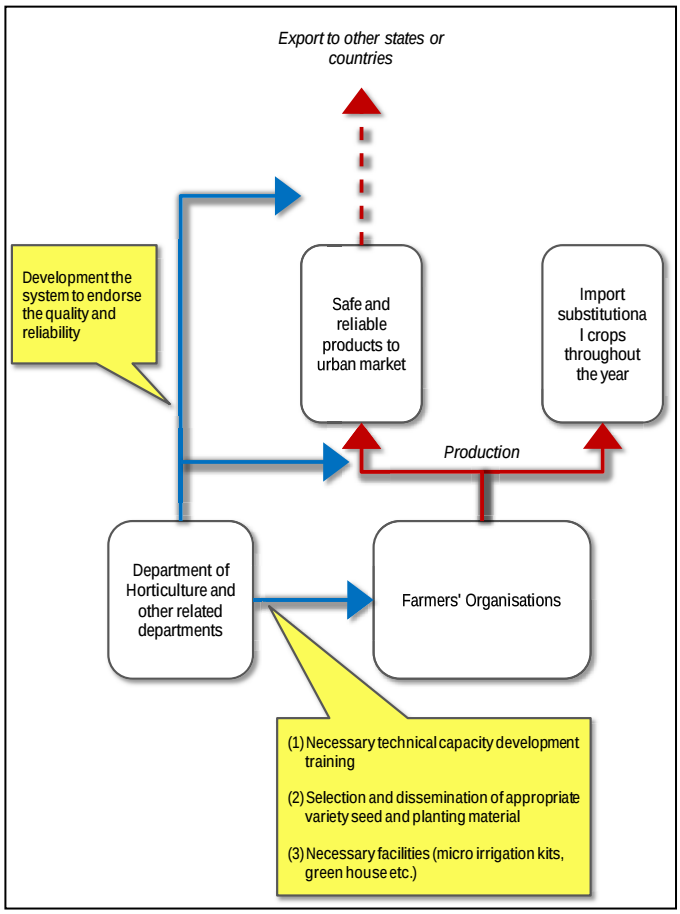
Programme 3-1 : Enhancement of Market Oriented Farming Technologies and Supporting System

Market information collection in major markets in the state and at checkpoints near the border gates to other states is a mandate of TCD. However, reliable collection has not been implemented and the extension system of collected data has not been established yet. Market information is important and an essential input for modern business management. The provision system of market information is a vital infrastructure for the development of economy in the state and shall be immediately established.

The programme plans to train all staff concerned in TCD to generate awareness on the basic perception about market-oriented cultivation and/or business and importance of market information for economic activities initially. Moreover, the programme establishes an IT network between the head office and district offices as well as checkpoint offices by which collected information can be sent to the head office. The head office gathers, process, and upload the data into the website and other outlets by reducing time delay.

In order to meet the needs of consumers and market in the state of Mizoram for horticultural crops, which are mostly imported, it is necessary to produce and supply them to the market with proper timing, and also, to increase their productivity. Consequently, the following actions shall be taken:

- Management capacity of horticultural farmers' organisations shall be built to strengthen their financial health and to promote their motivation to properly invest;
- Crops can be harvested continuously by the selection of proper varieties and appropriate farming plan, and the concentration of harvest time can also be avoided. Proper varieties shall be introduced and disseminated immediately.
- For the efficient and profitable production of horticultural crops, appropriate technologies and practices on cultivation timing diversification, labour savings, and cost reduction, shall be developed, introduced, and disseminated.
- Safety and reliability of horticultural crops shall be enhanced by introducing the certification system.



Source: JICA Study Team

Figure 6.4.4 Concept of Promotion of Market-oriented Good Horticulture Farming

Those actions shall be comprehensively taken to achieve the production of import substitution crops throughout the year. In addition, horticultural crops produced in Mizoram will be exported through those actions. The conceptual figure is shown in Figure 6.4.4 Concept of Promotion of Market-oriented Good Horticulture Farming and the expected outcomes under this programme are summarized as follows.

- Increase the Capacity development of the producers for production of market demanded product including the safe and reliable horticultural crops;

- Improvement of the market information accessibility of stakeholders

Programme 3-2 : Improvement of Present Rigid Supply Chain

The programme focuses on the establishment of a business model through establishment of a direct marketing system, establishment of direct supply chains for re-imported products and development of a state brand and support for the sale of brand products through sales outlets in other states. Extension of the market-oriented business skills and perception among all persons concerned to the programme is the basic and fundamental issue that will be addressed in the beginning. Implementation of this programme will keep order in starting from simple direct sales activities to expanded activities by accumulating experiences and knowhow of the expected synergy effects. The result is that participation enterprises will be able to manage and develop business by themselves. Furthermore, they will improve their business management ability and expand their sales activities.

The programme aims to enhance or establish the existing roadside shops and outlet shops in the urban city markets in and out of the state as a diversification of the market channels and value chains with encouragement of the organised farmers and/or enterprises in the state.

The target products in these direct sales business model activities will be selected after evaluation of profitability and marketability among all available products while considering agro-geographical circumstances. If the sales enterprise will gain experiences, increase sales amount, and develop skills in using market information, they may diversify or specialise on items that are expecting more profit. Potential products extracted by the market survey carried out by the JICA Study Team are listed in Table 6.4.5.

Table 6.4.5 Potential Products and Reason

Import Products (Substitution Target)

Product	Reason	Other States	Other Country
Potato, Fish, Egg, and Betel leaf/nuts	Major import commodities	○	
Onion and Tomato	Major import commodities	○	Myanmar
Garlic	Major import commodities	○	Myanmar, Bangladesh(China)
Vegetables	Various vegetables are imported. Even for local products, they are imported during the lean season.	○	Myanmar, Bangladesh
Rice	Quantity of imported rice shares little in all consumption (0.8%). However, it is sold in many grocery shops all over the state.	○	

Export Products

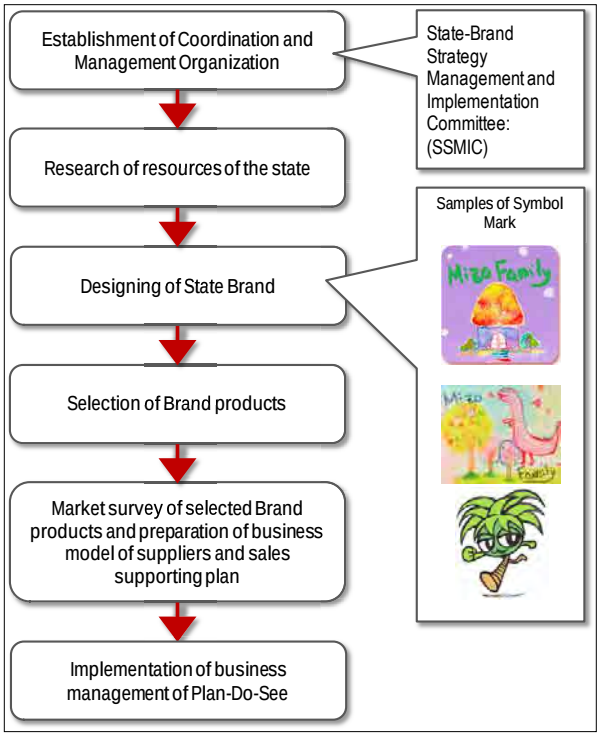
Product	Reason	Other States	Other Country
Ginger and Turmeric	Major export commodities	○	
Chilly、Htkora、and Orange	Major export commodities	○	
Vegetables	It is in the area close to the border to Bangladesh and these are exported.		Bangladesh
Fruits	Same as above. Mango, jackfruits, etc. Watermelon is imported.	○	Bangladesh

Source : JICA Study Team

The establishment of state branding is proposed to take the steps specified in Figure 6.4.5. State branding aims to support enterprises for their exportation to other state's and/or country's markets, although the enterprises will be able to manage their business by themselves. It will also foster the establishment of new purchasing networks and supply chains supported by other activities. The project provides two supporting measures, i.e., (i) establishment of the state brand strategy and (ii) establishment of sales outlets, "Antenna Shops", in big city markets outside the state.

The expected outcomes of this programme are:

- Development of basic business skill of producer, producers' organisation and MSME.
- Diversify the sale channel of the producers and establishment of appropriate value chain, and
- Establishment of sales outlet Creation of a sales support system for local products sold to other markets outside Mizoram.



Source: Study Team

Figure 6.4.5 Procedure for State Branding

Programme 3-3 : Enhancement of agro-industrialization

A steering committee aiming at creating a brand of horticultural / industrial crops and their processed products shall be organised through facilitation of the industry-academia-government collaboration, with a view to lead industrialisation. The committee shall comprise producers and their organisations, ICAR, KVK, state government of Mizoram, Mizoram University, food processors, distributors, and retailers. Additionally, the committee may include members from related business operators and institutions. Within the committee, a working group to assist in its operation shall be established. The working group shall study the trends and consumers' preferences within the state and the international markets, and elaborate a plan to create a brand of products with the collaboration of state-brand establishment and management committee (to be established under the previous programme). The committee shall finalize the plan for brand creation and construct a new measure considering the development of products with features of Mizoram by integrating various know-how including promotion of agriculture with high technical capabilities, development of products or services with high added value, cultivation of market through applying marketing techniques, etc.

The state government shall implement various promotion schemes based on the plan of brand creation, namely, development and introduction of new cultivars; subsidizing technology extension and procurement of input goods to enlarge the production area; low-interest financing for investment in processing plants; assistance for public relations activities to expand the market and/or to enhance commercial capabilities of the brand. However, regarding the direct financial assistance to private sectors by the government, it shall be limited to a minimum extent sufficient to enable the former to become self-reliant. The university, in collaboration with the state government, shall provide assistance in such areas as establishment of study techniques, development and extension of techniques for collection and analysis of relevant information, and management diagnosis.

As for target products, firstly, the plan shall take up grape and wine that already preceded others as business. Furthermore, through market research, the plan aims at developing new products such as high-class/high-quality fruits, essential oils, and food with health-promoting benefits. In particular, orange offers a guarantee where top-grade fruits (high sugar content and good appearance) can be branded as high-class orange, ordinary-grade fruits can be processed into juice or jelly, and other parts like peels and flowers can provide a possibility to consider the development of commercial products

like essential oils or skin lotions by utilising them as raw materials. One can also take notice of the health-promoting benefits of indigenous fruits and vegetables like hatkora, Assam lemon, roselle (*Hibiscus sabdariffa*), and konjac root (local name: *tel-hawng*), and if medical benefits could be verified, they could also be made as branded products.

In addition, the floricultural industry has just started but encountering many problems; however, it may hold great promise for future development. Especially the promotion of anthurium, which has increased its production and sales, shall be preferentially enhanced and the plan for brand creation shall be formulated. In point of industrial crops, vegetable oil industry for food, biodiesel and, cosmetic production made from tree-born-oil seeds, natural plants, and flowers shall be promoted. The expected outcomes under this programme are summarized as follows.

- Development of basic business skill of producer, producers' organisation and MSME.
- Production of flowers is increased, and sales of cut flowers are promoted;
- Production of industrial crops is increased, and their processing plants are operated stably and expanded;
- Business conditions of all stakeholders are improved;
- Employment opportunities are expanded by enlarging the ancillary and supporting industries

(3) Proposed Projects

The proposed project under this approaches are nine as described in Table 6.4.6.

Table 6.4.6 Proposed Project under Approach 3

No.	Project Name
Programme 3-1 : Enhancement of Market Oriented Farming Technologies and Supporting System	
3-1	Establishment of Market Information Provision System
3-2	Production of Import Substitution Crops throughout Year
3-3	Establishment of Safe and Traceable Crop Certification System
Programme 3-2 : Improvement of Present Rigid Supply Chain	
3-4	Establishment of Direct Marketing System
3-5	Establishment of Direct Supply Chain for Re-imported Products
3-6	Development of State Brand and Establishment of Sales Outlets in Other States
Programme 3-3 : Enhancement of agro-industrialization	
3-7	Development of Horticulture Agro-industry
3-8	Development and Enhancement of Industrial Crop Production and Processing
3-9	Development of Business Oriented Post-harvest Skills

Source: JICA Study Team

Chapter 7 Proposed Projects and Implementation Plan

7.1 General

This chapter describes the outline of the proposed projects under three approaches. Total 27 projects are proposed here and the contents of those projects are summarized in each "Project Sheet" available in the Appendix. The overall feasibility of the implementation plans is assessed based on expected development budget till 2035 and number and capacity of the human resources available in the State government. 13 projects out of 27 projects are selected as a priority project considering the nature, urgency and synergy impact to the other projects. The cost for priority projects is estimated and implementation sequence and expected financial sources are decided.

7.2 Estimation of Agriculture Development Budget and Human Resources

7.2.1 Agriculture Development Budget

Table 7.2.1 shows past five-year and annual plan expenditure in Mizoram. They have been increased even more drastically than inflation rate. Table 7.2.2 shows sector-wise actual expenditure for 11th Plan and proposed outlay for 12th Plan. Sectors of "I. Agriculture & Allied Activities" and "IV. Irrigation and Flood Control" could be regarded as agriculture-related sectors. They account for 20.47% for 11th Plan and 16.79% for 12th Plan, respectively.

Table 7.2.1 Past Five Year/Annual Plan Expenditure in Mizoram

	Five Year/Annual Plan	Duration	Expenditure (crore INR)	Increase over previous 5 years
1	Fifth Five Year Plan (1974 - 1979)	5 years	46.40	
2	Annual Plan (1979 - 1980)	1 year	15.64	
3	Sixth Five Year Plan (1980 - 1985)	5 years	150.08	
4	Seventh Five Year Plan (1985 - 90)	5 years	367.54	144.9%
5	Annual Plan (1990 - 1991)	1 year	125.00	
6	Annual Plan (1991 - 1992)	1 year	152.29	
7	Eighth Five Year Plan (1992 - 1997)	5 years	1,062.33	
8	Ninth Five Year Plan (1997 - 2002)	5 years	1,719.96	61.9%
9	Tenth Five Year Plan (2002 - 2007)	5 years	4,079.86	137.2%

Source: Statistical Abstract of Mizoram: 2011, and World Bank web-site.

Table 7.2.2 Sector-wise Expenditure and Outlay of 11th and 12th Plans of Mizoram crore INR

		Actual Allocation for 11th Plan (2007/08-2011/12)	Actual Expenditure for 11th Plan (2007/08-2011/12)	%	Proposed Outlay for 12th Plan (2012/13-2016/17)	%
I	**Agriculture & Allied Activities**	**954.0**	**884.3**	**15.80%**	**1,447.0**	**11.90%**
II	Rural Development	229.8	198.4	3.55%	483.0	3.97%
III	Special Area Programme	325.0	327.7	5.86%	387.9	3.19%
IV	**Irrigation & Flood Control**	**261.8**	**261.3**	**4.67%**	**594.6**	**4.89%**
V	Energy	382.7	383.7	6.86%	846.3	6.96%
VI	Industry & Minerals	130.7	141.8	2.53%	183.6	1.51%
VII	Transport & Communication	536.3	513.0	9.17%	1,630.7	13.41%
VIII	Science, Technology & Environment	36.5	9.9	0.18%	70.5	0.58%
IX	General Economic	495.2	303.5	5.42%	1,647.7	13.55%
X	Social Services	2,318.9	2,206.5	39.43%	4,476.1	36.81%
1	Education	685.7	774.4	13.84%	1,543.1	12.69%
2	Medical & Public Health	495.2	471.4	8.42%	677.3	5.57%

3	Water Supply & Sanitation	318.6	348.8	6.23%	1,039.7	8.55%
4	Housing	118.4	119.8	2.14%	232.3	1.91%
5	Urban Development	459.1	232.1	4.15%	521.7	4.29%
6	Other Social Services	242.0	259.8	4.64%	462.1	3.80%
XI	General Services	629.1	366.2	6.54%	391.6	3.22%
	Total	6,300.0	5,595.6	100.00%	12,160.0	100.00%
	Total (I+IV)	**1,215.8**	**1,145.6**	**20.47%**	**2,041.6**	**16.79%**

Source: Statistical Abstract of Mizoram: 2011. Draft 12th Five Year Plan (2012-17) & Annual Plan, Planning & Programme Implementation Department, Government of Mizoram.

Regarding base figure of 2014, sum of figures of above-mentioned agriculture-related sectors in the proposed outlay for 12th Plan is used (2,041.6 crore INR for 5 years, and 408.3 crore INR for a year). Based on outlay of 12th Plan, total development budget is assumed as 8,166 crore INR for 20 years (408.3 x 20 years).

7.2.2 Available Human Resources for Agriculture Development in the State Government

Human resources are important to implement regularly the Master Plan for a long time. The main implementers of the Master Plan are DOA, DOH, DOF, SWCD, and TCD in addition to MID. Total human resources of headquarter and division offices of these departments is show in Table 7.2.3. DOA which has 725 staff is the biggest department in a view of human resources. Meanwhile DOF is the smallest department of 150 staff. The proportion of the headquarter and the division offices are generally around 1:3.

Human resources are separated into technical & administrative staff and supporting staff. Average proportion of technical staff is around 80% of total staff as shown in Table 7.2.4. The technical & administrative staff mainly shoulders to implement the development projects. Supporting staff includes drivers and peon etc. and supports the technical & administrative staff.

Table 7.2.3 Total human resources of each department (Unit: person)

Department	Directorate	Division/District Office	Total
MID	42 (23%)	138 (77%)	180
DOA	217 (30%)	508 (70%)	725
DOH			386
DOF	37 (25%)	113 (75%)	150
AHVD			133
SWCD	79 (23%)	268 (77%)	347
TCD			164
KVK	25 (16%)	136 (84%)	161
LRSD	150 (41%)	213 (59%)	363

Source: Prepared by JICA Study Team

Table 7.2.4 Detailed human resources of each department (Unit: person)

Department	Technical & administrative staff	Supporting staff	Total
MID	163	17	180
DOA	565	160	725
DOH	299	87	386
DOF	101	49	150
AHVD	131	2	133
SWCD	298	49	347
TCD	140	24	164
KVK	120	41	161
LRSD	326	37	363

Note : Supporting staff includes Driver, Mail, Chowkider, Peon, Muster Roll, Project functionarities, Other

The budget for each department and handling budget for staff are also shown in Table 7.2.5. The handling budget per person is relatively high in AHVD of 0.6 crore, MID of 0.3 crore and DOA of 0.3 crore per year. Handling budget per staff per annum of DOH and DOF are 0.1 and 0.2 crore respectively.

Table 7.2.5 Handling Budget per Human Resources

Implementer	Item		Amount/Number	Source
MID	Actual Expenditure 2010-11	(a)	64 (Rs. crore)	1)
	Total Technical & Administrative Staff in 2010	(b)	163 (person)	1)
	Expenditure per Staff	(c=a/b)	0.4 (Rs. crore /staff)	
DOA	Actual Expenditure 2011-12	(a)	167 (Rs. crore)	2)
	Total Technical & Administrative Staff in 2013	(b)	565 (person)	4)
	Expenditure per Staff	(c=a/b)	0.3 (Rs. crore /staff)	
DOH	Actual Expenditure 2011-12	(a)	20 (Rs. crore)	2)

	Total Technical & Administrative Staff in 2012	(b)	299	(person)	3)
	Expenditure per Staff	(c=a/b)	0.1	(Rs. crore /staff)	
DOF	Actual Expenditure 2011-12	(a)	16	(Rs. crore)	2)
	Total Technical & Administrative Staff in 2014	(b)	101	(person)	3)
	Expenditure per Staff	(c=a/b)	0.2	(Rs. crore /staff)	
SWCD	Actual Expenditure 2011-12	(a)	28	(Rs. crore)	2)
	Total Technical & Administrative Staff in 2013	(b)	298	(person)	3)
	Expenditure per Staff	(c=a/b)	0.1	(Rs. crore /staff)	
AHVD	Actual Expenditure 2011-12	(a)	83	(Rs. crore)	2)
	Total Technical & Administrative Staff in 2013	(b)	131	(person)	4)
	Expenditure per Staff	(c=a/b)	0.6	(Rs. crore /staff)	
TCD	Actual Expenditure 2011-12	(a)	2	(Rs. crore)	2)
	Total Technical & Administrative Staff in 2013	(b)	140	(person)	6)
	Expenditure per Staff	(c=a/b)	0.02	(Rs. crore /staff)	
KVK	Actual Expenditure 2011-12	(a)	4	(Rs. crore)	2)
	Total Technical & Administrative Staff in 2013	(b)	120	(person)	4)
	Expenditure per Staff	(c=a/b)	0.03	(Rs. crore /staff)	

Source:1) Data from MID
2) Prepared by the JICA Study Team based on Approved Annual Plan Mizoram 2012-13, p.36
3) Government data prepared by JICA Study Team
4) DOA Data prepared by JICA Study Team
5) AHVD Data prepared by JICA Study Team
6) A bird's eye view of trade & commerce department

In a view of number of the division offices, each department has installed 4 to 12 offices in local area as shown in Table 7.2.6. MID has the biggest number (12) of the division office to handle the relatively bigger budget. TCD has the smallest number (3). Some departments faces the shortage of staff as described in the Chapter 4, however all the departments have posted staff in the division offices so far.

Table 7.2.6 Installed division offices

Division Office	MID	DOA	DOH	DOF	SWCD	AHVD*	TCD	KVK	LRSD
Aizawl	○	○	○	○	○	○		△	○
Serchhip	○	○	○	○	○	○	○	○	○
Kiolasib	○	○	○	○	○	○	○	○	○
Mamit	○	○		○	○	○	○	○	○
Zawlnuam	○								
Champhai	○	○		○	○	○	○	○	○
Khawzawl	○		○						
Ngopa	○								
Lawngtlai	○	○	○	○		○		○	
Chawngle	○								
Lunglei	○	○	○	○	○	○	○	○	○
Saiha	○	○	○	○		○		○	
Hnahtial					○				
Chhimtupui					○				
Tuidam			○						
Serchi									
Total	12	8	8	8	8	8	5	7	6

Note: AHVD ; unknown, △: Under the umbrella of Central Agricultural University*
Source: Prepared by JICA Study Team

7.3 Proposed Project

7.3.1 Composition and Outline of Development Project

27 projects are proposed under 3 approaches. The outline of the proposed projects are summarized in the Table 7.3.1. The proposed activities, implementation schedule, input and tentative estimated project cost are also shown in the Appendix.

Table 7.3.1 Outline of Proposed Projects

No.	Name of Project	Implementing Organisation		Project Period (Yrs.)	Applicable Zone							Target Group
		Main	Sub		1	2	3	4	5	6	7	
Approach-1 Institutional Development for Effective Agricultural Development Planning and Implementation												
1-1	Establishment of an "Agriculture Development Committee"	Chief Secretariat	Agriculture allied dept. MID, RDD, ATMA, TCD, ID, Cooperative, Private Sector	3	-	-	-	-	-	-	-	Higher level officers (directors or join-directors) of the agriculture related departments
1-2	Establishment of State-wide System for collecting and managing agriculture-related data and information	DES	Agriculture allied dept.	5	-	-	-	-	-	-	-	Officers of the Agriculture allied department
1-3	Capacity Strengthening Government Officers for planning and Good Agriculture Extension	DOA, KVK, DOH, MID, DOF	DSWC, AHVD, DOS, RDD ATMA	5	-	-	-	-	-	-	-	Officers of the Agriculture allied department And MID
1-4	Preparation of Regional Agriculture Development Plan	DOA, DOH, MID	SWCD, RDD, AHDV, DEF, DOF, DOS, ATMA, MIRSAC	6	○	○	○	○	○	○	○	VC, CBOs
1-5	Strengthening of village based self-reliant organisations for taking key roles for agriculture development	RDD	DOA, DOH, DOF, MID, RDD, AHVD, SD	5	○	○	○	○	○	○	○	Local NGO VC, CBOs,
1-6	Establishment of agrarian services centre	DOA	Agriculture allied dept. MID, EFD, DCRR, PWD, ATMA, RDD	10	○	◎	◎	○	○	○	○	Agriculture Development Sub Committee and officers concerned
1-7	Production of Appropriate and Quality Seed Paddy	DOA, KVK	-	10	◎	○	○	○	○	○	○	Seed producer group
1-8	Rehabilitation and upgrading of existing fish farms for sustain fingerlings production	DOF	CIFE, CIFA, CIFRI	5	○	○	-	-	○	○	○	Staff in Fish Farm
Approach-2 Enhancement of Sustainable Agriculture Production through Proper Resources Utilisation and Management												
2-1	Improvement of Jhum based agriculture	DOA	DOH, AHVD, DSWC, EFD	5	-	-	◎	○	-	-	-	VC, Individual Farmers
2-2	Enhancement of environmentally balanced slope area cultivation	DOA	DOH, AHVD, DSWC, EFD	3	-	◎	◎	○	◎	-	○	Horticultural farmers' organisations & individual farmers
2-3	Enhancement of WRC Cultivation and Promotion of Winter Crop	DOA	DOH, AHVD, DSWC, EFD	4	◎	-	-	-	-	○	◎	WUA
2-4	Integration of Livestock Farming into Crop Cultivation	DOA, DOH, AHVD	-	3	-	○	◎	○	◎	○	-	SHG, Individual Farmers

No.	Name of Project	Implementing Organisation		Project Period (Yrs.)	Applicable Zone							Target Group
		Main	Sub		1	2	3	4	5	6	7	
2-5	Integration of fish farming into crop cultivation	DOF	DOA	6	◎	○	-	-	◎	◎	◎	WUA, Individual Farmers
2-6	Irrigation and Command Area Development for WRC Potential Area	MID	DOA, DOH, DOF	20	◎	○	○	○	○	◎	○	WUA
2-7	Improvement of Water Resource Utilization for Existing Irrigation Schemes	MID	DOA, DOH, DOF	10	◎	◎	○	○	○	○	◎	WUA
2-8	Construction of Soil and Water Conservation Facilities	SWCD	MID, DEF	5	○	○	○	○	○	○	○	VC, CBOs
2-9	Improvement of Farm Accessibility and Transportation	DOA, MID	PWD	20	◎	○	○	○	○	◎	○	WUA, VC
2-10	Capacity Development of O&M of Fundamental Infrastructure	MID, DOA	-	5	○	○	○	○	○	○	○	WUA, VC
Approach-3 Establishment of Good Value Chain for Agriculture Product												
3-1	Establishment of Market Information Provision System	TCD	Agriculture allied dept.	2	○	○	○	○	○	○	○	Individual farmers, traders, processors and others private sector
3-2	Production of Import Substitution Crops throughout Year	DOH	DOA, KVK, ICAR	5	○	◎	-	○	○	○	◎	Horticultural farmers' organisations & individual farmers
3-3	Establishment of Safe and Traceable Crop Certification System	DOH	DOA, KVK, ICAR	5	-	○	-	○	-	-	◎	400 farmers belonging to Horticultural Farmers' Organisations
3-4	Establishment of Direct Marketing System	TCD	ID	3	○	◎	-	◎	○	-	○	Farmers' group or any private enterprises
3-5	Establishment of Direct Supply Chain for Re-imported Products	TCD	ID	3	◎	◎	-	○	-	-	○	Farmers' group and/or any private enterprises
3-6	Development of State Brand and Establishment of Sales Outlets in Other States	TCD	ID	4	◎	◎	-	○	-	-	○	Producers, Processors, traders and others
3-7	Development of Horticulture Agro-industry	DOH	DOA , TCD, DOI, KVKs, ICAR, Mizoram University	5	-	-	-	◎	-	-	◎	All stakeholders involved in the horticultural agro-industry
3-8	Development and Enhancement of Industrial Crop Production and Processing	DOA	DOH, AHVD, DSWC, EFD, DCRR	3	-	○	○	-	◎	-	○	Farmers cultivating TBO and other oil related plants
3-9	Development of Business Oriented Post-harvest Skills	KVK, DOA	DOH, DOF, DOAV, DCRZ	4	◎	◎	○	◎	○	○	◎	Farmers' group, youth group or any private enterprises

Source: JICA Study Team

7.3.2 Description of Proposed Project

The contents of the proposed 27 projects are summarised below. More detailed information are available in the project sheets as given in the attachment.

No.1-1 Establishment of an "Agriculture Development Committee"

Main Implementing Agency: Chief Secretariat

Project Period: Three years

Major Objective: Establishment of "agriculture development committee (ADC)" to prepare the vision, policy, and plans for the state agriculture development and to coordinate the programmes and projects for more effective and efficient implementation.

Project Contents: Under the establishment of an "agriculture development committee (ADC)", a preparatory committee consisting of representatives from agriculture-related departments (DOA, DOH, MID, DOF, RDD, etc.) and external experts as advisors will be firstly organised. Preparatory works such as a study on good practices of other states, examination on institutional arrangements for ADC, and preparation of by-laws and registration will be undertaken. After the start of ADC's operation, external advisors will monitor the activities of ADC and provide recommendations for improvement as necessary.

No.1-2 Establishment of State-wide System for Collection and Management of Agriculture-related Data and Information

Main Implementing Agency: DES

Project Period: Five years

Major Objective: Establishment of agriculture data collection and management system for better planning and monitoring.

Project Contents: In order to establish a proper information system, the project includes the following activities:

(i) Survey the current situation on collection and compilation of agriculture-related data/information by each state department.

(ii) Introduce improved data/information collection and compilation system with trainings to officers in charge.

(iii) Monitor the newly introduced system by the monitoring unit.

(vi) Promote utilisation of compiled data/information for policy and plan formulation and monitoring.

No.1-3 Capacity Strengthening of Government Officers for Planning and Good Agriculture Extension

Main Implementing Agency: DOA, KVK

Project Period: Five years

Major Objective: Strengthening of government officers' capacity and formulation of improved systems for promoting proper project planning and management and effective agricultural extension.

Project Contents: The capacity of government officers for proper planning and management of agriculture development programmes/projects in agriculture allied departments including MID will be strengthened by conducting the basic training on project cycle management (PCM) and advanced training and seminar on participatory development approach.

Technical expertise and extension skills of officers involved in the extension activities in all the fields of agriculture development will be improved by conducting the training. The plan and materials of the training will be prepared based on the results of the basic survey. Training plan and implementation structure for regular brush up of extension officers will also be formulated.

Block-based agriculture action plan will be developed by the officers trained in project planning and management. Block-based agricultural extension system will also be formulated for effective dissemination of agricultural technologies. These plan and system will be verified at the two to five selected RD blocks in collaboration with ATMA for further improvement. The results of the verification will also be fed back to the brush up training of extension officers.

No.1-4 Preparation of Regional Agriculture Development Plan

Main Implementing Agency: DOA

Project Period: Six years

Major Objectives: Preparation of integrated plan including land use plan, resource management plan, and agriculture action plan in each village to be the base for agriculture development in Mizoram.

Project Contents: The land use plan for effective resource utilisation, the resource management plan for assuring sustainability, and the agriculture action plan for livelihood improvement will be prepared in the model villages during first selection based on the basic survey. Through the preparation process, manuals and guidelines will be compiled, workshops for the officers concerned will be conducted, and verification trials will be carried out.

Then, the abovementioned three plans will be integrated into a regional agriculture development plan with future development vision, which will be promoted in the entire Mizoram. For proper plan preparation, a guideline will be compiled, awareness seminars will be held, and trainings of the officers concerned will be carried out. The regional agriculture development plan will be reviewed and revised every five years based on the results of monitoring of the plan implementation.

No.1-5 Strengthening of Village-based Self-reliant Organisations

Main Implementing Agency: DOA, RDD

Project Period: Five years

Major Objectives: Enhancement of village-based community-based organisations (CBOs) for making agriculture development more effective.

Project Contents: As a first step, non-governmental organisations (NGOs), which can facilitate the activities of the village-based self-reliant organisations (CBOs) will be identified. Two to four NGOs will be selected for supporting the project implementation, and their capacity will be enhanced.

For the implementation of CBO strengthening programme, the framework of CBO (by-laws, registration system, and action plan), training plan and materials for strengthening CBO, CBO management manual and record keeping book set, and monitoring and follow up guideline and manual will be prepared. The programme will be carried out in two districts in a year and will be continued for four years. A federation of CBOs will be set up and key personnel will be trained. A workshop will be held and a technical guidance will be provided for making CBOs functional. Activities of CBOs will be monitored based on the guideline.

No.1-6 Establishment of Agrarian Services Centre

Main Implementing Agency: DOA

Project Period: Ten years

Major Objective: Establishment of a one-stop service centre in each block for providing better agriculture support services.

Project Contents: The project targets the construction of 26 agrarian service centres in total, which will be located in each block. The project provides necessary system design for making the agrarian service centre functional in order to give the total support services such as cultivation technologies extension, input supply, provision of market information to the famers or group of farmers. The project enhances the linkage among the agrarian service centre, KVK, and private sector for keeping the quality of high services.

No.1-7 Production and Dissemination of Appropriate and Quality Seed Paddy

Main Implementing Agency: DOA, KVK

Project Period: Ten years

Major Objective: Selection of appropriate seed paddy and establishment of practical system to produce and disseminate enough quantity of quality seeds.

Project Contents: The project shall begin with the survey of the preference of farmers and potential productivity and present quantity of seed paddy available in the state. Based on the survey data, the project gives the necessary technical and physical supports such as employment of experts or infrastructure development for the development and verification of quality seed in the seed farm of DOA or KVK. After the development of quality seed paddy, the project shall organise the seed production farmers and enhance their skills for production. In order to disseminate the quality seed paddy produced by seed production farmers to general farmers, the project will also assist in the following activities: i) training of seed production farmers to produce quality seeds, ii) establishment of seed storing method by KVK and/or seed production farmers, iii) establishment of seed screening system, and iv) provision of seed processing units at a place where access is good from the block.

No.1-8 Rehabilitation and Upgrading of Existing Fish Farms to Sustain Fingerlings Production

Main Implementing Agency: DOF

Project Period: Five years

Major Objective: Production of quality fingerlings in the state and dissemination of these to the farmers.

Project Contents: The project targets to upgrade the 11 existing fish farms available in the state. These FSFs were established with varying physical capacities to produce 5 to 10 million fry/fingerlings per farm. However, the FSFs are facing weak manpower capacity, financial constraints, and deteriorated state of physical structures and thereby unable to fulfil adequately the DOF's mandate to produce and distribute fry/fingerlings to fish farmers.

The major activities under the project are as follows:

(i) Conduct an inventory survey of all FSFs to grasp the condition of buildings, facilities, equipment, etc., and undertake a complete evaluation of all farms.

(ii) Rehabilitate the damaged and deteriorated buildings, facilities, and equipment.

(iii) Acquire and build a stock of healthy and quality brood fish (spawners) from neighbouring states or other parts of India to maintain the genetic quality of the carps.

(iv) Strengthen the manpower in fisheries discipline and provide them in-service training on hatchery operation and management, pond ecosystem, management, etc., and provide staff in FSFs.

(v) Provide regular refresher courses in hatchery operation and management to farm managers and technicians to keep them up to date with the latest development of aquaculture.

No.2-1 Improvement of Jhum-based Agriculture

Main Implementing Agency: DOA

Project Period: Five years

Major Objectives: Improve the productivity of jhum cultivation.

Project Contents: The project aims to sustain and improve the productivity of jhum cultivation through proper utilisation of possible jhum land, prolonging the jhum cycle, and obtaining the additional income in the fallow jhum land. The project gives the necessary awareness to the VC who is managing the village jhum practice traditionally for appropriate selection of jhum land. The project targets to utilise the jhum land for at least two years in the same place to prevent soil erosion by introducing low input soil conservation measures and counter cultivation with

mixed crop. The project will also introduce the production of forest cultivation in the fallow land such as alder trees for securing the income of jhum farmers and present soil erosion.

No.2-2 Enhancement of Environmentally Balanced Slope Area Cultivation

Main Implementing Agency: DOA

Project Period: Five years

Major Objectives: Improvement of productivity of slope area cultivation through enhancement of environmentally balanced agriculture technologies.

Project Contents: The project gives the comprehensive measures for slope area cultivation, where soil erosion is more severe through technology transfer and provision of necessary equipment. The measures include: a) agronomic measures such as cover cropping, mixed or inter cropping; b) vegetative measures such as covering grass (vetiver grass, etc.,) surrounding the farm land; and c) structural measures such as placing flagstones. To figure out the effectiveness of these measures, observation points for soil erosion will be established and data for future planning will be collected.

No.2-3 Enhancement of WRC Cultivation and Promotion of Winter Crop

Main Implementing Agency: DOA

Project Period: Five years

Major Objectives: Increase in production and productivity of wet rice cultivation (WRC) and increase in winter crop production such as vegetables in WRC area

Project Contents: The project starts with assessment of major issues on WRC development. Present issues are assessed and divided into two broad categories: i) legal and institutional issues especially concerning the tenant system and ii) farm community's issues such as labour shortage, fund shortage, and low profitability. Based on the assessment mentioned above, the following activities are proposed: selecting six blocks (RDB) to implement the project as pilot and model project; setting up a state level committee to develop legal system and other laws concerning the tenancy system, etc.; and reforming WRC farming system drastically in order to develop and improve relevant farming practices and management systems.

In the pilot project, some recommendable actions and approaches to attend to the main issues include uniform paddy cultivation in Kharif for utilisation of irrigation water and appropriate cultivation of winter crop, introduction of farm machineries, provision of necessary equipment, and financial assistance and marketing through enhancement of group activity. The project also supports profitable farm management and record keeping skills development.

No.2-4 Integration of Livestock Farming into Crop Cultivation

Main Implementing Agency: DOA and AHVD

Project Period: Three years

Major Objectives: Increase in agriculture production and income security through integration of livestock farming into crop cultivation.

Project Contents: The project aims to transfer technologies on resources circulation using raw organic materials such as crop residues, animal wastes, and food garbage to produce the compost or animal feed in order to increase the productivity for both agriculture and livestock. The project is also targeting to secure the income source of subsistence farmer through enhancement of livestock farming. The project was implemented in the six model blocks for three years and necessary equipment and materials other than trainings for the farmers were provided.

No.2-5 Integration of Fish Farming into Crop Cultivation

Main Implementing Agency: DOF

Project Period: Six years

Major Objectives: Increase in fish production and income security through promotion of fish culture in the available water bodies.

Project Contents: The project aims to increase the production and productivity of fish culture by the utilisation of water bodies available around the farm land. The project promotes fish cum paddy and fishery culture in the irrigation dam and provides the necessary technologies, materials, and support for joint purchasing and shipping.

No.2-6 Irrigation and Command Area Development for WRC Potential Area

Main Implementing Agency: MID

Project Period: Five years

Major Objectives: Providing the irrigation and drainage facilities and development of irrigation command area in WRC potential area.

Project Contents: The project aims to provide and develop the 43,000 ha potential WRC area for 20 years. The potential area will be prioritised based on the regional agriculture plan prepared under Project 02-01. The DPR will be prepared according to the new guideline and the works include the irrigation and drainage facilities development as well as the command area development.

No.2-7 Improvement of Water Resource Utilisation for Existing Irrigation Schemes

Main Implementing Agency: MID

Project Period: Ten years

Major Objectives: Increase the cropping intensity of the existing minor irrigation scheme through construction of pond, rehabilitation of canals, and introduction of water saving irrigation.

Project Contents: The project aims to improve the cropping intensity of 439 existing minor irrigations by the rehabilitation or upgrading of irrigation and drainage facilities and by introducing water saving irrigation. The rehabilitation and upgrading works mainly include the construction of pond or dam, diversion structures, rehabilitation of canals, and/or providing water control structures, agro wells, lift irrigation facilities in some cases. For introduction of water saving irrigation, the necessary data should be collected in the pilot site such as soil moisture and water losses in the beginning. Based on the collected data, the micro irrigation system with proper guidance is given to the respective farmers.

No.2-8 Construction of Soil and Water Conservation Facilities

Main Implementing Agency: SWCD

Project Period: Five years

Major Objectives: Construction of soil and water conservation facilities and empowering the community for resources management through employing the community contract method.

Project Contents: The project targets to construct soil and water conservation facilities such as water harvesting structure, check dam, bank protection, and small-scale water intake and pond according to the village-based land use and resources management plan prepared under Project 02-01. The construction will be carried out by the community that will serve as the contract between the community (CBO or federation of CBOs) and SWCD, which expect to create the technical and financial capacity for operation and maintenance (O&M) and sense of ownership of the available resources. At first, the project starts with 26 pilot villages and will expand the activities to the others.

2-9 Improvement of Farm Accessibility and Transportation

Main Implementing Agency: DOA, MID

Project Period: 20 years

Major Objectives: Provide the necessary access from the main road to the farm land for better utilisation of potential land and transportation of agriculture input and output.

Project Contents: The project includes the upgrading of existing farm access road to provide the necessary culvert and side drains, and construction of new access road to the potential development site. The project prepares the design criteria, construction norms, typical drawings, and typical construction schedule for the said work pursuant to the standardisation of procedure. After giving the necessary awareness and training to the staff of DOA, the work is started. The total length of rehabilitation and new construction is not yet estimated at this moment.

2-10 Capacity Development for Operation and Maintenance (O&M) of Fundamental Infrastructure

Main Implementing Agency: MID, DOA

Project Period: Five years

Major Objectives: Capacity development of WUA and VC for O&M of irrigation facilities and farm access road. The institutional body tasked to support these stakeholders is also established.

Project Contents: The project mainly targets two infrastructures, namely, irrigation and drainage facility and farm access road. The O&M responsibility for these facilities is given to WUA and VC, respectively. For the irrigation and drainage facilities, the project starts with the establishment of O&M unit in MID, which is not existing at present in order to support the establishment and strengthening of WUA by introducing also the new WUA registration system in MID. The members of the unit should be trained in a suitable training place in India on the subject of PIM. The project formulates the O&M guideline based on the O&M training manual prepared under Project 01-02 and provides the O&M training to WUA. For the farm access road, the O&M manual which contains: (1) routine inspection and minor maintenance work, (2) rehabilitation planning and cost estimation, and (3) major repair works (earthwork and concrete work) is prepared. Based on the prepared manual, necessary trainings are given to the members of VC.

3-1 Establishment of a Market Information Provision System

Main Implementing Agency: TCD

Project Period: Two years

Major Objectives: Establishment of a systematic market information collection and provision system to promote market-oriented agriculture.

Project Contents: Market information is an important and essential input for modern business management; likewise, the provision system of market information is a vital infrastructure for the development of the economy. In Mizoram, collection of market information on major markets and on checkpoints near the border gate to other states is the mandate of TCD. However, scheduled and reliable collection has not been executed and provision system of collected data has not been established yet.

In order to establish a proper system, the project firstly plans to train all staffs concerned in TCD for promoting awareness on the basic way of thinking about market-oriented business and importance of market information for economic activities. Moreover, the project will establish an IT network system among the head office, district offices, and checkpoint offices to ensure that collected information will be gathered, processed, and uploaded to the website without delay.

The guidebook, manuals, and record forms will be prepared for the design and operation of the system, and an awareness seminar will be held for the users. The system will be reviewed by the users and will be improved appropriately.

3-2 Production of Import Substitution Crops Throughout the Year

Main Implementing Agency: DOH

Project Period: Five years

Major Objectives: Production of import substitution crops throughout the year and increase in productivity of these crops.

Project Contents: In order to meet the needs of the consumers and market in the State of Mizoram for horticultural crops, which are mostly imported, it is necessary to produce and supply these crops to the market with proper timing, and also to increase their productivity. Consequently, it is required to strengthen the management capacity of horticultural farmers' organisations and to introduce and disseminate appropriate varieties and technologies on cultivation timing diversification, labour saving, and cost reduction.

The project will prepare guides and provide trainings on the following: management of farmer's organisation; skills of individual farm management; market-oriented approach; market research by farmers' organisation; selection of target crops; formulation of action plan; introduction of appropriate varieties and technologies; and post-harvest management.

Appropriate varieties of horticultural crops will be selected through the farmer participatory approach using the participatory varietal selection (PVS). Seeds and seedlings of the recommended varieties will be distributed to the farmers with extension officers' technical support.

The project will also introduce and improve the technologies and facilities including rain-shelter vegetable cultivation practice and low cost greenhouse; water-saving irrigation technologies and systems; labour-saving and low-cost technologies, tools and machineries; techniques of organic fertiliser making and application; and technologies of low or free pesticide cultivation / integrated pest management (IPM).

No.3-3 Production and Supply of Safe and Traceable Crops by Introducing the Certification System

Main Implementing Agency: DOH

Project Period: Five years

Major Objectives: Production and supply of safe and traceable horticultural crops and adding of proper value on products through the introduction of certification systems.

Project Contents: In order to promote a healthy horticulture after taking into consideration the different demands from farmers and consumers, the project will take safety agriculture management measures such as organic agricultural product certifications and good agriculture practices (GAP)[1] in order to ensure agricultural product safety in India. These certification systems can also create high added value; however, procedures are quite complicated with high certification cost, time, and effort; and farmers are not familiar with the operation of information system. Furthermore, not only the production sector in horticulture but also the entire supply chain should be developed.

In carrying out the project, it is essential to empower the horticultural farmers' organisation through the implementation of the project entitled "Production of Import Substitution Crops Throughout the Year" as mentioned above. On that basis, technical guidelines will be prepared, orientation and training for adoption of

[1] Good agricultural practices are "practices that address environmental, economic and social sustainability for on-farm processes, and result In safe and quality food and non-food agricultural products". In India, the Agricultural and Processed Food Products Export Development Authority of India had initiated the development of an IndiaGAP standard. One of the objectives of the standard is to gain benchmarked recognition with GLOBALGAP so as to open the European market to Indian agricultural producers. (*Source: Food Safety and Good Practice Certification, FAO*)

organic farming will be implemented, basic inputs will be provided, certification procedures will be supported, and possibilities for establishing new marketing channels will be explored.

No.3-4 Establishment of Direct Marketing System

Main Implementing Agency: TCD and Agriculture Allied Department

Project Period: Three years

Major Objectives: Establishment of direct marketing system in order for producers and consumers in Mizoram to obtain reasonable benefits.

Project Contents: The project plans to establish two types of business models for selling agricultural products directly to consumers. One model is for selling at the roadside shops, and the other is for selling at the sales outlets in urban markets. The construction of the stall in the market will be supported by TDC.

Inventory survey on existing roadside shops and facilities and traffic survey for prioritised sites will be conducted. Based on the results of the surveys, proper sites, producers' groups and sales management organisations will be selected, and trainings on business skills in bookkeeping, market information utilisation, and business management cycle will be conducted to the leaders and key members. The network for product purchasing will be built up amongst selected groups and organisations and other stakeholders of the supply chain.

The annual plan for product purchasing and business activities will be formed, and guidebook, manual, and record book will be prepared. The operation plan will be reviewed and improved every three months.

No.3-5 Establishment of Direct Supply Chain for Re-imported Products

Main Implementing Agency: TCD and Agriculture Allied Department

Project Period: Three years

Major Objectives: Establishment of direct supply chain of re-imported products for obtaining reasonable profit and increasing job opportunities.

Project Contents: Re-imported products such as betel nuts and oranges tend to be produced in Mizoram, exported to and stored/processed in Assam, and then imported from Assam to Mizoram. In order to obtain reasonable profit from these re-imported agricultural products, it is required to establish a more suitable supply chain for Mizoram.

Target products of the project will be selected based on the results of the survey to the producers' groups, and business model for the direct supply chain will be designed. The plan for supply chain development including operation of storing/ processing facilities/equipment will be prepared, and the feasibility study of the plan will be carried out with the participation of producers' groups. Through the feasibility study, the guidebook, manuals, and record forms will be prepared, and the leaders of producers' groups and the operators/managers of facilities/equipment will be trained.

Then, the annual plan of the supply chain development will be prepared, business activities toward full-scale operation will be started with experts' consultation, and the plan will be reviewed and improved every three months.

3-6 Development of State Brand and Establishment of Sales Outlets in Other States

Main Implementing Agency: TCD and Agriculture Allied Department

Project Period: Four years

Major Objectives: Development of state brand and establishment of sales outlets in other states for expanding sales of agricultural products.

Project Contents: As a first step, the State-Brand Strategy Management and Implementation Committee (tentative name) will be organised to prepare for the effective and

efficient implementation of the project. In order to develop the Mizo brand, the following activities will be implemented: study of resources, holding of seminar, designing of brand image, preparation of regulation for qualifying branded products, preparation and implementation of support programme, review and improvement of the programme, market survey, preparation of sales promotion plan, training of key producers and suppliers, and advertising and sales of branded products.

On the other hand, in order to establish sales outlets in other states, the following activities will be implemented: study on market potential, listing and prioritising of candidate cities, forming of shop management body, preparation of shop management plan, conduct of training to shop staff, operation of outlet shop, and review and improvement of the operation.

3-7 Development of Horticulture Agro-Industry

Main Implementing Agency: DOH

Project Period: Five years

Major Objectives: Development of horticulture agro-industries for enhancing the production and creating new employment.

Project Contents: As a first step, the steering committee aiming to create brands of horticultural crops and their processed products will be organised through the industry-academia-government collaboration, with a view leading to industrialisation. The committee will comprise producers and their organisations, ICAR, KVK, State Government of Mizoram, Mizoram University, food processors, distributors, and retailers. Within the committee, a working group to assist the operation will be set up.

The plan of brand creation will be prepared by the committee. As target products, firstly, the plan will take up grapes and wine that already precede others as business. Furthermore, through the market research, the plan will also aim at developing new products such as high-class/high-quality fruits, essential oils, and food with health-promoting benefits. In addition, floricultural industry has just started but encountering many problems; however, it may hold great promise for future development. Especially, the promotion of anthurium, which has increased production and sales, will be enhanced preferentially and the plan of brand creation will be formulated.

Based on the plan, the state government will provide support services for new product development, vocational training, product promotion, domestic and international trade fair and exhibition.

No.3-8 Development and Enhancement of Industrial Crop Production and Processing

Main Implementing Agency: DOA

Project Period: Three years

Major Objectives: Reinvigoration of TBO seed cultivation and market, and development of new oil materials and oil production system.

Project Contents: Tree-borne-oil (TBO) seeds including tung and jatropha have been promoted by the state government; however, they are not utilised efficiently due to lack of oil milling facility and poor marketing system for produced oil. Meanwhile, essential oil extracted from natural plants and flowers might be of high value in the market, and material plants are naturally grown in the state. Therefore, the achievement of major objectives mentioned above will contribute to the further income generation of subsistence farmers.

As a first step of the project, a steering committee for the promotion of industrial crops will be set up through the industry-academia-government collaboration, which will consist of representatives of plant growers, University of Mizoram,

Integrated Scheme of Oilseeds, Pulses, Oil Palm and Maize (ISOPOM), ICAR/ KVK, relevant state departments, oil companies, and distributors. The study and research team will also be organised to grasp useful material plants, prepare the proposals, guideline, extension manuals, and draft action plan, and to select five RD blocks for the pilot project implementation.

The pilot project will be implemented with activities including holding of workshop/ seminar, arrangement of basic facilities, conduct of training for strengthening farmers' group, provision of materials with technical services, monitoring and evaluation of the pilot project, and finalisation of the guidelines and extension materials. Based on the results of the pilot project, the state action plan to promote plant oil production and marketing will be formulated by the committee.

No.3-9 Development of Business Oriented Post-harvest Skills

Main Implementing Agency: KVK, DOA

Project Period: Four years

Major Objectives: Initiate the agriculture-related business through skills development of unemployed youth group and subsistence farmer.

Project Contents: The project starts with the selection of potential group to be supported, and provides the technology improvement or business management skills training to the group. After such investigation on the present farming practice and activities, potential machineries and equipment for initiation of food processing or related business are identified. Furthermore, facilities such as small-scale processing plant or equipment with necessary O&M training will be given to the potential group for commencement of business activities.

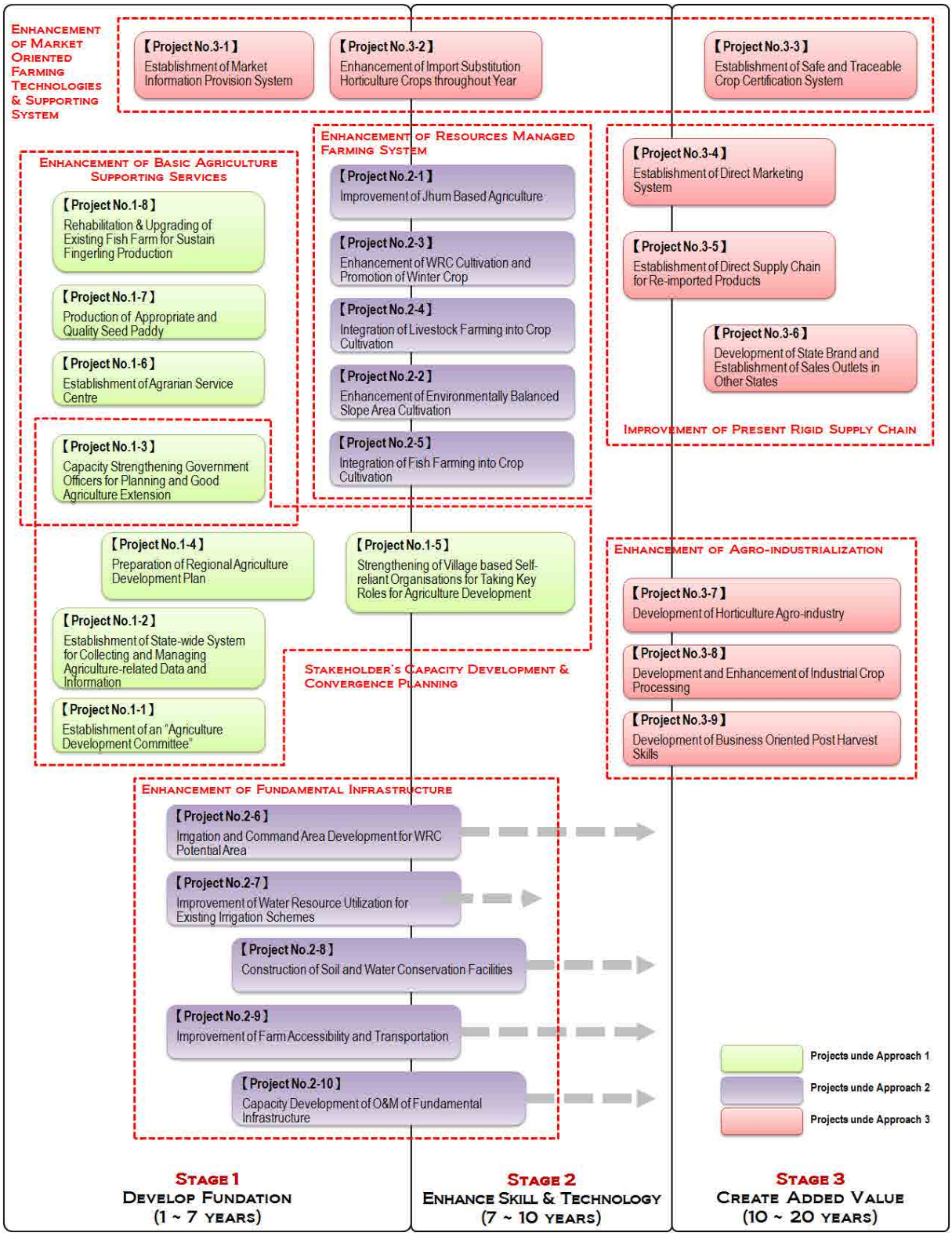
7.3.3 Project Implementation Plan

It is proposed to implement the 27 projects in three stages. The 1st stage, named "Develop Foundation", which is generally considered in the initial seven years, aims to develop the capacity of the government officers, develop the system of good planning and support services and develop the fundamental infrastructure such as land, roads, and irrigation facilities to support agriculture production and distribution. Project 1-1 "Establishment of an "Agriculture Development Committee"", Project 1-2 "Establishment of State-wide System for Collecting and Managing Agriculture-Related Data and Information", "Project 1-3 Capacity Strengthening of Government Officers for Planning and Good Agriculture Extension", and Project 1-4 "Preparation of Regional Agriculture Development Plan", are the highest priority projects in Stage 1. From the programme on fundamental infrastructure development, Project 2-7 "Improvement of Water Resource Utilisation for Existing Irrigation Schemes", Project 2-6 "Irrigation and Command Area Development for WRC Potential Area", and Project 2-9 "Improvement of Farm Accessibility and Transportation", are the urgent projects to be implemented during Stage 1. In addition, Project 3-1 "Establishment of Market Information Provision System" and Project 3-2 "Production of Import Substitution Crops Throughout the Year" are proposed to start early. The development of skills and technologies for cultivation also starts in Stage 1 as pilot basis. The full scale extension of these skills and technologies is proposed during Stage 2.

The 2nd stage named "Enhance Skill and Technology" is generally considered in the next 7 to 10 years, aiming to increase production through the extension of agriculture skills and technologies to the cultivators in the state. Out of all the projects listed in the programme of "Enhancement of Resource-Managed Farm Management System", Project 2-1 "Enhancement of Environmentally-balanced Slope Area Cultivation" is the most urgent project since soil erosion is most severe in the slope-settled cultivation area converted from *jhum* land. Project 2-3 "Enhancement of WRC Cultivation and Promotion of Winter Crop" and Project 3-2 "Production of Import Substitution Crops Throughout the Year" are also important subjects in Stage 2.

Stage 3, named "Create Added Value", is generally considered in 10 to 20 years aiming to increase the value of the product by restructuring the rigid market system to establish the appropriate value chain and enhancement of agriculture-related industries and enterprises. Project 3-4 "Establishment of Direct

Marketing System" and Project 3-5 "Establishment of Direct Supply Chain for Reimported Products" under the programme of "Improvement of Present Rigid Supply Chain" and Project 3-7 "Development of Horticulture Agro-industry", Project 3-8 "Development and Enhancement of Industrial Crop Production and Processing", and Project 3-9 "Development of Business Oriented Post-harvest Skills" under the programme of "Enhancement of Agro-industrialization", are the early implementation projects in Stage 3.The schematic drawing of the stage-wise implementation is shown in Figure 7.3.1.



Source: JICA Study Team

Figure 7.3.1 Stage-wise Implementation Plan of the Projects

7.3.4 Budget for Project Implementation

The tentative cost of the 27 projects is estimated as Rs. 3,463 crore for 20 years. The summary of the project-wise estimated cost is shown in Table 7.3.2 below.

Table 7.3.2 Summary of Project-wise Tentative Estimated Cost

No.	Project Name	Project Cost (INR. crore)					
		Civil Work	Equipment Machinery	Expert & Training		Others	Total
				Total	Cost for External Resources		
1-1	Establishment of an "Agriculture Development Committee"	-	-	1.0	(0.9)	0.3	1.3
1-2	Establishment of State-wide System for collecting and managing agriculture-related data and information	-	0.3	7.3	(5.9)	-	7.6
1-3	Capacity Strengthening Government Officers for planning and Good Agriculture Extension	-	-	15.4	(9.5)	-	15.4
1-4	Preparation of Regional Agriculture Development Plan	-	0.1	32.2	(10.0)	5.5	37.8
1-5	Strengthening of village based self-reliant organisations for taking key roles for agriculture development	-	-	15.6	(4.5)	0.6	16.2
1-6	Establishment of agrarian services centre	62.6	17.0	4.4	(1.0)	2.8	86.8
1-7	Production of Appropriate and Quality Seed Paddy	7.0	3.0	22.0	(18.5)	2.0	34.0
1-8	Rehabilitation and upgrading of existing fish farms for sustain fingerlings production	4.9	7.2	1.0	(0.0)	-	12.1
2-1	Improvement of *jhum* based agriculture	-	-	12.1	(5.0)	1.1	13.2
2-2	Enhancement of environmentally balanced slope area cultivation	-	-	8.9	(5.0)	0.8	9.7
2-3	Enhancement of WRC Cultivation and Promotion of Winter Crop	-	2.0	26.8	(8.4)	0.9	29.7
2-4	Integration of Livestock Farming into Crop Cultivation	-	5.4	9.7	(5.0)	-	15.1
2-5	Integration of fish farming into crop cultivation	-	-	4.1	(1.0)	-	4.1
2-6	Irrigation and Command Area Development for WRC Potential Area	2,1561	-	25.4	(19.9)	-	2,181.5
2-7	Improvement of Water Resource Utilization for Existing Irrigation Schemes	389.7	-	12.3	(4.0)	-	402.0
2-8	Construction of Soil and Water Conservation Facilities	9.2	-	6.2	(3.9)	-	15.4
2-9	Improvement of Farm Accessibility and Transportation	387.0	-	39.5	(0.3)	-	426.5
2-10	Capacity Development of O&M of Fundamental Infrastructure	-	-	7.4	(1.5)	-	7.4
3-1	Establishment of Market Information Provision System	-	0.1	1.1	(0.8)	-	1.2
3-2	Production of Import Substitution Crops throughout Year	-	0.1	21.8	(5.4)	16.0	37.8
3-3	Establishment of Safe and Traceable Crop Certification System	-	1.0	15.0	(5.0)	6.1	22.1
3-4	Establishment of Direct Marketing System	-	-	8.2	(3.0)	-	8.2
3-5	Establishment of Direct Supply Chain for Re-imported Products	-	-	10.5	(3.0)	-	10.5
3-6	Development of State Brand and Establishment of Sales Outlets in Other States	-	-	14.3	(10.0)	-	14.3
3-7	Development of Horticulture Agro-industry	-	0.1	17.4	(10.0)	15.2	32.7
3-8	Development and Enhancement of Industrial Crop Production and Processing	0.9	0.7	7.9	(5.0)	2.1	11.6
3-9	Development of Business Oriented Post-harvest Skills	0.4	5.0	3.2	(2.0)	-	8.6
Total		22,422.7	42.0	350.7	(148.5)	53.4	3,462.8

Source: JICA Study Team

The budget scale of the proposed projects is Rs. 173 crore per annum, which is 42% of the budget scale of agriculture-allied sector development and irrigation and flood protection of Rs.408.5 crore in the 11th Five-Year Plan as shown in Table 7.2.2. On the other hand, the main implementing organization based on the project budget is shown in Table 7.3.3. The table also shows the comparison between present handling budget scale per staff and proposed project budget scale per staff. In case of MID, the proposed project budget scale is 50% higher than the present scale. To implement the proposed project, the per capita productivity should be improved through Project 1-3 "Capacity Strengthening of Government Officers for Planning and Good Agriculture Extension". Considering the present budget scale of the other departments such as DOA and DOH, the proposed project scale is less than 20%, except TCD, and it can be considered feasible to implement given the present capacity of the departments.

Table 7.3.3 Major Department-based Project Budget on Proposed Project

Department	Present Staff (no.) (a)	Proposed Project (Rs., crore)			Capacity of Staff *2 (e)	Ratio (d)/(e)
		Total (b)	Per year (c) = (b)/20	Cost/per year/staff (d) = (c)/(a)		
MID	213*1	2,600	130	0.61	0.4	152%
DOA	565	632	32	0.06	0.3	20%
DOH	299	110	6	0.02	0.1	20%
DOF	101	12	1	0.01	0.2	5%
SWCD	298	15	1	0.003	0.1	3%
AHVD	131	5	0	0.002	0.6	1%
TCD	140	34	2	0.012	0.02	60%
KVK	326	21	1	0.003	0.03	10%

Source: Prepared by the JICA Study Team
**1 Information in 2014 collected from MID*

The related centrally-sponsored schemes approved in the 12th Five-Year Plan are eight, namely: National Food Security Mission, National Horticulture Mission, National Mission on Sustainable Agriculture, National Mission on Agriculture Extension and Technology and *Rashtriya Krishi Vikas Yojana* (RKVY) under the Ministry of Agriculture; National Rural Employment Guarantee Scheme (MGNREGA) under the Ministry of Rural Development; Integrated Watershed Management Programme (IWMP) under the Ministry of Land Resources; and Accelerated Irrigation Benefit and Flood Management Programme (AIBP) under the Ministry of Water Resources. The budget scale in the state and related proposed projects are shown in Table 7.3.4. Although cost norms and regulations of the CSS are rigid, some or part of the proposed projects can be initiated with the utilisation of the CCS fund as mentioned in Table 7.3.4.

Table 7.3.4 Centrally-sponsored Schemes in the 12th Five-Year Plan and Related Projects

Ministry in charge	Name of CSS	Outlay for Annual Plan 2014/15 *1 (Rs., crore)	Related Project
Agriculture	National Food Security Mission	7.1	(1-7) Production of Appropriate and Quality Paddy Seeds (2-2) Enhancement of Environmentally-balanced Slope Area Cultivation
	National Horticulture Mission	65.9	(3-3) Production of Import Substitution Crops Throughout the Year
	Mission on Sustainable Agriculture	14.0	(2-1) Improvement of *Jhum*-based Agriculture (2-2) Enhancement of Environmentally-balanced Slope Area Cultivation
	National Mission on Agriculture Extension and Technology	11.3	(1-3) Capacity Strengthening of Government Officers for Planning and Good Agriculture Extension (1-7) Production of Appropriate and Quality Paddy Seeds
	RKVY	116.2	(1-7) Production of Appropriate and Quality Paddy Seeds (2-2) Enhancement of Environmentally-balanced Slope Area

			Cultivation (3-1) Establishment of Market Information Provision System
Rural Development	MGNREGA	226.9	(2-9) Improvement of Farm Accessibility and Transportation
Land Resources	IWMP	38.4	(2-8) Construction of Soil and Water Conservation Facilities
Water Resources	AIBP	70.9	(2-6) Irrigation and Command Area Development for WRC Potential Area (2-7) Improvement of Water Resource Utilisation for Existing Irrigation Schemes (2-10) Capacity Development of O&M of Fundamental Infrastructure

[*1] *Source : PPID Letter No. G.28014/55 (A) 2014-15/PLG(RDB), Re-allocation of Sectoral Outlay for Annual Plan 2014-15*

Chapter 8 Environmental and Social Consideration

8.1 Institutional Framework and Environmental Impact Assessment

8.1.1 Institutional Framework for Management of the Environment

(1) Environmental Pollution

(a) Legislation

The Environment (Protection) Act, 1986, the Environment (Protection) Rules, 1986, and the Environmental Impact Assessment Act of 2001, amended in 2006, constitute the frame legislation for the management of the quality of the environment and for the control of pollution sources in Mizoram. All these legal statements have been adopted by the Government of Mizoram without change. Main individual laws are the Air (Prevention and Control of Pollution) Act, 1981, the Water (Prevention and Control of Pollution) Act, 1974, the Noise Pollution (Regulation and Control) Rules, 2000, and the waste management related laws. The Government of Mizoram has its own enforcement rules with the Mizoram Air (Prevention and Control) of Pollution Rules, 2000, and the Mizoram Air (Prevention and Control) of Pollution Rules, 2000, which have however no provisions regarding the environmental quality standards. Environmental quality standards are set at Central Government level for air (Notification 2009), noise (Noise Pollution (Regulation and Control) Rules, 2000, and water (Guidelines of Pollution Control Board for drinking water and surface water). The surface water quality criteria have been established for 5 classes of water use, of which wildlife and fishery objective, and irrigation objective. Solid waste are managed under national laws like the Municipal Solid Waste (Management and Handling) Rules, 2000, the Bio-Medical Waste (Management and Handling) Rules, 1998, and the Hazardous Waste (Management and Handling) Amendment Rules, 2003. There is no law requirement for industrial waste and construction / demolition waste. In Mizoram, there is no Municipal Board, Municipal Corporation, Municipal Committee, or Municipal Council equivalent body, and municipal waste management is under the jurisdiction of the Local Administration Department, shared with the Trade and Commerce Department (collection and disposal of market waste).

(b) Pollution Control Board

The State Pollution Control Board of Mizoram has been constituted by Order of the Environment and Forest Department of the Government of Mizoram in 1989, based on provisions of the Air Act and Water Act. The State Pollution Control Board is an autonomous body under the jurisdiction of both the Ministry of Environment and Forest, through its regional office in Shillong (Meghalaya), and the Central Pollution Control Board. The Board is composed of a chairman, 14 members, and a secretary, nominated for 3 years.

The State Pollution Control Board issues the Consent to Establish and the Consent to Operate permits to the industrial units subject to the pollution control conditions and site suitability conditions established by the Board. Through site inspection and monitoring, the Board is mandated for controlling the compliance of activities with environmental standards and the quality of the physical environment. The capacity of the Board to achieve its goal of pollution control is limited due to the lack of technical staff (4 inspectors) and enforcement tools (absence of environmental police).

The State Pollution Control Board of Mizoram has edited the State of Environment Report 2005, which is the last published State of Environment in Mizoram. It has also a specific role in the environmental impact assessment procedure, which is the holding of public hearings.

(c) Public Health Engineering Department

The control of water quality for drinking and domestic use is under the jurisdiction of the Public Health Engineering Department (PHED). This department conducts monitoring campaigns (pre-mansoon and post-mansoon monitoring), covering the water sources of the villages of Mizoram,

and awareness campaigns in the field of sanitation. The department is organized in 18 subdivisions and 8 district laboratories.

(2) Protected Areas

(a) Protected Areas

Protected Areas as defined under the provisions of the Wildlife Protection Act, 1972, are managed under the authority of the Chief Wildlife Warden in DEF. The Central Government law has been enforced at state level through the Mizoram Wildlife Protection Rules, 1990. A Protected Area can be a National Park, a Wildlife Sanctuary, a Conservation Reserve, or a Community Reserve. The Tiger Reserve of Dampa in Mizoram is a Wildlife Sanctuary designated as a Tiger Reserve.

A non forestry activity or project is not allowed in a Protected Area. The Wildlife (Protection) Act, 1972, stipulates that any diversion of land or water from a Wildlife Sanctuary or National Park is subject to a recommendation of the State Board for Wildlife or National Board for Wildlife, respectively, together with a recommendation of the Standing Committee of National Board for Wildlife, before approval by the Supreme Court. The same kind of procedure is applicable in the case of a Tiger Reserve or any Conservation Reserve.

The Guidance document for taking up non forestry activities in wildlife habitats (Ministry of Environment and Forest, 2012) has specified the conditions of approval of activities in areas surrounding the Protected Areas.

(b) Wetlands

Protected wetlands and their conditions of protection are stipulated in the Wetlands (Conservation and Management) Rules, 2010 (MOEF). The Central Wetlands Regulatory Authority is the institution in charge responsible for the wetlands protected under the Ramsar Convention. There are 3 small scale wetland habitats in Mizoram, which are the lakes Tamdil, Palak, and Rengdil.

(c) Specific Conditions of Permitting

When a project requiring environmental clearance is going to be located within the limits of an eco-sensitive zone around a Wildlife Sanctuary or a National Park, or within a distance of 10km from the boundary of such protected zone, if the delineation of the eco-sensitive zone has not been done, the recommendation of the Standing Committee of National Board for Wildlife is necessary for granting a permit. In its general conditions for environmental clearance, the EIA Notification, 2006, has similarly established that any project in category B should be regarded as belonging to category A when located at less than 10km from any sensitive area like a Protected Area, as defined by the Wildlife Protection Act, or in a notified eco-sensitive area, as defined by the Environment Protection Act.

The National Tiger Conservation Authority is entitled to notify areas connecting to a Tiger Reserve, and to request accordingly the recommendations of the Standing Committee of National Board for Wildlife for granting a permit, when a project is going to be located in an area around a Tiger Reserve.

(d) Eco-sensitive Zones

The Government of Mizoram has not yet notified the boundaries of the eco-sensitive areas. As per section 3(v) of the Environment (Protection) Act and Rule 5 Sub-rule 5(viii) & (x) of the Environment (Protection) Rules, lands falling within 10 km of the boundaries of National Parks and Wildlife Sanctuaries must be notified as eco-fragile zones. The delineation of the eco-fragile zones, known as the eco-sensitive zones, is planned by DEF. The eco-sensitive zones are designed as buffer areas extending all around each notified Protected Area. The extension from the boundaries of the Protected areas is planned to be 2000m at Dampa, 1000m at Takalo, 500m at Murlen and Ngengpui, and 100m in each remaining area.

(e) Extension Plans of Protected Areas

The Government of Mizoram has notified on 7th January 2013 its intention to extend the Thorangtlang Wildlife Sanctuary, by including the contiguous northern areas of Kawnpui W and Darngawn W village areas (Lunglei District). After extension, the surface area of the Sanctuary will increase to 198Km^2. There is presently no any other plan of extension of the protected areas.

(3) Protection of Forest

As per the forest cover data of the State of Forest Report, forests in Mizoram are constituted of Protected Forests, Reserved Forests, and unclassified forests. As per the provisions of the Mizoram Forest Act, 1955, Mizoram forests are constituted of Government Reserve Forests and Village Forest Reserves, the later constituted of Village Safety Reserves, Village Supply Reserves, and Protected Forest Reserves. The Mizoram Forest Act, 1955, has no provision for Protected Forest. The Forest Conservation Act, 1980, and Forest Conservation Rules, 2003 (amendment 2004 not applicable), do not explicit the meaning and protection rules of the Protected Forest. It is necessary to go back to the Indian Forest Act, 1927, which is not applicable in Mizoram, to find out a definition of the Protected Forest and Reserved Forest. From the historical background of the Indian Forest Act, 1927, the concept of Reserved Forest refers to the state ownership upon forest for its commercial exploitation, while Protected Forest is more opened to the rights of use of the forest resources by the local communities. Reserved forest has a higher level of protection than Protected Forest.

The main provisions for the protection of forest are those about forestry clearance in case of diversion of forest land into a non forestry use, under the Forest Conservation Act, 1980. The forestry clearance rules apply whatever the category of forest, including forest outside the jurisdiction of DEF.

(4) Protected Species

Animal and plant species in Mizoram are protected according to the Wildlife Protection Act, 1972 and the Mizoram Wildlife Protection Rules, 1990. The aquatic fauna is under the jurisdiction of the Fishery Department in the areas outside the Protected Areas. The Mizoram Forest Act, 1955, provides a list of reserved trees which use is restricted. This rule is now out of date and substituted by provisions of the DEP guidelines. The Guidelines for Felling of Trees from non Forest Areas Issued in Compliance of Supreme Court Order provide the list of tree species not requiring felling permission. They are : Khotal (*Artocarpus integrifolia*), Tung (*Alearites fordii*), all species of Bamboo, and approved horticultural species. All other tree species are required a felling permission.

As per the Wildlife Protection Act, 1972, animal species belonging to Schedule I (22 mammals, 4 pythons and reptiles, 13 birds) are strictly protected and cannot be hunted, except in specific conditions. Species belonging to Schedule II, III, and IV (16, 4 and 36 species respectively) can be authorized for hunting under certain conditions. Plant and animal species protected according to the requirements of the CITES Convention are listed in the Schedule VI of the Wildlife Protection Amendment Act, 2013.

(5) Biodiversity

The Biological Diversity Act, 2002, enacted at the Central Government level, and the Mizoram State Biological Diversity Rules, 2010 constitute the legal framework for the conservation of biodiversity in Mizoram. The State rules are provisions for the constitution of the Mizoram State Biodiversity Board and the Biodiversity Management Committees. The State Biodiversity Board is in charge of preparing procedures and guidelines, advising and assisting the State Government, collecting and publishing data, among others. The key mandate of the Biodiversity Management Committee is to ensure conservation and sustainable use of biodiversity and its components, in coordination with the Joint Forest Management Committee (JFMC) and/or the Eco-development Committee (EDC). The State Biodiversity Board of Mizoram, chaired by the Minister, Environment and Forest Department, should have met twice a year at least, as required by the Mizoram State Biological Diversity Rules, 2010. In practice, the Board has not yet been active.

The Biodiversity Management Committee (BMC) is established at District level and Village Council level. BMC have constituted in 221 villages (list of year 2009). The BMC are expected to contribute to the integration of biodiversity conservation in developmental planning at local level, based on Biodiversity Management Plans. The baseline data for such plans are the People's Biodiversity Registers, which are comprehensive documents on availability and knowledge of the local biological resources, their medicinal use, and any other associated traditional knowledge. Presently, there are 2 People's Biodiversity Registers (villages of Thenhlum and Pamchung in Lunglei and Champhai districts respectively).

There is no inventory of biodiversity in Mizoram. Data sources for biodiversity are the People's Biodiversity Registers, the wildlife sanctuaries management plans, including the Tiger conservation plan of the Dampa tiger reserve (draft plan in 2013, final plan expected to cover the period 2015-2020), the Zoological Survey of India, and the Book of Mizoram Plants (2003, revised 2013), which provides a list of plants, animals and birds in Mizoram. The MOEF has edited in 2011 a list of 57 critically endangered species in India, which is the group of species with the highest risk category in the IUCN Red List. In 2009, the Board has notified a list of species in Mizoram that are extinct or under extinction.

(6) Cultural and Historical Assets

The Ancient Monuments and Archaeological Sites and Remains Act, 1958, and the Ancient Monuments and Archaeological Sites and Remains Rules, 1959, make provisions on the protected monuments, protected areas, and archaeological excavations or archaeological discovery during excavation works. Protected Area means any archaeological site and remains which are declared to be of national importance by or under this Act. Protected Monument is an ancient monument which is declared to be of national importance. There is no registered Protected Monument or Protected Area of national importance in Mizoram.

The Mizoram Ancient Monuments and Archaeological Sites and Remains Act, 2001, and the Mizoram Ancient Monuments and Archaeological Sites and Remains Rules, 2003, are provisions for the preservation of historical and archaeological sites and remains other than those declared as to be of national importance under the Central Government legislation. Based on this legislation, the Art and Culture Department has notified a first list of 47 protected monuments or sites, in 2008, and a second list of 35 protected monuments or sites, in 2013.

(7) Social Environment Considerations

(a) Scheduled Tribes and Scheduled Castes

The Provisions of the Panchayats (Extension to the Scheduled Areas) Act, 1996, which concern the administration of the Scheduled Areas, to which the State of Mizoram belongs, contain the basic principles that have to be taken into consideration for compliance of the State laws under Part IX of the Constitution (Panchayats). Principles pertaining to the social and environmental considerations have been compiled as follows :

- The Gram Sabha is competent to safeguard and preserve the traditions and customs of the people, community resources and the customary mode of dispute resolution;
- The Gram Sabha approval is necessary before implementation of a plan, programme or project for social and economic development in the Panchayat, at the village level
- The Gram Sabha is competent for identifying or selecting the persons as beneficiaries under the poverty alleviation and other programmes;
- The Gram Sabhas shall be consulted before making acquisition of land in the Schedule Areas for development projects, and before rehabilitation and resettlement of persons affected by such project in the Schedule Areas;
- The Panchayats are responsible for planning and management of minor water bodies in the Scheduled Areas;

The Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006, has detailed provisions on the forest rights of the forest dwelling Scheduled Tribes and other traditional forest dwellers on all forest lands. Rights for land ownership, tenure, settlement, community use of forest and its products, access to biodiversity, and others, are specified in the law. The Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Rules, 2007, is largely dedicated to the roles of the Gram Sabha and the constitution of Forest Rights Committee, for assisting the Gram Sabha.

Provisions of the Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006, may be contradictory with those of the Forest (Conservation) Act 1980, since encroachment in a reserved forest by forest dwellers may be done without consideration of the forestry clearance requirements.

(b) Gender Equity

There are provisions in environmental regulations for taking into consideration the gender equity principal for the participation of women in the decision process at village level. At least one third of the members of the Forest Rights Committee, constituted by the Gram Sabha, must be women. The same requirement applies for the Biodiversity Management Committees, which members shall be women for at least one third, and preferably one half, the number.

8.1.2 Forestry Clearance and Compensatory Afforestation

(1) Diversion of forest land for non-forestry use

(a) Non Forestry Use

The Forest (Conservation) Act, 1980, section 2 is dedicated to the conditions of restriction on the dereservation of forests or use of forest land for non-forest purpose. A non-forest purpose is defined as the breaking up or clearing of any forest land or portion of it for cultivation of tea, coffee, spices, rubber, palms, oil bearing plants, horticultural crops or medicinal plants, and for any purpose other than reafforestation.

(b) Cases of Diversion of Forest

As per Clause 6 of the Forest (Conservation) Rules, 2003, the conditions and procedure of permitting activities in a forest differ according to whether the surface area of the forest land diverted for non-forest activity is up to 40ha or exceeds 40ha. This Clause has been corrected later in the Forest (Conservation) Amendment Rules, 2004, and MOEF Corrigendum, providing additional criteria of 5ha land area in case of diversion of forest land.

In addition, MOEF has reconsidered in 2005 the case of small-scale critical development activities or initiatives that induce a diversion of forest land but are necessary for the welfare and security of local communities. Permitting conditions depend on the surface area of the non-forest activity, whether up to 1ha or exceeding 1ha, and on the category of beneficiaries, whether belonging or not to the Scheduled Tribes. Therefore, it is possible to distinguish 4 basic cases of conditions and procedures for permitting activities in a forest, as summarized in Table below. The permitting procedure is the same, irrespective of the category of forest.

(c) Forestry Clearance Procedure

Getting the in principle approval of the Forest Advisory Committee, for diversion of forest land of more than 5ha, is the main step of the forestry clearance procedure. The objectives of the in principle approval are to identify a non forest land within the limits of the State, fitting with the general and specific conditions, and to transfer this land to the Environment and Forest Department, before proceeding to its mutation and declaration as a Reserved or Protected Forest. Once the in principle approval has been recognized, formal approval by the Regional Office of the MOEF, or by the Central Government level MOEF, through appraisal by and submission from the State level agencies involved, can been carried out. According to DEF, the full procedure requires 150 days in total.

The request for diversion of forest land is submitted by the applicant to the State Nodal Officer in all cases (Principal Chief Conservator of Forest). The Divisional Forest Officer or Conservator of Forest makes a detailed appraisal of the proposal, carrying out site-inspection and site survey, with evaluation of number of trees to be felled by diversion of the forest land. The State Principal Chief Conservator of Forests makes recommendations based on examination of the results of appraisal and submits the proposal with its recommendations to the Regional Office of MOEF, or MOEF directly, for getting approval. Procedure of forestry clearance is summarized in Table 8.1.1 according to the size of diversion (4 cases).

(2) Forestry Clearance as per Case 4

(a) Permitting Conditions

In the case of an activity involving the diversion of a forest land area up to 1ha, the Central Government has given a general approval for critical development activities or initiatives that induce a diversion of

forest land but are necessary for the welfare and security of local communities. Within the list of the 11 activities identified by the MOEF as appropriate for general approval, there are the minor irrigation canals and the water / rainwater harvesting structures. The main conditions of general approval for these activities are that:

- The forest land diverted should be less than 1ha in surface area;
- The legal status of land should remain unchanged;
- No more than 50 trees / ha should be felled;
- The project should be outside a protected area;
- To maintain the green cover, 2 times the number of trees felled should be replanted and maintained, and will belong to the State Environment and Forest Department;
- Measures to preserve the surrounding flora / fauna should be undertaken;
- The land use purpose should remain as specified.

Table 8.1.1 Cases of Forestry Clearance and Summary of Procedure

Diverted area (cases)		Reception of application by	Forwarding the findings of appraisal from	Approval decision by
1	>40ha	State Nodal Officer	DFO / CF / Regional CCF /State PCCF	Secretary MOEF
2	≤40ha >5ha	State Nodal Officer	DFO / CF / Regional CCF / RCF /SAG, then State PCCF	Regional CCF (as REC not constituted in Mizoram)
3	≤5ha >1ha	State Nodal Officer	DFO / CF / State PCCF	Regional CCF
4	≤1ha	State Nodal Officer	DFO / CF / State PCCF	State PCCF

Note:DFO Division Forest Office / CF State Conservator of Forest / RCCF Regional Chief Conservator Forest / CCF Chief Conservator of Forest / RCF Regional Conservator Forest / SAG State Advisory Group (State Government representatives and RCCF as chairman) / PCCF Principal Chief Conservator Forest / REC Regional Empowered Committee (Conservators and Deputy Conservators of Regional Office and Regional PCCF as chairman) / MOEF Ministry of Environment and Forest
Source: JICA Study Team

(b) Procedure

The procedure for permitting in this case starts with the submission of the project proposal to the State Government using the Form A provided in the Forest (Conservation) Rules, 2003. The conformity of the request is assessed by the Divisional Forest Officer of concern, before submission to the State Principal Chief Conservator of Forest for approval. After approval, the Chief Conservator of Forest submits to the North-East Regional Office of Environment and Forest Department a monthly monitoring report about compliance of the project with the conditions.

(3) Compensatory Afforestation

(a) General Conditions

Compensatory afforestation is a basic condition for approval of diversion of forest land by the MOEF. Compensatory afforestation has to be done over an equivalent area of the diverted forest land, with the following general conditions :

- The non forest land for compensatory afforestation must be contiguous to or in the proximity of a reserved forest or protected forest;
- If the precedent condition cannot be fulfilled, the non forest land for compensatory afforestation can be anywhere else in the State near the site of diversion;
- If non forest land is not available, or available to a lower extent than needed, compensatory afforestation can be executed over a degraded forest land twice in extent to the area diverted;
- If there is no any suitable land for compensatory afforestation in the State, the Central Government can provide its approval based on a certificate of the Chief Secretary of the State.

(b) Specific Conditions

There are specific conditions in the case of projects exempted from providing equivalent non forest land for compensatory afforestation. The projects of concern are:

- Projects exempted from providing equivalent non forest land, but having to provide twice the

extent of the diverted forest land over degraded forest land. This category of projects includes the construction of link roads, small water works, and minor irrigation works, among others, provided that these works are done in hill district having forest area exceeding 50% of the total geographical area, and provided that the diversion of forest area does not exceed 20ha. It includes as well the projects of diversion of linear or strip plantations declared as Protected Forest along the road or canal sides for widening or expansion of such road or canal;

- Projects inducing a diversion of less than 1ha forest land, exempted of compensatory afforestation (but requested to plant twice the number of trees felled);
- Projects of the Central Government, requested to provide twice the extent of the diverted forest land over degraded forest land, without justifying a certificate of the Chief Secretary regarding the non availability of non forest land.

(c) Procedural Aspects

The non forest land identified for compensatory afforestation must be transferred to the ownership of the State Environment and Forest Department and declared as Reserved or Protected Forest. In the case where the afforestation area exceeds 500ha in plans or 200ha in hill, a Monitoring Committee shall be established. The MOEF does not require the submission of a catchment area treatment plan in the case of minor irrigation project, which extension limit is set at 2000ha. The proposed area for compensatory afforestation is inspected by the DFO for diversion of land up to 40ha, by the State Conservator of Forest for diversion exceeding 40ha, and by the Regional Office of the MOEF if diversion exceeds 100ha. A summary of compensatory afforestation according to project conditions is provided in Table 8.1.2.

Table 8.1.2 Compensatory Afforestation According to Project Conditions

Project type	Forest area diverted	Conditions	Basic rule for compensatory afforestation
Any project	>20ha	CASE 1 and 2 conditions	Non forest land equivalent to the area of diverted forest land
Link road	≤20ha	Hill district having forest area exceeding 50% of the total geographical area	Twice the extent of the diverted forest land over degraded forest land
Small water work			
Minor irrigation			
Minor irrigation canal	≤1ha	CASE 3 conditions	Twice the number of trees felled (10 times in other cases)
Water / rainwater harvesting structure			
Widening / expansion of road / canal	-	Diversion of linear or strip plantations declared as Protected Forest along the road or canal sides	Twice the extent of the diverted forest land over degraded forest land

Source: JICA Study Team

8.1.3 Environmental Clearance

(1) Permitting system

The environmental permitting rules for projects and activities have been established by ministerial order (Ministry of Environment and Forests, Notification of 14th September, 2006), as enforcing the stipulations of the Environment Protection Rules, 1986. This notification makes statutory the environmental clearance for starting, expanding, or modernizing certain projects or activities. Environmental clearance requires an environment impact assessment (EIA).

(2) Classification of projects for EIA

The EIA Notification, 2006 (amended on 1st November, 2009), has specific and general conditions for deciding if a project is subject to environmental clearance or not. Specific conditions are the criteria of categorization of projects into A or B. Projects of category A have a wider spatial extent and higher

potential of detrimental impacts than projects of category B. Class B projects are further divided into B1 and B2, B1 requiring an assessment and B2 being exempted. General conditions are the cases where a project in category B is converted into category A, when located at less than 10km from any sensitive area like:

- Protected areas as defined by the Wildlife Protection Act;
- Critically polluted areas as they may be identified by the Pollution Control Board;
- Notified eco-sensitive areas as defined by the Environment Protection Act;
- Interstate boundaries and international boundaries.

The list of projects in the specific conditions basically belong to sectors like industry (materials processing manufacturing), infrastructure, waste and wastewater treatment facilities, and construction or area development. There is no specific category for irrigation. The category River valley projects (1c) has a threshold criteria of cultivable command area set at 10000ha (≥10000ha for category A and <10000ha for category B). The Ministry of Environment and Forest has edited guidelines in 1985 for the environmental assessment of river valley projects, which are large scale multi-purpose hydro-electric projects, with an irrigation component. Neither the minor irrigation projects on a whole, nor one of their components can be classified in any of the categories of the specific conditions. There is no legal obligation to get environmental clearance or submit an EIA for their implementation.

(3) Institutions involved in the EIA process

Projects of category A as per the EIA Notification, 2006 follow the procedure with submission to the Central Government institutions involved, while projects of category B are submitted at State level. State level institutions for environmental clearance are the State Level Expert Appraisal Committee (SEAC), the State Level EIA Authority (SEIAA), and the State Pollution Control Board (SPCB). The SEAC and SEIIA are established by Central Government Order for a period of 3 years. When SEAC and SEIAA have not yet been notified, which is the case in Mizoram, the projects in category B have to follow the procedure of category A projects. The institutions and their role in environmental clearance for projects of category A are summarized in Table 8.1.3 below. Environmental clearance is granted by MOEF, at central level for projects of category A, and through the regional office of MOEF for projects of category B.

Public hearing is entirely under the responsibility of the SPCB. Public hearing is mandatory but must be requested by the project proponent toward SPCB. The public hearing is held within 45 days after receiving the letter of request, under the chairmanship of the Deputy Commissioner. Proceeding are passed to the SEIAA (if constituted), as part of the submitted documents for environmental clearance.

Table 8.1.3 Institutions Involved in the EIA Process of Category A Projects

Institution	Statutory functions
Central Level Expert Appraisal Committee EAC	Reviewing the application and submitted documents
	Reviewing the application documents for B projects to identify if the project needs an EIA or not (B1 or B2), when no SEAC has been appointed
	Establishing the TOR of the EIA if required and providing the TOR to the applicant
	Assisting the EIAA through making recommendations
Central Level EIA Authority EIAA	Evaluating and assessing the EIA report Deciding to grant or reject the prior environmental clearance (permit) in case of projects of category A
	Deciding to grant or reject the prior environmental clearance (permit) in case of projects of category B when no SEIAA has been appointed
Pollution Control Board	Conducting the public hearing

Source: JICA Study Team

8.1.4 Key Issues and Recommendations

(1) Environmental Assessment

According to the Indian legislation, small scale irrigation, which is a major component of the Master Plan in terms of infrastructural works, is not required to follow the environmental clearance procedure, and is consequently not required to prepare an environmental impact assessment. Minor irrigation may

however put some threats on valuable natural habitats or resources, on existing human settlements, and on cultural or historical sites, if not properly located, which justifies its classification as category B under the JICA guidelines for environmental and social considerations. The proper selection of the project sites for irrigation, at the planning stage, with consideration and preservation of the local environmental values, is a necessary assessment for implementing the project in an environment friendly and sustainable manner.

(2) Forestry Clearance

Forestry clearance is the permitting procedure of the Environment and Forest Department for converting a forest land into non forest use. The principle of forestry clearance is that a non forest land equivalent in area to the forest land diverted for non-forestry use must be provided, with compensatory afforestation, and transferred to the Environment and Forest Department for notification as forest land. Since forest land has been widely encroached by non forest activities later approved by a pass for use, like for example a WRC pass or a garden pass, it is now difficult to identify which land is a forest land and whether forestry clearance is needed or not. It is the Environment and Forest Department which has competence, through the forestry clearance procedure, to notify if the land going to be developed is a forest land, and if forestry clearance permit is necessary. Forestry clearance is required for forest land under jurisdiction of the Environment and Forest Department. It is required for village forest land as well, although outside the jurisdiction of the Environment and Forest Department. However, more tolerance is admitted in the later case.

Diversion of a forest land that is a village forest reserve should be considered in agreement with the Environment and Forest Department instead of formal forestry clearance. The diversion of a village forest for the purpose of minor irrigation could be fruitfully compensated by afforestation of the Jhum lands. There are two good reasons for ranking the compensatory afforestation of a Jhum land higher than simply following the normal procedure of forestry clearance : a) Since 79% of the State territory is forest covered, there is reasonably no room for finding a sufficient equivalent area in non forest land, in substitution of the diverted forest land, unless agricultural development possibilities are stopped b) Most of the population in Mizoram belongs to the Scheduled Tribes, which are given specific rights and priorities for improvement of livelihood, as far as environmental quality and forest resources are not affected.

(3) Protected Areas and Assets

There are 10 protected areas in Mizoram, essential for the conservation of natural habitats and biodiversity. A protected area is a National Park, a Wildlife Sanctuary, a Conservation Reserve, or a Community Reserve (Wildlife Protection Act 1972). The location of the infrastructural projects outside the boundaries of the protected areas, and outside the boundaries of the areas assimilated to protected areas, is a prerequisite for implementation. Are considered as areas assimilated to protected areas the planned extension area of the Thorangtlang wildlife sanctuary, and the planned Eco-sensitive Zones (buffer zone around a protected area). Similarly, the location of the infrastructural project must be selected in a way to avoid encroachment on and degradation of the protected monuments or sites notified by the Arts and Culture Department.

There is no plan to extend the network of nature conservation areas in a near future. The number of protected areas should be maintained as it is presently, and only the extension of Thorangtlang Wildlife Sanctuary will increase the total protected area from 1728km^2 to 1876km^2, which represents 8.8% of the state territory. The protection of biological corridors is a potential direction of nature conservation. There are two areas having a potential of protection as biological corridors in the future: They are the corridor area extending between Dampa and Thorangtlang sanctuaries, and the corridor area extending between Ngengpui and Tokalo sanctuaries.

8.2 Land and Assets Compensation and Resettlement

8.2.1 Legal and Institutional Framework for Land Acquisition

(1) Legal and Policy Framework

The Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act, 2013, is a comprehensive law intended to integrate compensation, rehabilitation and resettlement measures with land acquisition. The provisions of this law will be applied to all the other existing laws having similar provisions for land acquisition, within 1 year, through notification.

The National Rehabilitation and Resettlement Policy, 2007 (Ministry of Rural Development), has the same integrated approach for considering land acquisition as a package including compensation, rehabilitation, and resettlement. Among the measures and criteria formulated in the policy, one is particularly important, laying down the rule that a project inducing an involuntary displacement of 400 or more families, en masse in plain areas, or 200 or more families en masse in tribal or hilly areas, must be required to carry out the full procedure from the Social Impact Assessment (SIA) to the rehabilitation and resettlement scheme / plan.

The Government of Mizoram is still not going to adopt the new Central Government law, and land acquisition remains dictated by the provisions of the Land Acquisition Act, 1894, amended in 1984. The Mizoram Land Acquisition Rules, 2010, have been notified.

(2) Institutions Involved in Land Acquisition

Institutions involved in the process of land acquisition under the Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act, 2013, are summarized in Table 8.2.1. The rehabilitation and resettlement policy refers to similar institutions.

In Mizoram, the Deputy Commissioner (Collector) is the executing authority all along the land acquisition procedure, namely for land survey, public hearing, compensation award, and related notifications. Decisions are taken by the Principal Secretary to the Government of Mizoram.

Table 8.2.1 Main Institutions Involved in Land Acquisition, as per Provisions of the Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act, 2013

State bodies	Objectives and responsibilities
Collector	Undertaking a preliminary survey of land records before public hearing Receiving and reviewing the proceedings of the public hearing Reviewing the draft rehabilitation and resettlement scheme before submission to the Commissioner for rehabilitation and resettlement Publishing the rehabilitation and resettlement scheme
Commissioner for rehabilitation and resettlement	Giving approval of the rehabilitation and resettlement scheme / plan Responsible for formulating and supervising the Rehabilitation and Resettlement schemes or plans and their implementation, as well as social audit made after implementation
Administrator for Rehabilitation and Resettlement	Conducting a survey of lands, properties, facilities, and amenities affected or lost, and livelihoods lost, and a census of the affected families or people Organizing a public hearing and preparing the proceedings of the public hearing Preparing the draft rehabilitation and resettlement scheme, with implementation schedule Formulating, executing the Rehabilitation and Resettlement plan, and monitoring the progress of implementation
Land Acquisition, Rehabilitation and Resettlement Authority	Determining the amount of compensation to be awarded Solving the disputes relating to land acquisition, compensation, rehabilitation, and resettlement
Rehabilitation and Resettlement Committee, chaired by the Collector	*Committee established in case of proposed land equal or higher than 100 acres* Monitoring the progress of implementation of the Rehabilitation and Resettlement plan, and carrying out the social audit after implementation of the Rehabilitation and Resettlement plan
State Monitoring Committee	Reviewing and monitoring the implementation of the Rehabilitation and Resettlement Plan

Source: JICA Study Team

8.2.2 Compensation, Rehabilitation and Resettlement Rules

(1) Compensation for Land, Assets, and Livelihood

The Central Government law as well as the national policy are including land and all assets of the affected people, like built structures, trees, plants, and standing crops, within the scope of evaluation of the compensation fee, which is based on their market value, and increased of a Solatium amount being equivalent to the compensation fee. The calculation of the compensation award takes into consideration criteria like the difference between urban and rural areas. The affected people likely to be compensated are:

- Land owners
- Landless workers, tenants, artisans whose primary source of livelihood is affected by the land acquisition and who have been working in the affected area during the last 3 years prior to land acquisition
- Families having lost their forest rights due to land acquisition and being recognized under the Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006.
- Families whose primary source of livelihood for the last 3 years prior to land acquisition has been dependent on forest or water bodies and is affected by land acquisition

The scope of compensation for land and assets in Mizoram is similar, and the compensation fee is also based on the market value of land and assets, increased by 30%. The definition of affected people and the consideration of livelihood in compensation are however more restricted to land owners and tenants in the Mizoram approach.

(2) Compensation for rehabilitation and resettlement

The conditions of compensation for rehabilitation and resettlement as per the provisions of the Central Government law are summarized in Table 8.2.2.

In the land Acquisition Act, 1894, to which the Mizoram procedure refers, there is one general clause regarding rehabilitation, stipulating that the compensation award should include the reasonable expenses of a change in residence or place of business, as a consequence of land acquisition. There is no clause for resettlement. There is no example of resettlement after land acquisition. Resettlement has been done in urgency cases like after landslide disaster. Resettlement by the Environment and Forest Department for notification of a Protected Area has been experimented in the case of the Thorangtlang Wildlife Sanctuary, in 2010-2011, with 61 families of Dampui village relocated. Among them, 14 are still remaining in Dampui in 2014. This Protected Area is actually the object of a new extension in an area occupied by 2 villages, Kawnpui and Darngawn, occupied by 45 and 96 families, respectively. The relocation plan will be formulated according to the Format for Preparation of Village Relocation Plan from Core / Critical Tiger Habitats, in 2008, which are guidelines of DEF used for relocation in Protected Areas, irrespective of the tiger habitat. These guidelines are based on the principles of the National Rehabilitation and Resettlement Policy, 2007.

Compensation for rehabilitation and resettlement under DEF is done as a payment fee compensating for rehabilitation and resettlement, or as a rehabilitation / relocation package. In the later case, the affected family is allocated with 2ha of agricultural land, housing, community facilities, incentive fee, and settlement of rights, at the equivalent rate of INR10 lakhs. The State Government has to pay the extra cost if the amount of INR10 lakhs for relocation has been exceeded. Relocation in this case is managed by the State level monitoring committee, and the District level implementing committee.

(3) Facilities and Amenities for Resettlement

The central government law stipulates minimum facilities and amenities for resettlement. The Third Schedule of the Act provides a list of 25 infrastructural facilities likely to facilitate resettlement of the affected and displaced people.

The National Rehabilitation and Resettlement Policy, 2007, makes mandatory the provision of all required facilities and amenities in the resettlement area, where large numbers of families are affected. Moreover, a Tribal Development Plan must be prepared when displaced people are Scheduled Tribes.

In case of small scale relocation or resettlement, set by the policy at less than 400 families, *en masse* in plain areas, or less than 200 families *en masse* in tribal or hilly areas, the State Government still needs to carry out substitute administrative arrangements in order to manage rehabilitation and resettlement. In a small scale resettlement configuration, the national policy explicitly requires that all the affected families shall be provided the basic infrastructural facilities and amenities at the resettlement place. The Environment and Forestry Department has also facilitated the provision of facilities for the Scheduled Tribes, in its notifications regarding the diversion of forest land.

Table 8.2.2 Compensation for rehabilitation and resettlement as per the Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act, 2013

Purpose	Measures	Conditions	Concerned affected people
Resettlement	Allowance	1 time payment of 50000 rupees	Each displaced family
	Subsistence grant	Monthly subsistence allowance of 3000 rupees for 1 year	Each displaced family
	Housing	House	Affected land owners but also affected residents without homestead and residing for more than 3 years
	Grant	1 time payment of an amount notified by governmental body, not less than 25000 rupees minimum	Family of an artisan or small trader, and family having non agricultural land or commercial / industrial structure in the affected area
Rehabilitation of livelihood	Land	Entitlement of 1 acre of land	Owner of agricultural land in case of irrigation project
		Entitlement of affected land equivalent or 2.5 acres of land	Persons belonging to the Scheduled Castes or Scheduled Tribes
	Job (option 1)	Providing training and skill development for the employment of 1 member of the affected family in case of job induced project	One of the 3 options for all affected families
	One time payment (option 2)	One time payment of 5 lakhs rupees	
	Annuity (option 3)	Annuity of 2000 rupees per month per family for 20 years	
	Fishing rights	Fishing rights in the reservoir as notified by governmental body	Affected family in case of irrigation or hydraulic project
	Transportation cost	Payment of 50000 rupees	Each displaced family for shifting, and transportation of building materials

Source: JICA Study Team

8.2.3 Social Impact Assessment of Projects

The large scale projects involving a significant involuntary resettlement are required, under the provisions of the national policy as well as those of the Central Government law, to carry out a Social Impact Assessment (SIA). The Council for Social Development has edited its SIA guidelines in 2010. Before carrying out a full SIA, an Initial Social Impact Assessment (ISIA) is recommended by the guidelines.

The objectives of the SIA are to establish the social impacts and to confirm compliance with the basic principles of the law and policy, namely that land acquisition has been minimized, that impact on people and their livelihood has been avoided as much as possible, and that public purpose of the project is fully justified. The SIA must provide an estimate of the affected people and their lands and assets, and an evaluation of the social impacts of the project on livelihood, community properties, and public infrastructures or facilities. The SIA report must also include the records of the public hearing hold for its purpose. The final output of the SIA is a social impact management plan.

Although done separately, the SIA has complementary facets with the EIA. In case where both an EIA and a SIA are required, public hearing should be hold in common instead of separately. A copy of the SIA report must be attached to the EIA for environmental clearance. The case of an irrigation project

constitutes however an exception, whatever its scale. An irrigation project requiring an EIA is totally dispensed of SIA.

The SIA is carried out in consultation with the local Panchayats. The experts group set up for appraisal of the SIA is composed of 7 persons, whose 2 must be representatives of the Panchayat, Gram Sabha. The experts group is habilitated to make recommendations, and may recommend that the project should be abandoned if it considers that public purpose is not served and that social costs outweigh the expected benefits.

8.2.4 Procedural Steps

The procedural steps of compensation, rehabilitation, and resettlement, as per the provisions of the national policy, and those of the Central Government law, are first and respectively the SIA, to be completed within 6 months after its notification, the land acquisition notification by the Collector, issued within 10 months from the date of appraisal of the SIA, and at the same time the meeting of information hold with Gram Sabhas or Sabhas (village level). Land surveys are then undertaken under the responsibility of the Collector for updating the land records, and separately under responsibility of the Administrator for rehabilitation and resettlement. The rehabilitation and resettlement survey clarifies the lands, properties, facilities, and amenities affected or lost, and the families and livelihoods affected. The Administrator holds then a public hearing with discussion based on the results of the surveys, in view to finalize the rehabilitation and resettlement scheme and the schedule of implementation. The rehabilitation and resettlement scheme is later approved by the Commissioner, and made public.

In Mizoram, the land acquisition procedure as under the Land Acquisition Act, 1894, does not cover the involuntary resettlement issue. The Deputy Commissioner (Collector) engages the land survey, and makes sure that the proposed land acquisition is suitable and compliant with the law. Based on the recommendation of the Collector, the Secretary (Principal Secretary to the Government of Mizoram) makes a notification of land acquisition for public purpose, which is published through the Mizoram Gazette, local newspapers, and billposting, and passed on the Village Council (Gram Sabha) of concern. Objections are collected during 30 days by direct writing to the Collector. A public hearing, organized by the Collector, and generally attended by the sub-deputy commissioner and its staff, is held later. Basically, the people are expected to give their consent. In case of objection, possession of land may be compulsory, and claim is referred to the decision of the Court.

8.2.5 Public Consultation and Local Stakeholders

Through the constitution of the experts group, for appraisal of SIA, and the Rehabilitation and Resettlement Committee, the provisions of the Central Government law as those of the national policy have reinforced the participation of the local institutions (Gram Sabhas, in rural areas) in land acquisition, in case of major involuntary resettlement. The experts group includes 2 members of the Panchayat. Members of the Rehabilitation and Resettlement Committee, chaired by the Collector, must include representative residents of the affected area, specifically a representative of the women and a representative of the Scheduled Castes and Scheduled Tribes. The Chairpersons of the Panchayats in the affected area are also members of the Committee. For projects involving a low number of affected people, there is no specific mechanism of participation in planning the land acquisition, and redressing grievance, but the national policy explicitly requires that substitute administrative arrangements should be undertaken in such case.

8.2.6 Compliance with Requirements of JICA Guidelines

A comparison of the compensation, rehabilitation and resettlement rules and procedures in India, with those of the JICA guidelines, is performed in Table 8.2.3. It shows that the provisions of the new Central Government law and national policy fit with the requirements of the JICA guidelines. The Mizoram land acquisition procedure under the old Central Government law has dramatic gaps when compared with the JICA requirements.

8.2.7 Summary of Key Issues

- Given the specific pattern of occupation of land for housing in Mizoram, with settlements

grouped along the crest lines, the infrastructural development projects like minor irrigation and farm roads in the lowland areas should not encroach on the housing settlements or affect them. A case-by-case study is however necessary to identify exceptions. The need of compensation or relocation of settlements used for other purposes than housing, like for example the huts established in the cultivation fields, is a more likely to occur issue.

- Since the Government of Mizoram has not adopted the new Central Government law on land acquisition, the compensatory measures are based on the land Acquisition Act, 1894. The land acquisition procedure under this Act is almost not compliant with the JICA guidelines. There is no example of planned involuntary resettlement in Mizoram, excepted in the case of Protected Areas, at the initiative of the Environment and Forest Department.
- In case of rehabilitation and resettlement, and in the absence of legal provisions specific to Mizoram, the rules given by the National Rehabilitation and Resettlement Policy, 2007, should be adopted. The scope of the national policy and its provisions are perfectly consistent with the requirements of the JICA guidelines.

Table 8.2.3 Comparison of Requirements in India and from JICA Guidelines for Compensation, Rehabilitation, and Resettlement, in land Acquisition

JICA Guidelines	Central Government LAW 2013 and POLICY	MIZORAM/Central Government LAW 1894 and State RULES
1. Involuntary resettlement and loss of means of livelihood are to be avoided when feasible by exploring all viable alternatives.	Effective in the LAW and POLICY, which set down the condition of land acquisition as: a) Minimizing as much as possible the extent of land proposed for acquisition; b) Avoiding as much as possible the extent of people displacing and resettlement; c)Making sure that the expected benefits shall outweigh the social costs of impacts. For example, the acquisition of agricultural land for non-agricultural use must be minimized. The use of wasteland, degraded land, or un-irrigated land for land acquisition has priority.	Non effective - Only a general consideration is found in the RULES, conditioning land acquisition to: a) The suitability of the land proposed for acquisition; b) No excessive area of land proposed for acquisition. The avoidance of involuntary resettlement and loss of livelihood are not within the scope of the provisions of LAW 1894 and RULES.
2. When population displacement is unavoidable, effective measures to minimize impact and to compensate for losses should be taken.	Effective in the LAW and POLICY, which aim at rehabilitating the affected families to recover standards of living, through measures like subsistence allowance, housing, land allocation, fishing rights, training and skill development, and through the provision of facilities and amenities.	Almost non effective - Only one clause of LAW 1894 stipulating that the compensation award should include the reasonable expenses of a change in residence or place of business as a consequence of land acquisition.
3. People who must be resettled involuntarily and people whose means of livelihood will be hindered or lost must be sufficiently compensated, so that they can improve or at least restore their standard of living, income opportunities and production levels to pre-project levels.	Effective in the LAW and POLICY - with compensatory measures for a large spectrum of affected people, including families whose livelihood is dependent on forest and water bodies affected by land acquisition, or families of Scheduled Tribes having lost their forest rights. For example, each affected family below poverty line which is without homestead land and has been resident in the affected area for more than 3 years shall be entitled to a house of at least 100m2, in rural areas. The implementation of SIA for large scale involuntary resettlement aims at identifying the categories of affected people and the impacts on their livelihoods.	Almost non effective - Hindered / lost means of livelihood are compensated for the affected land owners and tenants, leaving behind people affected by the loss of their rights or access to their livelihood sustaining resources.

JICA Guidelines	Central Government LAW 2013 and POLICY	MIZORAM/Central Government LAW 1894 and State RULES
4. Compensation must be based on the full replacement cost, as much as possible.	Effective in the LAW and POLICY - with the principle of land-for-land or house-for-house, and if not possible, monetary compensation on replacement cost. When a house has to be allotted free of cost, for compensation, its size must be 250m2 in rural areas. When an agricultural land is allotted, its size must be equivalent, up to 9ha of irrigated land or 2ha of un-irrigated land, if Government land is available. In the case of an irrigation project, allotment of land-for-land in the command area has priority.	Partly effective - for compensation of land and assets. Non effective for compensation of rehabilitation and resettlement.
5. Compensation and other kinds of assistance must be provided prior to displacement.	Effective in the LAW and POLICY - The compensation award shall be declared well in advance and full payment of compensation before resettlement. If compensation has not been paid before taking possession of land, a 9% interest rate per year is applied. This rate is increased to 15% if no payment was done during one year after possession of land. In the case of affected people classified as Scheduled Tribes, at least 1/3 of the compensation amount due shall be paid at the outset as first installment, and the rest at the time of taking over possession of land. Non financial assistance prior to displacement is not formally established. An example of non financial assistance is the development of programs for alternate fuel, fodder and non timber forest products resources on non forest land sufficient to meet requirements of the affected Scheduled Tribes, during 5 years.	Non effective – for financial or non financial assistance.
6. For the projects that entail large-scale involuntary resettlement, resettlement action plans must be prepared and made available to the public.	Effective in the LAW and POLICY - After approval of the rehabilitation and resettlement scheme or plan, the appropriate Government shall publish the scheme or plan in the Official Gazette.	Non effective
7. In preparing a resettlement action plan, consultations must be held with the affected people and their communities based on sufficient information made available to them in advance.	Effective in the LAW and POLICY - The draft rehabilitation and resettlement scheme or plan is discussed with Gram Sabha in the rural areas, and in public hearings. For involuntary resettlement of more than 200 persons of the Scheduled Tribes, the Tribes Advisory Councils may be consulted.	Non effective
8. When consultations are held, explanations must be given in a form, manner, and language that are understandable to the affected people.	Effective in the LAW and POLICY – Notifications and publications related to land acquisition, as well as public hearing and SIA reports, are done in the local language of the affected people.	Seems effective in practice but not formally stipulated in the LAW and RULES

JICA Guidelines	Central Government LAW 2013 and POLICY	MIZORAM/Central Government LAW 1894 and State RULES
9. Appropriate participation of affected people must be promoted in planning, implementation, and monitoring of resettlement action plans.	Effective in the LAW and POLICY – The participation of the affected people in planning rehabilitation and resettlement is effective through Gram Sabha, in rural areas, and public hearings. Participation in implementation and monitoring is done through the rehabilitation and resettlement committee, with residents and Panchayat chairpersons represented.	Not effective
10. Appropriate and accessible grievance mechanisms must be established for the affected people and their communities.	Effective in the POLICY – Any aggrieved affected person , for not being offered the expected rehabilitation and resettlement benefits, may move an appropriate petition for redress of grievances to the Ombudsman, who is entitled to consider and dispose of claims relating to rehabilitation and resettlement against the decision of the Administrator for Rehabilitation and Resettlement. The Ombudsman shall be appointed by the state Government within the scope of the POLICY.	Not effective
11. It is desirable that the resettlement action plan include elements laid out in the World Bank Safeguard Policy, OP 4.12, Annex A.	Effective in the LAW and POLICY – The affected people are identified and recorded at an early stage through the SIA, implemented with public hearing, and the land survey, which includes a census of the affected population. As mentioned earlier, eligibility of benefits includes those people who have no legal rights to the land, according to conditions. The principle of land based resettlement for persons having land based livelihoods is inherent to the LAW and POLICY, as mentioned above. Needs of the vulnerable groups are given a particular attention, particularly those below the poverty line, the landless, and the Scheduled Tribes. An abbreviated resettlement plan for land acquisition involving less than 200 persons is not formerly required, but the POLICY makes mandatory the administrative arrangements for rehabilitation and resettlement of small scale involuntary resettlement. Regarding the post evaluation and monitoring of the resettlement plan, the constituted Rehabilitation and Resettlement Committee is entitled to do it. Furthermore, the LAW requires that the State Government shall constitute a State Monitoring Committee for rehabilitation and resettlement.	Not effective

Source: JICA Study Team

8.3 Impacts on the Environment

8.3.1 Environmental Issues and Impact Sources

The approaches of the Master Plan and their environmental components or issues are described in Table 8.3.1. Among the 7 programmes of the master plan, only one will be implemented according to infrastructural development projects (Programme 2-2). The approaches and actions or programmes that are likely to affect the natural and social environment in a positive or negative way are:

- Bench terracing and afforestation of steep slopes for soil and water conservation (Programme 2-1, 2-2)
- Improvement of farming in slope area according to environmental and sustainable management principles (Programme 2-1)
- Improvement of farming in slope area according to horticultural farming management skills, marketing of products, and development of exportation (Programme 2-1, 3-1)
- Development of agro-industry (Programme 3-3)
- Development of new irrigation schemes and improvement of agri-link accessibility and farm transportation (Programme 2-2)

Table 8.3.1 Environmental Issues and Impact Sources of Programs

Approaches	Programmes	Description	KEY ISSUE / impact sources
Institutional Development for Effective Agriculture Development Planning and Implementation	(1-1)Stakeholders Capacity Development and Conversion Planning	This programme aims at strengthening the institutional capacity of agriculture management departments for a more integrated and efficient development in this sector.	NO ENVIRONMENTAL ISSUE There is no source of impact on environment
	(1-2) Enhancement of Basic Agriculture Supporting Services	This programme aims at supporting poor farmers through institutional settings for the production and supply of appropriate seed and planting materials, and for improvement of farm machineries and equipment .	NO ENVIRONMENTAL ISSUE This is not considered as a source of impacts on the environment.
Enhancement of Sustainable Agriculture Production through Proper Resources Utilization and Management	(2-1) Enhancement of Resources Managed Farm Management System	This programme aims at the improved management of soil and water on slopes by the farmers themselves, with the institutional and technical support of the agriculture management agencies. A more efficient use of the agricultural potential of steep slopes with declivity higher than 25%, through rainfed or irrigated farming, is expected (Table 6.4.2).	CONSERVATION OF SOIL AND WATER AND IMPROVEMENT OF SUBSISTENCE FARMING This programme deals with the participatory management of soil and water at village level, state wide. Implementation will be done through bench terracing and afforestation of steep slopes. This programme will improve the conditions of availability of soil and water for agricultural use, on lands which are presently used for rainfed agriculture or constituted of open degraded forests, particularly the Jhum land. Since most of the land area in Mizoram State is concerned (27%), this program is expected to induce a major change in land use in the long term.
	(2-2) Enhancement of Fundamental Infrastructure	This programme basically aims at the improvement and extension of the existing irrigation schemes, development of new schemes, and improvement of accessibility and transportation, through the widening of existing roads and opening of new agri-link and farm roads. The expected effects are the development of the irrigation potential, increased production of paddy, increased income, and improved livelihood.	DEVELOPMENT OF SMALL SCALE IRRIGATION IMPROVEMENT OF FARM ROADS This programme will directly involve the planning and construction of irrigation infrastructure, like irrigation canal and water intake weirs and ponds, including the access farm roads. The potential area for development of small scale irrigation is estimated at 82700ha, covering land used for cultivation and forest land. The command area of an individual irrigation scheme is expected to be within a range of 10 to 100ha in most cases. Irrigation will be done through diversion of surface water from minor seasonal rivers (rivulets), at mini-watershed level, with distribution of water by gravity. In cases of seasonal scarcity of surface water, groundwater intake will be planed as a complementary source of water for covering the irrigation needs during the dry season.

Approaches	Programmes	Description	KEY ISSUE / impact sources
Enhancement of Good Value Chain for Agriculture Product	(3-1) Enhancement of Market Oriented Farming Technologies and Supporting System	This programme aims at increasing the production of horticultural crops and improving the quality of products, through capacity development of the farmers organizations, selection and dissemination of proper varieties of crops, use of appropriate technologies and facilities, and establishment of a certification system for safety and traceability of products from the farmers to the consumers. The expected effects are the substitution of locally produced crops for the imported crops, the exportation of crops, and the increased income of farmers.	DEVELOPMENT OF MARKET ORIENTED FARMING This programme is based on the capacity building of farmers organizations. While approach 2 is targeted to subsistence farming, this programme is more focusing on the marketing potential of horticultural crops. The target area of this programme is basically the same as for the approach 2. The potential sources of impacts on the environment are the conversion of traditional farming into a market oriented farming, and the substitution of locally produced crops for the imported crops.
	(3-2) Improvement of Present Rigid Supply Chain	This programme aims at improving the marketing conditions and distribution chain of crops, and developing post harvest processing activities.	NO ENVIRONMENTAL ISSUE This programme is based on promotion and training for the improvement of business management skills, through business model projects and supporting activities under the State organizations of concern (through the State Brand Programme Management and Implementation Committee). This programme is not considered as a source of impacts on the environment.
	(3-3) Enhancement of Agro-industrialization	This programme aims at developing the horticultural industry, developing the industrial crops and processed products, developing the production of flowers, and promoting sales. The expected effects are the improved business conditions, the creation of jobs in processing industry, and the activation of regional economy.	DEVELOPMENT OF AGRO-INDUSTRY This programme will be based on a joint collaboration of agro-industry, university and government for identifying the competitive products and developing the business conditions among the agricultural, industrial and commercial sectors for the production and marketing of such products. Then, this programme focuses on clarifying the conditions for facilitating the development of the agro-industry, and does not provide in itself any plan or project for development of the agro-industry. Within the scope of the master plan, this objective is however considered as a source of impacts on the environment.

Source: JICA Study Team

8.3.2 Consistency with Environmental Objectives

(1) Background

Consistency between the programmes and objectives of the master plan approaches with programmes and objectives of the management policies of environment is considered as an indicator and as a condition of environmental sustainability of the former programs. Since the Government of Mizoram has not yet carried out any integrated policy or plan for the management of the environment, as a substitute, the State Forestry Action Programme 1997-2017, and the State Action Plan on Climate Change 2010-2015, are taken into consideration. Both plans are coming to their final stage of implementation.

The State Action Plan on Climate Change provides a range of vulnerabilities to climate change and actions needed for adaptation to the new conditions and mitigation of the detrimental impacts. Its time horizon is the short term (2030) and long term (2050). Given its long term perspective, it is useful to retain this action plan as an indicator of consistency of the master plan programmes.

The issues and basic orientations of the State Forestry Action Programme provide a more restricted perspective, but can be fruitfully compared with the objectives of the master plan programmes, after actualization to the present conditions. Based on discussion between the JICA Study Team and the Chief Wildlife Warden (Environment and Forest Department), the future trends in nature conservation have been taken into consideration.

(2) State Action Plan on Climate Change (2010-2015)

Agriculture, forest, water, habitat, energy, health, and vulnerable groups are the sectors or issues selected for establishment of the vulnerabilities and actions in the State Action Plan on Climate Change. Climate change simulations are based on temperatures and precipitations data of the last 20 years. An increase of minimum and maximum temperatures is foreseen for all Mizoram, with the highest increase for minimum temperatures in northern districts (≥1.5degreeC in Kolasib). Higher rainfalls are expected in all Mizoram, together with an increase in the number of extreme rainfall days (more than 100mm a day). The highest increase in rainfall is foreseen in the northern part of the state, in Kolasib.

The main expected impacts of climate change in agriculture are crops failure and food insecurity. Rice yields are expected to decrease by 2035, at the highest rate of 8% in Lunglei, Kolasib, and Aizawl districts. No change is foreseen on forest in the short term by 2030, but a higher vulnerability in terms of change in vegetation cover is expected in central districts (Serchip, Aizawl, Lunglei).

The main issues and actions proposed in the Action Plan for adaptation, or mitigation of the impacts of climate change on agriculture, forest and water are presented in Table 8.3.2, in correspondence with the master plan programs that have equivalent objectives. There are important measures not retained because not relevant in this analysis (for example, the need of a water management policy and the promotion of an integrated management of water at the river basin level, in the case of water).

Table 8.3.2 Main adaptative measures and priority actions proposed in the Action Plan for mitigating the impacts of climate change on agriculture, forest, and water, in relationship with the master plan objectives

Master plan	State action plan for climate change	
Master plan approaches and programmes	Main measures of the Action Plan for Climate Change / AGRICULTURE	Main measures of the Action Plan for Climate Change / FOREST and WATER
(Programme 2-1) Enhancement of Resources Managed Farm Management System (Programme 2-2) Enhancement of Fundamental Infrastructure CONSERVATION OF SOIL AND WATER	Soil and moisture conservation practices through activities like contour ploughing, dams, organic manuring, mulching	Restoration of the abandoned Jhum areas and degraded lands through reforestation and afforestation, agro-forestry, soil moisture conservation measures
	Develop water management and conservation innovations, including irrigation, to address the risk of moisture deficiencies and increasing frequency of droughts	Improvement of forest quality and density in degraded lands and abandoned Jhum lands
	Construction of hill slope terraces for conservation of moisture and cultivation of foodgrain, vegetable, pulses and oilseed crops	Increasing water use ef8ficiency
	Water storage and providing proper diversion channels to the existing ponds for drainage of catchment runoff during sudden heavy rains	Water conservation
(Programme 2-2) Enhancement of Fundamental Infrastructure DEVELOPMENT OF SMALL SCALE IRRIGATION IMPROVEMENT OF FARM ROADS	Development of Wet Rice Cultivation (WRC) on available lands having 0-10% slope and Improvement of ExistingWet Rice Cultivation (WRC)	Increasing water use efficiency of existing irrigation systems

Master plan	State action plan for climate change	
(Programme 2-1) Enhancement of Resources Managed Farm Management System IMPROVEMENT OF SUBSISTENCE FARMING	Encourage organic farming practices Promotion of organic farming through usage of compost and vermicompost	Restoration of the abandoned Jhum areas and degraded lands through reforestation and afforestation, agro-forestry, soil moisture conservation measures
	Optimization of Jhum cultivation through conservation of arable land, water utilization management, parallel cultivation of alternative crops	-
	Conservation of agrobiodiversity to provide specific gene pools for crop and livestock adaptation to climate change	-
(Programme 3-1) Enhancement of Market Oriented Farming Technologies and Supporting System DEVELOPMENT OF MARKET ORIENTED FARMING	Improving post harvest management such as cold chain for perishable crops	-
	Develop new crop varieties to increase the tolerance and suitability of plants to temperature, moisture and other relevant climatic conditions	-
	Diversify crop types and varieties to address the environmental variations and economic risks associated with climate change	-

Source: JICA Study Team

(3) State Forestry Action Programme and Future Trends in Nature Conservation

The main relevant issues raised by the State Forestry Action Programme are:

- Inadequate protection of forest from illegal felling, encroachment, shifting cultivation, fire and other adverse activities
- Depletion of forest cover in the existing village safety and supply forest reserves
- Mounting demand of fuelwood in excess of the sustainable capacity of supply
- Importance of the non-timber forest products as sources of food and livelihood for the rural people, but mismanagement leading to degradation of forest

The following priorities have been established:

- Priority I – Protect the existing notified forest from encroachment, fire damage, illicit felling, degradation and diversion of forests area for non-forest purpose;
- Priority II – Increase productivity of forest;
- Priority III – Strengthening of policy and institutions;
- Priority IV – Increase the overall forest cover (notified forest) for ensuring environmental stability, ecological balance, and long term sustainable forests;
- Priority V – Reduce the current levels of total consumption of domestic forest based goods to the existing sustainable capacity.

As a result, the State Forestry Action Programme has defined a set of strategic orientations. The most relevant are summarized in Table 8.3.3, with their actualization based on recent trends. This table shows how the master plan programs are consistent with the orientations of the State Forestry Action Programme.

Table 8.3.3 Strategic orientations of the State Forestry Action Programme, in relationship with the master plan objectives

Strategic orientations of State Forestry Action Programme	Observations and actualization	Consistency of master plan programs

EXTENSION OF NOTIFIED FOREST ・ Identification and constitution of Jhum land (unclassified forest) into notified forest (Reserved, Protected, Village Supply Forest)	There is neither any evaluation of the achievement of this objective, nor any evaluation of the State forestry action program. However, the trends for extension of the notified forest seem to be focusing on the strict application of the forestry clearance procedure only.	Implementation of Approach 2 will be compliant with the requirement of a forestry clearance procedure. The principle of forestry clearance is that a non forest land equivalent in area to the forest land diverted for non-forestry use must be provided and transferred to the Environment and Forest Department for notification as forest land. In practice, it will be pertinent to replace the non forest land equivalent by the Jhum land equivalent, in agreement with the EFD. Following this procedure makes the program consistent with the principle of extending the notified forest.
PROTECTION OF FOREST ・ Protection of forest from illegal felling, encroachment, shifting cultivation, fire, and other adverse activities ・ Control shifting cultivation by developing alternatives	Protecting forest against illegal encroachment and controlling shifting cultivation are a business as usual practice for forestry. The forestry clearance procedure is the most important tool for maintaining the forest coverage.	Minor irrigation of Approach 2 will cover more than 46000ha of land by 2035, which is possible only from the conversion of forest land. This program is in itself in contradiction with the objective of protection of forest. The strict application of the forestry clearance will compensate the loss by afforestation and maintain the forest coverage at its initial state. This procedure makes the program compliant with the requirements and consistent with the forestry programme of protection of forest.. Improvement of Jhum farming in Approach 2, which is going to facilitate the conditions of substitution of settled farming for Jhum farming, is consistent with the strategic orientation of controlling shifting cultivation.
INCREASE THE AVAILABILITY OF FOREST PRODUCTS ・ Plantation of fuelwood mixed species on degraded forest lands and jhum lands ・ Planting of various tree species whose fruit, leaves or other parts are used as food or medicine	How the plan has achieved the objective of increasing the availability of forest products is not yet clarified. Given the conditions of growth of the population dependent on subsistence farming and forest, this objective is still important and will contribute to the sustainable replenishment of forest products.	Afforestation and environmental oriented cultivation of slopes in Approach 2 may be oriented toward increasing the availability of non timber forest products, according to the will of the local communities. These programs are consistent with the strategic orientations of the Environment and Forest Department
EXTENSION OF THE PROTECTED AREAS ・ Expansion and strengthening of the existing protected areas network	At the exception of the planned extension of the Thorangtlang sanctuary and establishment of the eco-sensitive zones, there is no more objective or trend toward increasing the number or extending the area of the protected areas. There are however areas having a potential for nature conservation in the future. They are the 2 biological corridors of Dampa-Thorangtlang and Ngengpui-Tokalo (see 8.1.4) and the 14 community reserves. These reserves have not yet been notified but they constitute a patchwork of rich biodiversity pockets with a potential of conservation in the future. They individually cover 1.2km2 to 50km2, have objectives in the field of conservation of nature or environmental resources, and belong to the jurisdiction of the village authorities.	All Approaches, but more specifically Approach 2, will be located taking into account the existing protected areas and their extension plans (extension of Thorangtlang and eco-sensitive zones). The areas having a potential for conservation of nature, namely the biological corridors and the community reserves, will be taken into consideration in order to maintain intact the potential for nature conservation in the future. The Approaches are consistent with the present trends of nature protection.

Source: JICA Study Team

8.3.3 Environmental Conditions

The present conditions of the natural and social environment in Mizoram are described in Table 8.3.4 according to the JICA criteria, and relevant issues. Within the scope of the environmental and social considerations, the description of environmental conditions has two important functions:

- Statement of the initial conditions of the environment, before their modification from implementation of the master plan;
- Statement of the main issues or sensitivities of the environment, which determine how the impact sources of the master plan are likely to induce a positive or negative change in the present conditions (impacts)

Table 8.3.4 Present conditions of the natural and social environment in Mizoram

Criteria	Present conditions
Pollution and physical environment	
A1. AIR QUALITY	The whole area of Mizoram state has been declared as an air pollution control area, which means managed under the provisions of the Air (Prevention and Control of Pollution) Act, 1981. Road transportation and Jhum shifting cultivation are the main sources of degradation of ambient air quality. Apart from the urban areas where inhabitants are directly exposed to exhaust gas emissions, with potential health incidences, the major issue about air quality is the emission of greeenhouse gases and their contribution to global warming. This issue is addressed in the State Action Plan on Climate Change, but not estimated.
A2. WATER QUALITY	The main source of water pollution is urban and domestic sewage, causing a wide spread bacteriological pollution of surface water and water sources. Open waste dumping sites are also a major cause of water pollution. The recent industrial development of Aizawl (730 units have been delivered a consent permit during the last 5 years by SPCB) results into an increased risk of pollution of rivers. The pollution from the use of agro-chemicals is not understood. Currently, the consumption of fertilizer in the Mizoram state is 42 kg/ha/year, against 112 kg/ha/year for the national average. It seems that pesticides are not widely used. The presence of heavy metals and pesticides in surface water is not monitored. Monitoring of water quality is performed by the State Pollution Control Board (SPCB) and the Public Health Engineering Department (PHED). SPCB has 6 monitoring stations (rivers Tlawng and Tuirial, and 2 springs), with monthly measurement of 20 parameters. Monitoring is also performed on a quarterly basis in Aizawl for about 70 water sources. Monitoring of drinking water quality is done yearly by the PHED according to 24 parameters, state wide. The last monitoring (pre-mansoon campaign 2014) was performed for 1213 water sources in 217 villages, showing a general conformity with the drinking water quality standards, at the exception of bacteriological parameters. The next monitoring campaign of PHED will be undertaken in the post-mansoon period from November 2014 and cover all the villages not included in the pre-mansoon campaign.
A3. SOLID WASTE	Village councils manage the collection and dumping of domestic waste in the rural areas. In Aizawl, and similarly in few cities, the municipal council together with the Trade and Commerce Department (market waste) are the agencies responsible for solid waste management. Industrial waste and hazardous waste are managed by the waste generators in controlled storage facilities in accordance with conditions set by the State Pollution Control Board. Demolition / construction waste are disposed of together with the domestic waste, or through illegal dumping. There is no sanitary landfill in Mizoram. Waste dumping sites are a potential source of surface water and groundwater pollution.
A4. NOISE	Population in the rural areas of Mizoram are not exposed to noise sources.
A5. SOIL, EROSION	High precipitations and low water retention hillside contribute to flash floods and soil erosion. The Department of Agriculture has undertaken field surveys to estimate the rate of soil erosion. The average erosion rate has been found to be 16.84 Mt/ha/year. Erosion rate is variable according to land use and slope conditions, from the highest erosion rate of 32Mt/ha/year in Jhum paddy cultivation area with slopes of 40% (23,5Mt/ha/year with 20% slope) in Kolasib, to the lowest erosion rate of 6Mt/ha/year in dense forest area with slopes of 50%, in Kolasib. Shifting cultivation is a factor of intensification of vulnerability of soil to erosion, particularly along the river banks.
Natural environment	
B1. FOREST	FOREST DEGRADATION Forest land covers 79% of the state territory, but in terms of canopy density, very dense forest represents only 0.64% of the total cover, with an extent of 134km2, mostly distributed among 3 districts (Aizawl, Champhai, Mamit). According to the State of Forest Report 2011, about 70% of the forest land is open forest (61%) and non forest (9.3%). In terms of dominant species composition, tropical semi-evergreen forest represents 72% of the total cover, and tropical moist deciduous forest 27%. The classification given by the EFD Statistical

Criteria	Present conditions
	Handbook (2011) is different, including temperate forest, Bamboo forest, Quercus forest, and Jhumland. According to the same source, the riverine forest occupies 1832km^2, which is about 9.5% of the total forest cover. Riverine forest is not specific in its botanical composition, and is highly degraded. The riverine forest is defined as a riverside forest land strip of 800m wide along the major water ways of Mizoram, as per the Riverine Reserved Forests Gazette Notification of 19 May 1965. The main cause of forest degradation, riverine forest included, is Jhum cultivation, through deforestation by shifting cultivation and uncontrolled forest fires.
B2. JHUM LAND	Jhun land is an unclassed forest (open forest) extending over an area of 24,000ha, and is at the same time a farming system based on shifting slash and burn cultivation, which is a declining practice. The cycle of Jhum shifting cultivation is presently 5 to 8 years. Shifting cultivation is a source of detrimental impacts on the environment like degraded forest, degraded soil, decreased capacity of water retention, extended forest fires, and greenhouse gaz emissions. The induced impact in terms of loss of forest habitat and biological diversity is significant. The impact on bird communities is documented. Jhum cultivation leads to the colonisation of open fallows by common widespread species, and loss of the important forest bird species. The environmental policy trends have been to reduce Jhum land in favour of an extension of the notified forest area, as in the State Forestry Action Program, and to improve the Jhum farming system, as in the State Action Plan for Climate Change.
B3. RIVERS	There are 14 major perennial rivers and 3 small wetlands (Tamdil, Palak, and Rengdil lakes). These rivers are located in the areas of available flat land, and then highly exposed to development activities, human settlements and cultivation encroachment, and deforestation by shifting cultivation. The aquatic habitats, which have not been studied, are potentially affected by river banks erosion and siltation. The Zoological Survey of India has identified 5 fish species which are common in Koladyne (or Kaladan) river, but not yet inventoried in the other states of India, possibly indicating the relative importance of the rivers in terms of biological diversity value. They are: Glyptotorax churmarii, Glyptotorax jayarami, Glyptotorax verrucosus (Sisoridae), Schistura koladynensis (Schistura), and Barilius profundus (Barilius).
B4. PROTECTED AREAS	Protected areas are part of the forest land and represent about 8% of the state territory, distributed into 2 national parks and 8 wildlife sanctuaries. About 70% in extent of the protected areas is shared by 2 districts, Mamit and Saiha. The Thorangtlang wildlife sanctuary in Lunglei is going to be extended almost 3 times its present area. There is no wetland notified as protected area. The Environment and Forestry Department is planning the notification of Eco-sensitive zones having a function of buffer zones around the protected areas. Protected areas are known to be extremely rich for their biological diversity and valuable species. In Dampa, which is a tiger reserve, terrestrial fauna is extremely rich in rare mammalian, and includes a population of tigers that was estimated to be of 6 individuals, based on genetic analysis (no visual observation). The total number of bird species is 237. Flora comprises 654 species.
B5. BIOLOGICAL DIVERSITY	Outside the protected areas, biodiversity is expected to be strongly degraded, as a result of degradation of the forest habitat. Only the protected areas, and the dense canopy forest outside the protected areas, which is however almost insignificant in extent area, are habitats with very valuable biological diversity. The People's Biodiversity Register of Thenhlum village shows that fauna species initially abundant like the Golden Cat, the Malayan Sun Bear, the Common Sloth Bear, the Leopard, and many others, are now near threatened to rare. The biological diversity of rivers in Mizoram is not documented.
B6. NATURAL RISKS	Natural risks are mainly landslides and forest fires. Since human settlements are located hilltop or hillside, they are directly exposed to landslide risk, with high potential damages. Floods are far less damageable than landslides. Forest fires essentially result from the uncontrolled slash and burn practice in Jhum farming. During the 5 years period from 2006 to 2011, 1787 forest fires have been recorded, with an affected area 52295ha (Statistical Handbook 2011 – Environment and Forest Department). The classification of Mizoram state into category 5 of earthquake risk levels in India makes it highly exposed to major earthquake occurrence.
Social environment	
C1. LAND USE	According to the JICA GIS data, forest cover occupies 46% of the state territory, Bamboo cover 32%, and Jhum land 19%, totalizing 97%, which are forest land. In the flat land area (slope under 25%), which represents 27% of the state territory, and is the area with potential development of minor irrigation projects, forest land still represents 94% of the area. The area with slopes between 35 and 70% represents 45% of the total area. The protected areas, which are part of the forest land, represent less than 6% of the state territory. According to the JICA household survey (Dec.2013-Jan.2014), the share of households having irrigated land or rainfed land was low, 18% and 28% respectively, compared with the higher rates of 78% of households having a shifting cultivation land, and 60% having fallow land (both categories belonging to the Jhum farming system) .

Criteria	Present conditions
C2. WATER USE	The main sources of water in Mizoram are springs and streams. The data collected by PHED in 2014 (pre-mansoon monitoring) show for example the predominance in number of streams (172) and springs (83), for a total of 301 water sources in Champhai district, while springs (302) and groundwater (57) are the main sources in Aizawl district, amoung a total of 369 water sources. The classification of water sources by PHED shows uncertainties, but it seems that the diversion of water from small streams and springs through pipes for domestic use is the pattern of water supply. The JICA household survey (Dec.2013-Jan.2014) has provided however a different figure: Shallow well is the domestic water supply source for 93% of the households, while 75% are supplied through pipe, and 19% declared to collect and use rain water. There is no case of water supply from deep well, and from pond or river. The surface water sources are sensitive to pollution and drought. Water retention is hindered by the morphological conditions of steep hillsides, leading to the drying of water sources in dry season, particularly in hillsides and hilltop areas, where most of the settlements are lying. According to the JICA household survey (Dec.2013-Jan.2014), drought is regarded as a major problem (16% of respondents), due to water scarcity, but is coming largely after the calamities caused by rodents and insects (64%). Water scarcity during the dry season is experienced by 95% of the households involved in irrigated cultivation.
C3. FOREST PRODUCTS	The main non-timber forest product used by villagers is fuelwood, assuming that Bamboo, widely used as a housing material, has a specific status (under Bamboo Development Agency) and is not retained as a forest product. The demand of fuelwood is in excess of the capacity of sustainable supply, contributing to the degradation of forest. In rural areas, fuelwood consumption ranges between 1.48 and 2.99kg/day/capita (as reported in the State Forestry Action Programme, 1996). Collection of wild fruits and plants for cooking or for medicinal use is locally present but there is no inventory or records. It is generally considered as an important source of food and livelihood, particularly in remote areas. Illegal hunting for wild meat consumption seems not practiced. The main forest product yield for self-consumption is fish, got by illegal fishing in rivers (riverine forests). Fishing using poisoning substances is a serious source of water pollution. Fishing seems to be as well a leisure activity.
C4. HOUSING SETTLEMENTS	Villages are clustered hilltop or hillsides. The basic pattern of land use for housing is that there is no housing settlement at the bottom of the hills and along the rivers. According to the JICA household survey (Dec.2013-Jan.2014), the average distance from home to the fields is 4,43km in the case of shifting cultivation, 4,62km for settled rainfed cultivation, and 4,06km for settled irrigated cultivation.
C5. HISTORICAL, CULTURAL HERITAGE	Among a total number of 82 protected monuments or sites notified by the Art and Culture Department, most of them are located in Aizawl (30), Champhai (22), and Langlei (17) districts. The existence of sacred grooves is mentioned, but was not confirmed by the Environment and Forest Department.
C6. LIVELIHOOD - Local economy, employment,	Livelihood mostly depends on agriculture for 70% of the population in Mizoram, which makes the people particularly sensitive to any detrimental change in land use and agriculture. The dependence on forest products is potentially high, as recognized by the specific rights given to the forest dwellers through law.
C7. POVERTY, VULNERABILITY	The share of population below the poverty line was around 20% in Mizoram (35% for the rural population), against 21.92% for India (25.70% for the rural population), in 2011-12 (see Chapter 3). The Scheduled Caste population (0.1%) in Mizoram is largely below the average in India (16.2%).
C8. GENDER	Agricultural work is traditionally distributed according to gender, women being exclusively in charge of weeding, seed storage, and selling of products, while partly in charge of forest clearing, slash-and-burn, sowing and harvesting, together with the men (see Chapter 4). Men are exclusively in charge of marketing and transportation. Women do not traditionally participate in the decision process at village level, but there are trends in representing more equitably the women in consultative committees like the Forest Rights Committees and the Biodiversity Management Committees.
C9.INDIGENEOUS PEOPLE, MINORITIES	Nearly all the population of Mizoram (94.4%) was categorised as Scheduled Tribes in 2011 (compared to the 8.2% average in India).
C10. PUBLIC HEALTH	Health care is organized into 13 hospitals, 12 community health centres, 57 primary health centres, and 370 subsidiary health centres. The burden of water borne diseases is significant. In 2010, 15626 malarial cases have been registered, of which 71 were lethal. Malaria has induced 199 cases of death injury in 2009. The incidence of malaria in Mizoram has been increasing during the last 3 years. Apart malaria, diarrhoea and enteric fever are the main water borne diseases, in relationship with polluted water sources. 16,142 cases of diarrhoea, and 1,115 cases of enteric fever have been registered for 2010.

Source: JICA Study Team

8.3.4 Assessment of Impacts and Mitigation Measures

The assessment of impacts of the master plan is based on the evaluation of the strategic directions and objectives of the approach. The sources of impacts are the relevant actions of projects and the resulting conditions of achievement of the objectives, which involve any change, positive or negative, on the natural and social environment.

Table 8.3.5 is a summary of issues, impact sources, and main potential impacts from the approach, without consideration of the existing environmental conditions. Impacts may be negative or positive. Table 8.3.6 is the detailed statement of impacts likely to occur from implementation of the Approaches, with their ranking, and according to the environmental criteria of the JICA guidelines. This statement takes into consideration the existing conditions (Table 8.3.4), and the mitigation measures. It is worthwhile to note that only the programme of "Enhancement of fundamental infrastructure" is concerned with the construction phase assessment. Table 8.3.7 gives the same results with simplification and according to the programmes. Table 8.3.8 provides a summary of the mitigation measures at planning and operation stages. These measures, already integrated in the evaluation of impacts in Table 8.3.6, are indispensable for the environmental management of the master plan. Their strict application is required. In the improved DPR preparation procedure considerable checklist of application of important mitigation measures at the planning stage of minor irrigation projects are proposed.

Table 8.3.6 and Table 8.3.7 show that the master plan has a wide range of important to moderate positive impacts, and only very few moderate to low impacts. These results assume that the mitigation measures have been fully implemented. The positive impacts are the reduction of greenhouse gas emissions, the conservation of soil and control of erosion, the conservation of protected areas and biological diversity, the improvement of livelihood and alleviation of poverty, and the allocation of benefits to the indigeneous people. The negative impacts concern only water quality, water use, and solid waste. They are ranked as small to moderate.

Table 8.3.5 Summary of issues, impact sources, and main potential impacts

Issues	Impact sources	Main potential impacts
CONSERVATION OF SOIL AND WATER (Programme (2-1) Enhancement of Resources Managed Farm Management System (Programme 2-2) Enhancement of Fundamental Infrastructure	Construction of bench terracing	Increased retention of surface water
		Fixation of soil against erosion
		Intensification of agricultural use
	Afforestation works	Increased retention of surface water
		Fixation of soil against erosion
		Extension of forest cover
IMPROVEMENT OF SUBSISTENCE FARMING (Programme 2-1) Enhancement of Resources Managed Farm Management System	Intensification of agricultural use	Improvement of livelihood
	Organic farming	Conservation of surface water quality
		Production / consumption of healthy products
		Alleviation of burden dedicated to the transportation of inputs
		Preservation of species
	Improvement of Jhum farming	Improvement of livelihood
DEVELOPMENT OF SMALL SCALE IRRIGATION (Programme 2-2) Enhancement of Fundamental Infrastructure	Construction of irrigation schemes	Generation of solid waste
	Diversion of surface water	Conflictual use of water
	Conversion of forest land into irrigated agriculture	Loss of forest land
	Intensification of agricultural use of land	Improvement of livelihood
		Intensified use of fertilizers, pesticides
IMPROVEMENT OF FARM ROADS (Programme 2-2) Enhancement of Fundamental Infrastructure	Rehabilitation / construction of farm roads	Generation of solid waste
		Loss of vegetation
		Improved accessibility

Issues	Impact sources	Main potential impacts
DEVELOPMENT OF MARKET ORIENTED FARMING (Programme 3-1) Enhancement of Market Oriented Farming Technologies and Supporting System	Conversion of traditional farming into a market oriented farming	Intensification of agricultural use of land
	Improvement of market oriented farming	Intensification of agricultural use of land
	Marketing of products	Road transportation of products
DEVELOPMENT OF AGRO-INDUSTRY (Programme 3-3) Enhancement of Agro-industrialization	Operation of processing factories	Generation of solid and liquid waste
	Creation of jobs in processing industry	Improvement of livelihood
		Boosting of the local economy

Source: JICA Study Team

Table 8.3.6 Statement of impacts of the programmes and mitigation measures

Environmental impacts criteria	Description of impacts	Ranking of impacts
Pollution and physical environment		
A1. AIR QUALITY	CONSTRUCTION PHASE (Programme 2-2) Land clearing and excavation works for the construction of irrigation structures and farm roads (Programme 2-2) are sources of dust and exhaust gases. This impact will however be quite limited in time (during construction) and intensity, due to the localization in rural area mostly outside the housing zones, with immediate dispersion of pollutants. The potential impact is not significant.	D
	OPERATION PHASE (Programme 2-2) None of these programs has a direct impact on air quality, but all of them do contribute to the long term shift from Jhum cultivation to settled cultivation, and then to the decreasing practice of slash and burn shifting cultivation. As a result, it should positively contribute to the reduction of greenhouse gas emissions and to the increase of sequestration capacity of carbon in forest.	A+
A2. WATER QUALITY	CONSTRUCTION PHASE (Programme 2-2) During the construction phase of irrigation structures and farm roads (Programme 2-2), excavation materials, fuel oils and lubricants for machineries and vehicles, and solid waste or waste water generated by workers will be potential sources of degradation of water quality. The collection and appropriate disposal of these waste materials in existing authorized dumping sites, and the proper storage of excavated soil, will mitigate the risk of water pollution. Works will be completed preferably during the dry season in order to avoid siltation in and increased turbidity of the river water.	B-
	OPERATION PHASE (Programme 2-1, 3-1) Programme 2-1 is an improvement of the present farming based on low inputs, with minor water pollution source. Programme 3-1 will promote the quality of products, based on the selection and dissemination of crops varieties and on the establishment of a traceability system. As a result, the use of organic fertilizers or pesticides is inherent to the approach and should contribute to the conservation of water quality. Programme 3-1 for horticulture and Programme 2-1 for paddy must promote an organic farming system, as much as possible. If agrochemicals are likely to be used in particular situations, awareness heightening campaigns for the proper handling and use of fertilizers and pesticides by the farmers must be undertaken at the planning phase and later during operation. In the long term, campaigns for monitoring the use of agrochemicals and the quality of surface water must be undertaken. Since the impact of programs on water quality will be minor and eventually positive compared with a no implementation alternative, but possibly negative in specific cases, the global ranking is attributed a D.	D
	OPERATION PHASE (Programme 2-1, 3-1) The master plan establishes the conditions for facilitating the development of the agro-industry sector in Mizoram at the horizon 2035. The implantation of an agro-industrial plant is not subject to an EIA, but has to be compliant with the pollution control conditions and site suitability conditions established by the State Pollution Control Board, which issues the Consent to Establish and the Consent to Operate permits. Since the conditions of management of waste and solid waste are going to be improved and pollution control under SPCB increased, the impact on water quality should be limited. Compliance with the surface water quality criteria of the Pollution Control Board is a prerequisite.	B-

Environmental impacts criteria	Description of impacts	Ranking of impacts
A3. SOLID WASTE,	CONSTRUCTION PHASE (Programme 2-2) Construction works of infrastructures for irrigation and for farm roads improvement will generate various solid waste in small quantities, mainly green waste, inert soil excavation waste, demolition / construction waste, and to a lesser extent, but more likely to have a significant impact on landscape and surface water quality, domestic solid waste left by workers, and dangerous waste like fuel oils and lubricants for machineries and vehicles. The discharge of any of these waste materials in or along the water courses must be avoided. Waste should be properly handled and disposed of using the authorized dumping facilities. The proper storage of excavated soils away for water courses, and the proper storage of fuel oil and lubricants in safe containers, will minimize the impacts.	B-
	OPERATION PHASE ((Programme 2-1, 3-3) There is basically no waste generation likely to occur from implementation of the master plan, at the exception of the agro-industrial development expected as a result of Programme 3-3. This impact is significant in terms of needs to improve the waste management capacities for proper collection and disposal, which in turn will not affect directly the quality of the environment. In specific cases where agro-chemicals would be used, in horticulture or paddy production, the farmers organizations must be aware of the need to collect and properly dispose of the waste packaging of the used substances. On a whole, waste generation will be minimized thanks to the promotion of low inputs farming, and almost no impact is expected.	D
A4. NOISE	CONSTRUCTION PHASE (Programme 2-2) Since the construction works of irrigation facilities will be lying off the housing settlements and be limited to the period of works. The traffic of trucks and machines will not significantly affect the residents.	D
	OPERATION PHASE (Programme 2-2) Since irrigation will be done by diversion weirs and gravity distribution, without pumping, noise is not an issue of Programme 2-2. The increased road traffic in village areas for the transportation of horticultural products will affect ambient noise levels, but will not significantly affect the living environment.	D
A5. SOIL, EROSION	OPERATION PHASE (Programme 2-1) Soil and water conservation is the one of the objectives of Programme 2-1. On the other hand, the compensatory afforestation of forest land diverted for the development of irrigation (Programme 2-2) and eventually horticulture (Programme 3-1), will improve the conditions of water conservation in the watershed. Programme 2-1 will improve the Jhum farming practice and the slope upland agriculture and consequently contribute to the fixation of soil and conservation of water. The programs have positive impacts on the conservation of soil.	A+
Natural environment		
B1. FOREST	PLANNING PHASE (Programme 2-1) The area planned for opening or widening irrigation schemes is estimated to be around 43000ha by 2035, which will necessarily be detrimental to the existing forest land area, particularly in flat land and in the riverine reserved forest. The potential loss of forest cover is important. The implementation of Programme 3-1 for horticultural development is similarly concerned, since encroachment of forest land is a potential issue. The strict application of the procedure of forestry clearance and compensatory afforestation is necessary, in order to maintain at least the area of reserved forest at its initial level. The MID will submit the details of the project at the planning stage to the Environment and Forest Department in order to identify the existence and boundaries of forest land, and to establish the conditions of compensatory afforestation. At this condition, the implementation of Programme 2-2 should not induce a loss of forest cover, but only affect the allocation of forest in land use. Ranking of this impact is consequently given a D.	D
	OPERATION PHASE (Programme 2-2) Afforestation of steep slopes within the scope of soil and water conservation and agroforestry development are directly positive for the extension of the forest cover and for the creation of pockets with rich agroforestry ecosystems.	B+
B2. JHUM LAND	PLANNING AND OPERATION PHASE (Programme 2-1) Jhum cultivation is detrimental for forest and its related environmental resources. From the standpoint of environmental conservation, jhum is a form of degraded forest. Jhum farming is declining, and the implementation of programs under the master plan provides the conditions for improved jhum cultivation and long term conversion to settled agriculture. Afforestion, improved Jhum agriculture and agroforestry development, and compensatory afforestation inherent to infrastructure development are all contributing to the replacement of shifting cultivation by settled farming and conservation of forest. This impact is quite positive both in terms of environmental conservation and support of livelihood.	A+

Environmental impacts criteria	Description of impacts	Ranking of impacts
B3. RIVERS	PLANNING PHASE (Programme 2-1) Conservation of water in Programme 2-1 will contribute to maintain the sustainable flow in rivers downstream and has an indirect positive effect on rivers habitats. River water diversion for irrigationwill mainly concern small streams, which are less dependent on ecological flows than major rivers for the maintenance of aquatic habitats. Then, the minor irrigation schemes are more likely to affect rivers habitats in case of development along perennial rivers, during the dry season, if the minimum ecological flow is not maintained. This risk has more negative consequences in case of development in the upstream catchment of a protected area, were terrestrial wildlife is also dependent on water availability in the stream. Coordination with the wildlife management authorities and fishing authorities at the planning stage will help to find the best conditions and best alternatives for the proper location of the irrigation schemes, and for the appropriate allocation of water in view of compliance with the nature conservation needs. Based on such consultation, the approaches should not affect the rivers habitat.	D
B4.PROTECTED AREAS	PLANNING PHASE (Programme 2-1, 2-2, 3-1, 3-2, 3-3) All the programmes should contribute to the alleviation of human pressure on forest land including the protected areas, and are positive for maintaining the integrity of the protected areas. Market oriented horticulture farming and infrastructure development are however likely to affect the protected areas in case of misallocation. The notion of protected area must be extended to the planned extension area of an existing protected area, the planned Eco-sensitive Zones (buffer zone around a protected area), but also to the areas having a potential for notification as protected area by the horizon 2035 (Table 8.3.3). Coordination with the wildlife management authorities at the planning stage is necessary for the integration of the protected areas objectives in the proper selection of sites for the irrigation schemes and horticultural development projects. Based on such consultation, the programs will not affect the existing and potential protected areas.	B+
B5. BIOLOGICAL DIVERSITY	PLANNING PHASE (Programme 2-1, 3-1) The biological diversity resources are concentrated within the boundaries of the protected areas, and more secondarily in the areas having still a potential for being notified as protected areas. The master plan programs will be implemented outside such areas (B4), avoid sensitive locations (B3), and accordingly not affect the biological diversity. There are additional conditions for avoiding any detrimental loss in biological diversity: to set the location of the horticultural or irrigation projects outside any pocket of forest with dense canopy, outside the possibly existing sacred grooves, and outside old community ponds that could be the refuge of specific aquatic species, which on a whole means outside the areas considered by the local communities of high value for biodiversity. Coordination with the Biodiversity Management Committees, including the view of women, who are in principle largely represented in these committees, will help to identify the conservation needs and avoid inappropriate location of the development projects. On the other hand, the long term partial reconstitution of forest cover in Jhum land through improvement of agriculture and afforestation, and the agroforestry development may all together contribute to the reconstitution of a biological diversity. The impact of the master plan on biological diversity is regarded to be rather positive.	B+
	OPERATION PHASE (Programme 2-1, 3-1) The promotion in the master plan of a low input organic farming and of organic fertilizers and pesticides, instead of agro-chemical products, is a positive condition for the preventive conservation of biological diversity of the river habitats. Basically, there is no detrimental impact.	D
B6. NATURAL RISKS	OPERATION PHASE (Programme 2-1) The beneficial effects of the programs for soil and water conservation will consequently contribute to minimize the risk of landslide. The improved practice of Jhum or the substitution of Jhum land with afforested land will contribute to minimize the risk of forest fires, which are mainly caused by the shifting cultivation practice. Irrigation schemes may reduce the risk of floods downstream, through increased water retention. The approach have a positive impact due to the improvement of conditions for reducing the occurrence of landslides and fires in the long term, within a context of increased risks from extreme weather events under climate change conditions.	B+
Social environment		
C1. LAND USE	PLANNING PHASE (Programme 2-1) The main sources of change in land use from implementation of the master plan approach are the conservation of soil and water, which put the conditions for an intensification of farming on slopes, and the development of irrigation in flat land, which has the same effect and lead in addition to the reallocation of converted forest land, through the procedure of compensatory afforestation. These changes in land use are important in terms of intensification of the use of land, but do not modify the general pattern of land use allocation in the state. Intensification of the agricultural use of land may contribute to the lower pressure on forest land and improvement of its conservation in the long term, which is positive.	B+

Environmental impacts criteria	Description of impacts	Ranking of impacts
C2. WATER USE	PLANNING PHASE (Programme 2-1, 2-2) Construction of infrastructure has a potential of negative impacts on water use. As shown in Table 8.3.4 (C2), springs and streams are the main sources of water for domestic use. Given the conditions of water scarcity during the dry season, water use is particularly sensitive to any upstream change in quality or quantity. In case of development of irrigation schemes in chain along the same catchment area, the potential for conflictual use of scarce water is high. Each scheme must be properly designed in order to guarantee that the flow maintained in the river downstream will be sufficient to cover the needs at all times. The use of groundwater as a supplementary source of irrigation should be maintained at its minimal use with full capacity of natural replenishment and absence of groundwater users in the same hydro-geological unit. On the other hand, promotion of participatory land use planning and management has a positive impact on water conservation and water resources. On a whole, the resulting impact should be minimal to moderate.	B-
	OPERATION (Programme 2-2) Clogging of canals due to infestation of aquatic weeds could contribute to reduce the flood flow downstream and then the availability of water supply, particularly during critical drought periods when water becomes scarce. Maintenance of the canals against clogging will maintain the normal water flow. Impact can be mitigated.	D
C3. FOREST PRODUCTS	PLANNING PHASE (Programme 2-1) The intensification of agriculture from implementation of Programme 2-1 provides the conditions for the improved conservation of forest, the replenishment of forest products and their use in a sustainable manner by forest dwellers. Afforestation in participatory land use planning and management and environmental oriented cultivation of slopes may be oriented toward increasing the availability of non timber forest products, according to the will of the local communities. The master plan has a potential positive impact on forest products.	B+
C4. INVOLUNTARY RESETTLEMENT	PLANNING PHASE (Programme 2-1) Given the conditions of permanent housing hilltop or hillside, it is assumed that small scale irrigation projects are not likely to affect housing and induce resettlement of people. The loss of housing is however possible in specific cases according to local conditions. Human settlements other than housing settlements are more likely to be affected by the projects, especially the farmers huts established in the field and used during the week days for agricultural work. Induced damages on or loss of such settlements need to be compensated at least according to the Mizoram Land Acquisition Rules 2010. Main agriculture activities have no impact on human settlements.	B-
C5. HISTORICAL, CULTURAL HERITAGE	PLANNING PHASE (Programme 2-2) Coordination with the Art and Culture Department will be undertaken in order to make sure that the project irrigation schemes will not be contiguous to, and will not affect directly (physical damages) or indirectly (landscape), any of the notified protected monuments or sites. In addition, in coordination with the Village Council, the location of the project irrigation schemes will be selected taking into consideration the valuable existing cultural or historical assets or places of importance for the local communities. There should be no impact of the programs on the historical and cultural heritage.	D
C6. LIVELIHOOD - Local economy, employment,	PLANNING PHASE (Programme 2-1, 2-2, 3-1, 3-2, 3-3) All approaches aim at the improvement of income and livelihood. Participatory land use planning and management will provide the conditions of enhanced livelihood through the better availability of water resources for domestic use and cultivation. Activities under approach 2, 3 will improve livelihood through improvement of farming practices or intensification of agriculture. Approach 3 will provide employment opportunities. The impact of the approaches is positive.	A+
C7. POVERTY, VULNERABILITY	PLANNING PHASE (Programme 2-1, 2-2, 3-1, 3-2, 3-3) All the approaches are positive for the vulnerable farmers, through the improvement of farming conditions and income of a population whose livelihood is strongly or completely dependent on the steep slopes farming (mountain agriculture). Conservation oriented agriculture is however more specifically dealing with subsistence farming and most vulnerable farmers. The impact on poverty and vulnerability alleviation is positive.	A+
C8. GENDER	PLANNING PHASE (Programme 2-1, 2-2, 3-1, 3-2, 3-3) Through implementation of the Master Plan, improvement of water availability and a more efficient use of agriculture in the slope areas will directly contribute to the alleviation of burden on women and children. Consultation and participation of women is inherent to the developing process of Master Plan. Planning of infrastructure development will fruitfully take into consideration the standpoint of the women of the community of concern, and more particularly the women in vulnerable condition, for finding out the possibilities and opportunities of improvement of the living environment in relationship with irrigation works. The construction of irrigation works can be an opportunity to improve the conditions of use and the conditions of access to water. The programmes may contribute to gender equity, and do not have detrimental effects on women, children, or vulnerable people.	B+
C9. INDIGENEOUS PEOPLE, ETHNIC MINORITIES	PLANNING PHASE (Programme 2-1, 2-2, 3-1, 3-2, 3-3) Since almost all the population has been categorized as Scheduled Tribes, the approaches benefit to the indigeneous people.	A+

Environmental impacts criteria	Description of impacts	Ranking of impacts
C10. PUBLIC HEALTH	OPERATION (Programme 2-2) The improvement of accessibility through the opening or rehabilitation of farm roads may contribute to a better access of people to health centres. The improved availability of water may contribute to an improved quality of water sources and lower exposure to the risk of water borne disease like diarrhoea. On the other hand, the extension of irrigated land in a context of climate change with an expected increase in the incidence of malaria could result into detrimental impacts in terms of burden of disease. This impact is however considered to be minimal.	D

Note: A+/- : Important positive or negative impact; B+/- : Moderate positive or negative impact ; C : Not known; D: Almost no impact or low impact
Source: JICA Study Team

Table 8.3.7 Summary of Impacts According to the Master Plan Programmes

Criteria	Master plan programmes			
	2-1	2-2	3-1	3-3
Pollution and physical environment				
A1. AIR QUALITY	+++	+++	+++	/
A2. WATER QUALITY	+	-	-	-
A3. SOLID WASTE	/	-	-	-
A4. NOISE	/	/	/	-
A5. SOIL, EROSION	+++	+	+	/
Natural environment				
B1. FOREST	++	/	/	/
B2. JHUM LAND	++	++	++	/
B3. RIVERS	+	-	/	/
B4. PROTECTED AREAS	+	+	+	+
B5. BIODIVERSITY	+	/	/	/
B6. NATURAL RISKS	+++	+	/	/
Social environment				
C1. LAND USE	+	+	+	/
C2. WATER USE	+++	-	-	-
C3. FOREST PRODUCTS	+	+	+	/
C4. INVOLUNTARY RESETTLEMENT	/	-	/	/
C5. HISTORICAL, CULTURAL HERITAGE	/	/	/	/
C6. LIVELIHOOD - Local economy, employment,	+++	+++	+++	+++
C7. POVERTY, VULNERABILITY	++	++	++	/
C8. GENDER	+	+	+	/
C9. INDIGENEOUS PEOPLE, MINORITIES	+	+	+	+
C10. PUBLIC HEALTH	+	-	/	/

+ positive – negative --- important -- moderate - low / no impact
Source: JICA Study Team

Table 8.3.8 Summary of Mitigation Measures at Planning and Operation Stages

Category of measure	Measures	Issues and main programs of concern
Engineering design and technical planning	Proper hydraulic design of each irrigation scheme in order to guarantee that the flow maintained in the river downstream will be sufficient to cover the needs at all times	WATER USE / Programme 2-2
	Proper hydraulic design of groundwater use to maintain the full capacity of natural replenishment *The use of groundwater as a supplementary source of irrigation should be maintained at its minimal use*	WATER USE / Programme 2-2
Awareness heightening campaigns	Promotion of an organic farming system *Action inherent to the implementation of programs*	WATER QUALITY / Programme 2-1, 2-2
	Awareness heightening campaigns for the proper handling and use of fertilizers and pesticides	WATER QUALITY / Programme 2-1, 2-2
Monitoring	Monitoring the use of agrochemicals and the quality of surface water *In case of use of agrochemicals*	WATER QUALITY / Programme 2-1, 2-2
Administrative procedures	Forestry clearance and compensatory afforestation *Details of the project will be submitted to the Environment and Forest Department in order to identify forest land and compensatory afforestation needs*	FOREST / Programme 2-1, 2-2
Implication of	Coordination with water users associations	WATER USE / Programme

Category of measure	Measures	Issues and main programs of concern
stakeholders	*To identify potential conflicts in water use*	2-2
	Coordination with wildlife management authorities and fishing authorities *Best conditions and best alternatives for the proper location of the irrigation schemes and appropriate allocation of water to maintain a minimum flow in rivers*	RIVER HABITATS / Programme 2-2
	Coordination with the wildlife management authorities *Proper selection of sites for the irrigation schemes and horticultural development projects to avoid impacts on the existing and potential protected areas*	RIVER HABITATS / Programme 2-1, 2-2
	Coordination with the Biodiversity Management Committees *To identify the conservation needs and avoid inappropriate location of the development projects*	BIOLOGICAL DIVERSITY / Programme 2-1, 2-2
	Coordination with the Art and Culture Department *To make sure that the project irrigation schemes will not be contiguous to, and will not affect directly (physical damages) or indirectly (landscape), any of the notified protected monuments or sites*	HISTORICAL CULTURAL HERITAGE / Programme 2-1, 2-2
	Women and vulnerable women's view must be included in planning *For finding out the possibilities and opportunities of improvement of the living environment in relationship with irrigation works and in relationship with the use of forest products.*	GENDER / Programme 2-2 BIOLOGICAL DIVERSITY / Programme 2-1, 2-2

Source: JICA Study Team

8.3.5 No project alternative

There is no alternative to the proposed approaches within the scope of the master plan. The only alternative is the no-project alternative, which means not implementing a components of master plan. Table 8.3.9 provides a statement of direct and indirect impacts in case of no implementation, compared to implementation. Table 8.3.10 is a summary at the level of the master plan. These tables show that implementation of the master plan is far more beneficial for the conservation of the environment than the no-project alternative. Given the context of population growth and climate change, the no-project alternative is worsening the conditions and has no environmental benefit.

Table 8.3.9 Compared impacts of the components in case of no project alternative

Programs	Impacts in case of no project alternative
Programme 2-1	Not improving the community management of soil and water in the slope areas would stop the possibilities of agricultural improvement or development for the largest part of Mizoram area and for a large population whose livelihood depends on agriculture. Due to population increase and growth of demand for food, the intensification of agricultural use of land on the slopes in the absence of better management of water and soil could induce environmental threat like soil degradation, increased water scarcity, increased use of agrochemicals to sustain yields, increased encroachment on forest land including protection areas, and finally pauperization and villages desertification by the younger generations. Inversely, program 2-1 makes possible the environmental improvement of slopes and the creation of a rich agro-forestry ecosystem in the long term. Program 2-1 is typically an environmental program and the no-project alternative is of course undesirable.
Programme 3-1	Implementation of Program 3-1 is similarly conditioned by the achievement of Program 2-1, but focuses on intensification of horticultural agriculture with marketing of products. The no-project alternative would mean the as usual business with worsening conditions, namely the production of low quality and low quantity products, unable to satisfy the growing demand, and the intensified traffic for transportation of imported products. While implementing the project is a way to maintain and improve agricultural activity and livelihood of farmers, and to improve the energy efficiency of transportation due to the shortening of trips between producers and consumers, no implementation would result into an environmental threat, as for programs 2-1, with in addition worsening conditions of road traffic to satisfy the local demand, inducing increased air and noise pollution, and increased greenhouse gas emissions from transportation. Given the expected population growth and increasing demand for horticultural products, the no-implementation alternative has no positive incidences on the quality of the environment, but only worsening of the social and environmental conditions.
Programme 3-3	Implementation of program 3-3 will have positive impacts on employment and livelihood, and negative impacts on the physical environment, due to solid waste and liquid waste emissions, with

	contamination of the surface water sources. Implementation is however assumed to be in the long term, and the conditions of management of waste and solid waste are already being improved through the planning of treatment facilities and control of pollution under SPCB. This program is the outcome of program 4 and sustain its successful achievement, making implementation of program 7 indirectly desirable from the environmental point of view. The no-implementation alternative does not present environmental advantages.
PROGRAM 2-2	Not developing minor irrigation for development of the flat land can hardly been compensated by any other agriculture intensification activity, given the physical constraints. No irrigation would result into an increased pressure on non cultivated lands and uncontrolled encroachment on sensitive forest land areas like the river banks, with degradation trends like increased erosion and increased loss of forest cover. The "no irrigation project" alternative is not desirable for environmental and social conditions.

Source: JICA Study Team

Table 8.3.10 Compared impacts of the master plan in case of no project alternative

Criteria	WITH MASTER PLAN		WITHOUT MASTER PLAN	
	+	-	+	-
Pollution and physical environment	・ Soil conservation ・ Water conservation ・ Decrease of greenhouse gas emissions from Jhum farming ・ Extension of forest as a carbon sink	・ Degradation of water quality (low to moderate)	None	・ Degradation of water quality ・ Degradation of soil and erosion ・ Increased air and noise pollution from transportation ・ Increased greenhouse gas emissions of transportation and Jhum farming.
Natural environment	・ Creation of rich agroforestry systems ・ Lower human pressure on existing or potential protected areas ・ Improvement of forest cover ・ Conservation of biodiversity ・ Alleviation of natural risks ・ Energy efficiency from shortening of trips between producers and consumers of horticultural products	・ Degradation of river habitats (low)	None	・ Encroachment on forest land and protected areas ・ Increased loss of forest cover ・ Degradation of river banks and loss of river habitats ・ Degradation of biodiversity ・ Worsening of natural risks, specially landslides
Social environment	・ Conversion of Jhum farming into settled farming ・ Sustainable replenishment of forest products ・ Improvement of income and livelihood ・ Creation of employment opportunitires ・ Improved accessibility of farm roads	・ Conflictual use of water	None	・ Increased water scarcity ・ Degradation of income and livelihood ・ Pauperization of villages ・ High dependency on Jhum cultivation ・ Increased scarcity of forest products ・ Worsening conditions of road traffic from importation of horticultural products

Note: + positive – negative
Source: JICA Study Team

Chapter 9 DPR Preparation Guideline

9.1 General

In addition to the preparation of master plan for development and management of land and water resources for sustainable agriculture as described previous chapters, the improvement of DPR preparation procedure for minor irrigation development is also the other objective of the Study. This chapter describe the background, methodologies, result of field verification and the contents of improved DPR preparation guideline for minor irrigation development.

9.2 Background and Objectives of the Phase-2 Works

The minor irrigation facilities are one of the most important agriculture infrastructure in the state, and 439 minor irrigation schemes are developed in the past years. However, the inventory survey carried out in October 2013 to February 2014 showed that 49% of the created irrigation potential under the minor irrigation facilities was not in use and only 7% of the facilities are properly maintained by the established Water Users' Associations (WUAs). Based on the observation made out by the inventory survey, MID and the JICA Study Team discussed and analysed why the existing minor irrigation schemes did not bring maximum output. Then, it was found out that some points should be improved in the selection of the project and DPR preparation procedure.
It is therefore that the new guidelines for DPR preparation for minor irrigation development has been prepared with close discussion with MID based on the field verification in four model sites.

9.2.1 Results of the Inventory Survey of Existing Minor Irrigation Schemes

The inventory survey of minor irrigation schemes was carried out from October 2013 to February 2014. The outline including number of data, collected data, and methods, is summarised in Table 9.2.1

Table 9.2.1 Outline of Inventory Survey of Existing Minor Irrigation Schemes

Surveillance Period		**17 October 2013 – 16 February 2014**
Number of Survey		**374 scheme data were collected out of 439**
Collected Data	Basic Information	Type of scheme, year, total cost, coordination, altitude, irrigation water source, GCA, CCA, IPC
	Facilities, Infrastructure	Accessibility, number/length of irrigation facilities, conditions of O&M
	Farming	Seasonal major irrigated crops, other usage of irrigation water
	Problems	Sufficiency of water, flood damage, major problems, major constraints for irrigated agriculture
	WUA	WUA activities, number of members
	Other	Loans, fees for irrigation water
Method		Interview, GPS, DPR

Source: JICA Study Team

According to the results of the inventory survey, the following points have been observed:

- Season-wise water sufficiency rate is as follows: 72% for *Kharif*, 14% for *Rabi*, and 8% for summer. About 30% of schemes need more water even during the *Kharif* season, and the cultivable area is very limited during the dry season.
- There is a gap between the irrigation potential created (IPC) in the DPR and the survey results. It is expected that the existing total IPC of Mizoram is about 19,300 ha, which is 51% of the DPR's IPC information (37,730 ha).
- Rehabilitation of 70% of schemes (big or small) may be necessary, especially for canal and intake facilities. More than half of the schemes have experienced flood damages (permanent: 16%, temporary: 48%).
- The survey results showed that only 26 (7%) out of 374 WUAs collect water use fees from

their members regularly. Most of WUAs are short of financial and technical capacity for sustainable irrigation management.

9.2.2 Present DPR Preparation Procedure and Points to be Improved

Based on the observation made out by the inventory survey, MID and the JICA Study Team discussed and analysed why the existing minor irrigation schemes did not bring maximum output. Then, it was found out that some points should be improved in the selection and planning procedure, as shown in Table 9.2.2, together with construction quality and operation and maintenance of the scheme.

Table 9.2.2 Present DPR Preparation Procedure and Points to be Improved

No.	Procedure	Points to be Improved
1	Project Selection	・ The project selection is inefficient since the application procedure such as time schedule, applicants, and necessary data, is not standardised. ・ The project selection is affected by those in power since the selection criteria are not clearly decided yet and there is no transparency in the site selection. ・ The project is selected with mainly irrigation aspect only by the MID staff. The manifold aspects should be incorporated for selection of a good project. ・ Technical and social information is not enough to evaluate and select a good project.
2	Agriculture Planning	・ The proposed cropping calendar is prepared without considering the preference and technical rationality of the farmers, and technical knowledge in DOA and DOH are not incorporated either. ・ The means to achieve the proposed cropping calendar are not discussed in the planning among the relevant government staff and farmers.
3	Irrigation Planning	・ The requirements and available water resources are not strictly evaluated, and some data used are not realistic. ・ Possible options such as construction of reservoir or employing a pipeline system to increase the available water or improve the irrigation efficiency are not discussed deeply.
4	Facility Design, Construction Planning and O&M	・ The facility plan is not clear in the drawings. ・ The construction plan and quality control plan are not discussed deeply. ・ The general facility plan is applied to all without considering potential disasters such as landslide. ・ Necessary operation and maintenance is not discussed and not notified to WUAs.
5	Overall	・ The contents of the DPR are not properly shared with the stakeholders like the farmers, village authority, and relevant departments, and are not getting the proper approval.

Source: JICA Study Team

9.2.3 Proposed Improved Procedure for Verification

Based on the assessment of the present DPR procedure for minor irrigation scheme development, the JICA Study Team proposed an improved procedure after closed discussion with MID and other relevant departments. The improved procedure is mainly focused on the involvement of beneficiaries and other related departments such as the Department of Agriculture (DOA) and the Department of Horticulture (DOH) in the planning procedure.

The proposed procedure has 12 steps as mentioned in Table 9.2.3.

Table 9.2.3 Proposed Procedure for DPR Preparation

Step	Contents of Each Step	Responsibility	
		Main	Sub
Step 1	Publication of MI Scheme Selection and Implementation Procedure and Reception of Application	MID	-
Step 2	Preliminary Technical Site Survey for Scheme Selection	MID	-
Step 3	Preparatory Meeting among Relevant Departments in Division	MID, DOA, DOH	-

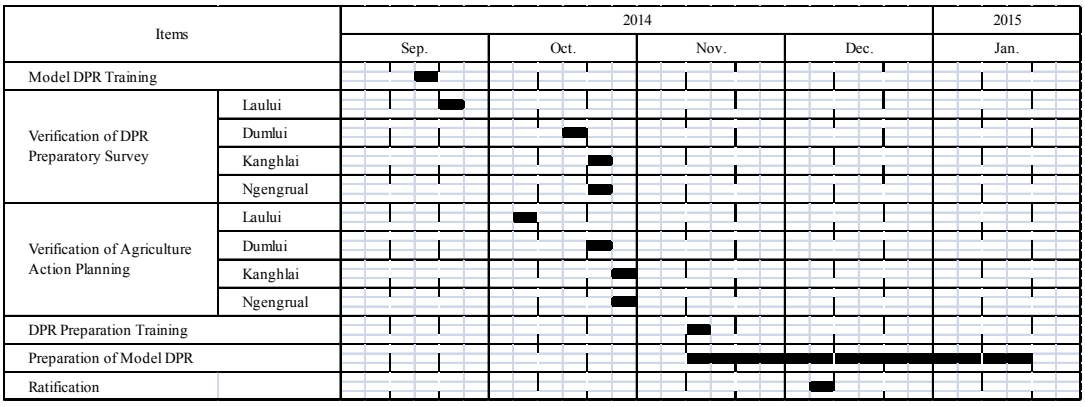
	Level	Other department concerned	
Step 4	Evaluation and Selection of MI Development Project	MID, DOA, DOH Other department concerned	-
Step 5	Establishment of WUA	MID	DOA, DOH Other department concerned
Step 6	DPR Preparatory Survey	MID	DOA, DOH Other department concerned
Step 7	Preparation of Agriculture Action Plan	WUA, MID, DOA, DOH	-
Step 8	Irrigation Planning	MID	-
Step 9	Facility Design and Preparation of O/M Plan	MID	-
Step 10	Preparation of Construction and Quality Control Plan	MID	-
Step 11	Cost Estimation, Benefit Assessment and Other Impact Assessment	MID	-
Step 12	Consensus Building and Finalisation of DPR	MID, DOA, DOH Other department concerned	-

Source JICA Study Team

Applicability and technical feasibility based on the present capacity of the government officers are verified in the field test in the model sites and finalised at the end of Phase-2.

9.3 Work Procedure and Schedule

The improvement of the DPR procedure including the necessary training to the government officers and preparation of the model DPR are carried out from September 2014 to January 2015. The work schedule is shown in Figure 9.3.1



Source JICA Study Team

Figure 9.3.1 Work Schedule for Preparation of the Model DPR

9.4 Model Sites for Verification

Four model sites, minor irrigation schemes (MI schemes) of Laului, Dumlui, Kanghai, and Ngengrual, were selected with the following criteria for the verification of the model DPR:

- Total of three or four sites.
- Model sites should include typical site for wet rice cultivation (WRC) gentle-slope site.
- Model sites should include typical site for mountainous sloppy site.
- Model sites should include existing scheme site for rehabilitation and future candidate site for new construction.
- Access to model sites is not difficult even during the *Kharif* season.
- The model site should be located where the MID division office can visit easily and conduct follow-up activities.

- The model site should be located where DOA and DOH can also visit easily and conduct follow-up activities.
- Concerned villagers (WUA) are organised and cooperative for minor irrigation projects.
- Model site security conditions should be safe and there should not be any land problem.
- Land ownership of the command area is clear, and beneficiaries have been identified already.
- Majority of WUA members are farming by themselves, and not as hired labourers.
- The model site scale should be of typical size for farming type in the region.
- The model site should be where comprehensive approach for irrigation, agriculture, horticulture, and fishery is necessary.

Basic outline of each scheme is described below.

9.4.1 Laului Minor Irrigation Scheme

(1) Location and Accessibility

The scheme is located in Sailam Village, Aibawk Rural Development Block (RD Block), Aizawl District, and lies between Sailam Village and Thenzawl Town below National Highway (NH) 54. Accessibility of the scheme is shown in Table 9.4.1.

Table 9.4.1 Accessibility of the Laului MI Scheme

Distance from major town	10.0 km from Thenzawl (Serchhip District)
Distance from district headquarters	83 km from Aizawl
Distance from main road	3.5 km
Distance from farmers' village	23 km from Sailam; 28 km from Sialsuk; 10 km from Thenzawl
Distance from market	6.0 km
Farm road condition	*Rabi*: Easy to access; *Kharif*: Difficult to access

Source: Minor Irrigation Department (MID) and JICA Study Team

(2) Natural Conditions

The scheme is located at the valley bottom of the Laului River. Natural conditions in the area of the scheme are summarised in Table 9.4.2.

Table 9.4.2 Natural Conditions in the Laului MI Scheme Area

Elevation of farm[1)]	370 m above sea level	
Slope of land development area[2)]	20%	
Annual precipitation (1998-2011) at Siaksuk Station[3)]	Average: Maximum: Minimum:	3,330 mm 4,650 mm in 2007 2,334 mm in 2005
Water resources[4)]	Streams:	Thingkhuang, Vawmkuak, and Pukpui
Soil characteristics[5)]	Soil colour: Soil texture: Drainage class: Erosion:	Brown to dark brown – Clayey Humic Hapludults Light yellow – Clay Aquic Dystrochrepts Fine loamy and loamy skeletal Well drained Slight

Source: 1), 2) and 4) MID and JICA Study Team, 3) Department of Agriculture, 5) Mizoram Remote Sensing Application Centre

(3) Socio-Economic Situation of Farmers

A household survey of the farmers who participated in the DPR workshop was conducted, and the answers were received from 20 farmers (18 male and 2 female). Key findings of the survey are described below.

The average family size of respondents is 6.7 persons. It seems that poverty is not severe, however, there are three households whose socio-economic status is classified as below poverty line (BPL) or under the *Antyodaya Anna Yojana* (AAY). The following are the survey results: above poverty line (APL)=15, BPL= 2, AAY= 1, and no answer= 2.

Farmers' economy and land holdings are shown in Table 9.4.3. The largest income resource is agriculture (32%), followed by cottage industry (20%), wage labour (12%), and permanent employment (11%). The largest expenditure is food (35%), followed by agricultural input (24%) and savings (12%). The largest type of land is irrigated land/wetland (2.2 acres), followed by permanent rainfed (1.1 acres), while, *jhum* land is very small at 0.1 acre. It shows that wetland agriculture is the base of their livelihood.

Table 9.4.3 Farmers' Economy and Land Holdings in the Laului MI Scheme

Annual Income: average of 20 respondents (Unit: INR)													
Agriculture	Livestock / Dairy	Fishing / Aquaculture	Forestry	Sericulture	Cottage industry	Business / Trade	Wage labour	Private Services	Permanent employment	Loan	Grant	Others	Total
43,775	6,750	0	0	0	27,900	100	16,600	11,885	15,000	0	16,000	0	138,010
32%	5%	0%	0%	0%	20%	0%	12%	9%	11%	0%	12%	0%	100%

Annual Expenditure: average of 19 respondents (Unit: INR)													
Food	Fuel	Water	Electricity	Transpor-tation	Communi-cation	Agri Input	Education	Health	Clothing	Social functions	Loan repayment	Savings	Others	Total
46,417	5,981	758	2,595	4,009	3,521	31,273	6,747	3,153	5,989	2,353	0	15,924	2,368	131,088
35%	5%	1%	2%	3%	3%	24%	5%	2%	5%	2%	0%	12%	2%	100%

Land Holdings: average of 19 respondents (Unit: acre)							
Jhum	Irrigated/ Wetland	Permanent rainfed	Fallow	Fishpond	Residential	Others	Total
0.1	2.2	1.1	0.1	0.2	0.3	0.0	3.9

Source: MID and JICA Study Team

(4) Agriculture Situation and Issues of Development

Potential area of the scheme along the Laului River has been under cultivation as early as 1935. Though a small irrigation facility was provided by MID way back in 2004, it was not sufficient to benefit majority of the farmers. Due to lack of systematic irrigation facilities and proper land development works, all the potential areas cannot be properly utilised. It is required to divert water from nearby small perennial streams to provide irrigation.

The area has flat and gentle slopes and requires land levelling works. Presently, the farmers utilise land only for cultivation of paddy during the rainy season (*Kharif*). If proper irrigation facilities are provided, the farmers will be able to cultivate even in winter and thereby increase their income.

Several issues on agricultural development in the area were reported by the farmers who participated in the DPR workshop. The major issues are shown in Table 9.4.4.

Table 9.4.4 Major Issues on Agricultural Development of the Laului MI Scheme

Category	Issues
Irrigation and Water Control	・ Insufficient irrigation water ・ Insufficient drainage ・ Undeveloped irrigation system (intake, canal lining, pipeline, etc.) ・ Flood/ No check dam
Crop Cultivation	・ Difficulty in ploughing/ No machine ・ Damage by pest and disease ・ Need for land development for crop cultivation ・ Lack of materials for cultivation during winter (pipe, sprinkler, etc.)

Transportation	・ Poor approach road and link road ・ Hanging bridge/ Need for bridge construction

Source: MID and JICA Study Team

9.4.2 Dumlui Minor Irrigation Scheme

(1) Location and Accessibility

The scheme is located in the western side, at the outskirts of Kolasib Town, Thingdawl RD Block, Kolasib District. Accessibility of the scheme is shown in Table 9.4.5.

Table 9.4.5 Accessibility of the Dumlui MI Scheme

Distance from major town	6.0 km from Kolasib
Distance from district headquarters	6.0 km from Kolasib
Distance from main road	5.0 km
Distance from farmers' village	6.0 km from Kolasib
Distance from market	6.0 km
Farm road condition	Rabi: Easy to access; Kharif: Difficult to access

Source: MID and JICA Study Team

(2) Natural Conditions

The scheme is located at the valley bottom of the Dumlui River. Natural conditions in the area of the scheme are summarised in Table 9.4.6.

Table 9.4.6 Natural Conditions in the Dumlui MI Scheme Area

Elevation of farm[1)]	70 m above sea level	
Slope of land development area[2)]	1.8%	
Annual precipitation (2000-2011) at Kolasib Station[3)]	Average: Maximum: Minimum:	2,867 mm 4,204 mm in 2001 1,781 mm in 2009
Water resources[4)]	Streams:	Dumlui and Holder lui
Soil characteristics[5)]	Soil colour: Soil texture: Drainage class: Erosion: Soil depth:	Yellowish brown to light olive brown (surface to sub-surface) Fine texture, alluvial and colluvial soils Moderately well drained Moderate Very deep

Source: 1), 2) and 4) MID and JICA Study Team, 3) Department of Agriculture, 5) Mizoram Remote Sensing Application Centre

(3) Socio-Economic Situation of Farmers

A household survey of the farmers who participated in the DPR workshop was conducted, and answers were received from 16 farmers (13 male and 3 female). Key findings of the survey are described below.

The average family size of respondents is 5.1 persons. It seems that poverty is not severe, however, there are three households whose socio-economic status is classified as BPL or under AAY. The survey results are as follows: APL= 8, BPL= 1, AAY= 2, and no answer= 5.

Farmers' economy and land holdings are shown in Table 9.4.7. The largest income resource is permanent employment (44%), followed by cottage industry (14%), agriculture (10%), and aquaculture (8%). All farmers are town dwellers and most of them have their own businesses or jobs. Therefore, they hire tenant farmers to manage their farmlands. The largest expenditure is food (37%). The balance of income and expenditure shows a high surplus. The largest type of land is irrigated land/wetland (1.1 acres), followed by fishpond (0.8 acres), while, *jhum* land is very small at 0.3 acres.

Table 9.4.7 Farmers' Economy and Land Holdings in the Dumlui MI Scheme

Annual Income: average of 16 respondents (Unit: INR)													
Agriculture	Livestock / Dairy	Fishing / Aquaculture	Forestry	Sericulture	Cottage industry	Business / Trade	Wage labour	Private Services	Permanent employment	Loan	Grant	Others	Total
35,450	16,875	28,275	250	0	46,563	14,281	12,000	12,500	150,000	6,250	1,875	15,000	339,319
10%	5%	8%	0%	0%	14%	4%	4%	4%	44%	2%	1%	4%	100%

Annual Expenditure: average of 14 respondents (Unit: INR)														
Food	Fuel	Water	Electricity	Transpor-tation	Communi-cation	Agri Input	Education	Health	Clothing	Social functions	Loan repayment	Savings	Others	Total
69,000	16,418	4,437	10,737	10,486	10,457	17,400	13,254	6,986	12,486	6,375	3,864	2,571	846	185,317
37%	9%	2%	6%	6%	6%	9%	7%	4%	7%	3%	2%	1%	0%	100%

Land Holdings: average of 15 respondents (Unit: acre)							
Jhum	Irrigated/ Wetland	Permanent rainfed	Fallow	Fishpond	Residential	Others	Total
0.3	1.1	0.4	0.0	0.8	0.0	0.0	2.6

Source: MID and JICA Study Team

(4) Agriculture Situation and Issues of Development

Cultivation of WRC and upland areas of Dumlui was started around in 1955. Paddy as well as other crops were grown. Then with the outset of "disturbances across the state", where indigenous people fought against the Government of India, cultivation of the area could not be carried out properly. From 1972, cultivation was again started in a much proper manner than before. The first action taken by the Government of Mizoram, DOA in the command area was responsible for construction of a link road in 1975, and such road was further made to a jeepable road in 1997. DOA further took up works such as land levelling, land reclamation, and irrigation. Some farmers went on to make fishponds.

During the *Kharif* season, apart from some fishponds, the whole command area is used for paddy cultivation. The farmers convey water to the field through earthen canals to irrigate the WRC area constructed by them. Not much cropping is done during the *Rabi* and summer seasons because water cannot reach a larger part of the area due to the absence of irrigation system (water conveyance facilities). Due to the low production of crops and the low return from crops, some of the farmers left much of their land fallowed. Some of the farmers have engaged in fisheries, and a few farmers have made use of their land all year round only for aquaculture.

As mentioned above, most of farmers hire tenant farmers coming from Assam State. They are the so-called landlords, and some of them lack interest in farming and leave tenants in charge of farm management. Tenancies are governed by customary practices and are usually on a crop share basis with rents fixed at 33-50% of the production.

Several issues on agricultural development in the area were reported by the farmers who participated in the DPR workshop. The major issues are shown in Table 9.4.8.

Table 9.4.8 Major Issues on Agricultural Development of the Dumlui MI Scheme

Category	Issues
Irrigation	・ No water supply during dry season ・ Collapsed irrigation canals/ Improper maintenance of canals/ Too small canals ・ Small drainage canal (overflow during the rainy season) ・ Siltation and waterlogging
Paddy Cultivation	・ Unlevelled paddy field ・ Weeds ・ Damage by pest and disease

	・ Damage by flood during rainy season ・ Lack of proper varieties (Need for short period varieties of paddy to reduce the days of plantation period to avoid risks) ・ Conversion from paddy fields (Some farmers prefer aquaculture instead of paddy cultivation)
Other Crop Cultivation	・ Difficult to grow other crops in large scale since the farm is very far from the main road ・ No training from concerned departments regarding winter crops/cash crops
Agricultural Inputs and Machineries	・ Absence of quality seeds ・ High cost of weedicides ・ Absence of machineries
Fish Farming	・ Irregular level of fishpond ・ Weeds ・ Absence of ready availability of fingerlings ・ High cost of fingerlings ・ Erosion of fishpond banks by the fish ・ Overflowing of ponds ・ Sub-standard available fingerlings (subsidised)
Livestock	・ Difficult in raising livestock such as piggery and poultry (all landowners are living in town and only tenant farmers (labourers) are living in the farm)
Transportation	・ Damaged approach road/ Need for an approach road repair
Other	・ No exact relationship among landowners ・ Very few landowners invest on their farmland, and many owners do not go to their farm periodically. Therefore, many landowners cannot identify/consider problems exactly on different aspects. ・ Each landowner has different contract system with Assam tenant farmers. Therefore, there are some problems to do some activities concerning agriculture. ・ Crop varieties are selected by the tenant farmers and not by the owners.

Source: MID and JICA Study Team

9.4.3 Kanghai Minor Irrigation Scheme

(1) Location and Accessibility

The scheme is located in Tlangsam Village, Champhai RD Block, Champhai District, and lies on the outskirts of Champhai Town (about 8 km from the town). Accessibility of the scheme is shown in Table 9.4.9.

Table 9.4.9 Accessibility of the Kanghai MI Scheme

Distance from major town	8.0 km from Champhai
Distance from district headquarters	8.0 km from Champhai
Distance from main road	1.0 km
Distance from farmers' village	8.0 km from Champhai
Distance from market	1.5 km from New Champhai
Farm road condition	Rabi: Easy to access; Kharif: Easy to access

Source: MID and JICA Study Team

(2) Natural Conditions

The scheme is located in the Champhai plain, which is the largest plain in Mizoram and is known as the 'Rice Bowl of Mizoram'. Natural conditions in the area of the scheme are summarised in Table 9.4.10.

Table 9.4.10 Natural Conditions in the Kanghai MI Scheme Area

Elevation of farm[1)]	1,296 m above sea level	
Slope of land development area[2)]	10%	
Annual precipitation (1998-2011) at Kolasib Station[3)]	Average: Maximum: Minimum:	2,005 mm 2,725 mm in 2010 1,632 mm in 2001
Water resources[4)]	Stream:	Thlerpui
Soil characteristics[5)]	Soil colour:	Dark

	Soil texture:	Clayey Humic Hapludutus, FL Humic Hapludults, Clayey Tupic Hapludults
	Drainage class:	Well drained
	Erosion:	Moderate
	Soil depth:	Deep

Source: 1), 2) and 4) MID and JICA Study Team, 3) Department of Agriculture, 5) Mizoram Remote Sensing Application Centre

(3) Socio-Economic Situation of Farmers

A household survey of the farmers who participated in the DPR workshop was conducted, and answers were received from 18 farmers (17 male and 1 female). Key findings of the survey are described below.

The average family size of respondents is 6.3 persons. It seems that poverty is not severe because only one household is classified under AAY. The survey results are as follows: APL= 14, BPL= 0, AAY= 1, and no answer= 3.

Farmers' economy and land holdings are shown in Table 9.4.11. The largest income resource is permanent employment (35%), followed by business/trade (20%), private services (20%), and agriculture (11%). All 18 farmers are town dwellers, and 12 of them have their own businesses or jobs. However, they have never hired tenant farmers to manage their farmlands. The largest expenditure is food (32%), followed by savings (21%). The largest type of land is irrigated land/wetland (1.8 acres), followed by permanent rainfed (0.4 acres), while, *jhum* land is very small at 0.1 acre.

Table 9.4.11 Farmers' Economy and Land Holdings in the Kanghai MI Scheme

Annual Income: average of 16 respondents (Unit: INR)													
Agriculture	Livestock / Dairy	Fishing / Aquaculture	Forestry	Sericulture	Cottage industry	Business / Trade	Wage labour	Private Services	Permanent employment	Loan	Grant	Others	Total
38,156	0	5,313	0	0	0	71,000	31,375	69,250	125,000	0	0	15,000	355,094
11%	0%	1%	0%	0%	0%	20%	9%	20%	35%	0%	0%	4%	100%

Annual Expenditure: average of 14 respondents (Unit: INR)													
Food	Fuel	Water	Electricity	Transportation	Communication	Agri Input	Education	Health	Clothing	Social functions	Loan repayment	Savings	Others	Total
100,786	7,091	6,329	8,111	15,371	7,814	11,329	18,281	8,714	14,714	4,047	29,057	66,286	20,957	318,888
32%	2%	2%	3%	5%	2%	4%	6%	3%	5%	1%	9%	21%	7%	100%

Land Holdings: average of 13 respondents (Unit: acre)							
Jhum	Irrigated/ Wetland	Permanent rainfed	Fallow	Fishpond	Residential	Others	Total
0.1	1.8	0.4	0.0	0.1	0.1	0.0	2.3

Source: MID and JICA Study Team

(4) Agriculture Situation and Issues of Development

The area is a good prospect for supplying vegetables and other cash crops to Champhai market. The progressive farmers put their best efforts to utilise the farmlands from their own resources. So far, they have accomplished providing irrigation to some potential areas by diverting the water from a nearby perennial stream and conveying the water to the WRC area through earthen canals, for production of paddy in the *Kharif* season. Though the farmers tried their level best, even the areas which were already irrigated could not be properly utilised for production of crops especially during the *Rabi* and summer seasons due to lack of irrigation water.

Several issues on agricultural development in the area were reported by the farmers who participated in the DPR workshop. The major issues are shown in Table 9.4.12.

Table 9.4.12 Major Issues on Agricultural Development of the Kanghai MI Scheme

Category	Issues
Irrigation	・ Need for water pumping from the Tuipui River ・ Difficult to get water from the drainage canal for winter cultivation ・ Difficult to control water ・ Big seepage from canal
Paddy and Other Crop Cultivation	・ Damage by flood ・ Decrease land area due to river bank erosion ・ Water shortage (*Rabi*: big, *Kharif*: small) ・ Weeds ・ Shortage of fertiliser/Difficult to apply fertiliser in time ・ High labour cost ・ Hard soil after applying fertiliser ・ Low post-harvest value addition ・ Improper government servicing (not on time)
Fish Farming	・ Poor fish farming management ・ Flooding ・ Shortage of water to produce fish ・ Shortage of fingerlings ・ Shortage of feeds for fish

Source: MID and JICA Study Team

9.4.4 Ngengrual Minor Irrigation Scheme

(1) Location and Accessibility

The scheme is located about 5 km on the eastern side of Thingfal Village, Lunglei RD Block, Lunglei District. The village itself is on NH 54, about 67 km from Lunglei. Accessibility of the scheme is shown in Table 9.4.13.

Table 9.4.13 Accessibility of the Ngengrual MI Scheme

Distance from major town	14 km from Lawngtlai (Lawngtlai District)
Distance from district headquarters	67 km from Lunglei
Distance from main road	5 km
Distance from farmers' village	5 km from Thingfal
Distance from market	14 km from Lawngtlai
Farm road condition	*Rabi*: easy to access; *Kharif*: difficult to access

Source: MID and JICA Study Team

(2) Natural Conditions

The scheme is located at the valley bottom of the Ngengrual River. Natural conditions in the area of the scheme are summarised in Table 9.4.14.

Table 9.4.14 Natural Conditions in the Ngengrual MI Scheme Area

Elevation of farm[1)]	780 m above sea level	
Slope of land development area[2)]	WRC = 5%, Horticulture area = 20 %	
Annual precipitation (1998-2007 and 2011) at Lunglei Station[3)]	Average: Maximum: Minimum:	3,584 mm 5,554 mm in 2000 2,334 mm in 2005
Water resources[4)]	Streams:	Ngengrual and Darnam
Soil characteristics[5)]	Soil colour: Soil texture: Drainage class: Erosion: Soil depth:	Brown to dark brown Clay, Loam Well drained Slight Very deep

Source: 1), 2) and 4) MID and JICA Study Team, 3) Department of Agriculture, 5) Mizoram Remote Sensing Application Centre

(3) Socio-Economic Situation of Farmers

A household survey of the farmers who participated in the DPR workshop was conducted, and answers were received from 39 farmers (34 male and 5 female). Key findings of the survey are described below.

The average family size of respondents is 5.9 persons. It seems that poverty is spreading in the area, as there are 15 households whose socio-economic status is classified as BPL or under AAY. The survey results are as follows: APL= 24, BPL= 5, and AAY=10.

Farmers' economy and land holdings are shown in Table 9.4.15. The largest income resource is agriculture (22%), followed by private services (20%), business/trade (19%), and permanent employment (10%). The largest expenditure is education (22%), followed by food (22%), and savings (11%). It shows that most of the households have schoolchildren and make efforts for children's education. The largest type of land is irrigated land/wetland (2.1 acres), followed by permanent rainfed (1.0 acre), while, *jhum* land is very small at 0.1 acre.

Table 9.4.15 Farmers' Economy and Land Holdings in the Ngengrual MI Scheme

Annual Income: average of 39 respondents (Unit: INR)													
Agriculture	Livestock / Dairy	Fishing / Aquaculture	Forestry	Sericulture	Cottage industry	Business / Trade	Wage labour	Private Services	Permanent employment	Loan	Grant	Others	Total
33,856	7,282	179	1,154	0	4,615	28,874	19,279	30,923	15,692	0	10,487	0	152,344
22%	5%	0%	1%	0%	3%	19%	13%	20%	10%	0%	7%	0%	100%

Annual Expenditure: average of 39 respondents (Unit: INR)													
Food	Fuel	Water	Electricity	Transpor-tation	Communi-cation	Agri Input	Education	Health	Clothing	Social functions	Loan repayment	Savings	Others	Total
23,064	6,639	885	2,572	5,127	4,175	9,612	23,597	5,874	4,421	2,953	4,462	11,403	1,744	106,526
22%	6%	1%	2%	5%	4%	9%	22%	6%	4%	3%	4%	11%	2%	100%

Land Holdings: average of 28 respondents (Unit: acre)							
Jhum	Irrigated/ Wetland	Permanent rainfed	Fallow	Fishpond	Residential	Others	Total
0.1	2.1	1.0	0.0	0.4	0.2	0.0	3.9

Source: MID and JICA Study Team

(4) Agriculture Situation and Issues of Development

Potential area along the Ngengrual River has been under cultivation as early as 1935, making it one of the earliest WRC areas in Mizoram. However, a heavy landslide in 1995 has completely damaged most of the cultivated flatland, covering it with mud and other debris and leaving the area uncultivable for a number of years. Even the course of the Ngengrual River itself suffered severe and drastic changes. In fact, the surrounding area of about 300 m long of the river proper course was inundated, making it marshy and unsuitable for any type of cultivation. Now, after more than 15 years, the land seems to be suitable and ready again for any type of cultivation. Some farmers have started paddy cultivation in a limited area with good and reasonable harvest even without proper irrigation facilities. Their activities greatly aroused interest of local farmers. In order to utilise all the potential areas along the Ngengrual River, it is necessary to divert water from nearby streams since some of the potential areas is located at higher elevation.

Several issues on agricultural development in the area were reported by the farmers who participated in the DPR workshop. The major issues are shown in Table 9.4.16.

Table 9.4.16 Major Issues on Agricultural Development of the Ngengrual MI Scheme

Category	Issues
Irrigation/ WUA	・ Insufficient irrigation water ・ Need for irrigation canal renovation ・ No proper irrigation facilities to obtain irrigation water ・ Difficult to form WUA due to no common channel to share among farmers
Paddy Cultivation	・ Insufficient funds for paddy cultivation ・ Renovation of paddy fields and other farmlands ・ Need for paddy seed supply on time ・ Not enough fertiliser application (fund shortage and not available on time) ・ Unlevelled farmland after landslide ・ Difficult to remove weeds ・ No overall farmland development ・ Shortage of water due to no proper irrigation facilities ・ Damage by flood
Winter Crop Cultivation	・ Need for seed supply on time ・ High price of fertiliser (not enough subsidy) and not available on time ・ High labour cost and shortage of fund for hiring labour ・ Damage by pest and diseases
Machineries	・ Not enough machineries for tillage
Transportation	・ No proper approach road to transport farm inputs and harvested crops ・ Need for a bridge across the river

Source: MID and JICA Study Team

9.5 Necessary Training before Verification

9.5.1 Seminar on Participatory Planning

(1) General

Involving farmers in the area in the entire planning process may alter their mind-set on planning and implementation of development, and could create self-sustaining circumstances of such. Positive impacts can be anticipated through application of participatory method in preparing the Detailed Project Report (DPR). Furthermore, maintaining accountability and transparency can assure sustainable development, in particular.

From the above viewpoint, it was determined and verified to use the participatory method in the preparation of the DPR after consultation with the Minor Irrigation Department (MID). Also, it was identified that experiences of officers of agriculture allied departments on participatory method for development are not necessarily adequate, therefore, a seminar on participatory method and workshops were carried out based on a model DPR implementation process.

The JICA Study Team invited a professor of the Department of Extension Education and Rural Development of Mizoram University to the seminar and workshops on participatory method for development, which gave substantial impacts to the participants.

(2) Outline of the Seminar

The general outline of the seminar on participatory method is summarised in Table 9.5.1.

Table 9.5.1 Outline of the Seminar

Particular	Brief Description		
Purpose	・ Understand the outline, flow, and attainment of project targets. ・ Understand/appreciate the effectiveness of current projects being enforced in Mizoram ・ Obtain general ideas about important elements of a project in relation to community participatory approach and community-based organisations (CBOs). ・ Understand the advantages and disadvantages of participatory approach in the conduct of sustainable development. ・ Understand the schedule and outline on how to implement the workshop for the model DPR.		
Implementation Period	17 September 2014 / One-day seminar		
Venue	Administrative Training Institute (ATI)		
Participants	Department	No. of Participants	Job Title

	MID	37	CE, SE, EE, AE, SDO, JE, Surveyor, Computer Operator, UDC, MR, etc.
	DOA	8	DAO, SDAO, AEO, SO/SA,
	DOH	8	HDO, DHO, ADHO, HEO
	DOF	3	DD, FI, TA
	DSWC	4	DO, OSD, ASCO, ASLO
	Other	1	DD (planning)
	Total	61	
Agenda	・ Conceptual Aspect of Process of a Project ・ Important Elements of Development ・ Community Action Plan and Management (CAP) Approach ・ Community-Based Organisation (CBO) ・ Overview of Workshop Procedures ・ Implementation Procedures of CAP Approach ・ Preparation of Cropping Pattern and Agriculture Action Plan		
Methods	Seminar (make a power point presentation with question and answer portion and exchange of opinions among participants)		
Handout	Printed PowerPoint presentation		
General Results	・ Every participant showed a keen interest throughout the seminar. ・ Most of them appreciated doing DPR preparation through participatory method. ・ Many participants actively shared their opinions and experiences. ・ Although participants expressed that participatory approach has many benefits, they also presented different constraints such as political influence, shortage of funds, lack of human resources and skills, lack of coordination among departments, no proper policy and system, lack of support from higher authorities, and nepotism. ・ However, at the end participants made a presentation that all the above constraints they pointed out except for funds can be resolved among themselves.		

Source : JICA Study Team

(3) Findings

In Mizoram, the New Land Use Policy (NLUP) had been prepared adopting the participatory method and implemented involving the Young Mizoram Association. At the beginning, NLUP started well but the implementation was not continued till completion. The participatory method in accordance with the guideline of the Central Government was implemented in some projects, however, such experiences were very limited. Furthermore, as there was no policy done by the state on the said subject, almost no officers have carried out the participatory method on the projects, at present.

There are a few officers who obtained their knowledge and experience on the participatory method through overseas or domestic training courses, or have tried adopting the method to their projects by his/her own interest. Accordingly, with regard to human resources development, the participatory development method as well as development method in general is essential in Mizoram, by improvement of the environment for development framework including the participatory method. Many participants of the seminar expressed the necessity of having practical trainings in order for them to learn how to adopt the participatory method in actual projects, not only through the seminar.

Table 9.5.2 compiles the opinions of the participants of the seminar on benefits and constraints of the participatory method. Items listed as benefits showed the participants' understanding on the advantages of the participatory method, while items listed as constraints showed issues on the policy and implementation system of projects of the Mizoram State government.

Table 9.5.2 Benefits and Constraints of Participatory Approach: Opinions from Participants

No.	Benefits of Participatory Approach	Constraints of Participatory Approach
1.	Better acceptance by the people	Political influence (should be avoided)
2.	Sense of belonging "we feeling"	Time constraints
3.	Actual needs are identified	Policy and system constraints at present
4.	Identifying existing resources (internal) and other resources (external)	Fund constraints (paucity, delay in the release of funds)
5.	Sense of togetherness	Lack of human resources
6.	Good accountability and transparency	Lack of knowledge (in general)

7.	Transparency	Lack of skills/attitudes for participatory approach
8.	Unlimited potentials for development	Lack of communication (top-down)
9.	Human resources mobilisation	Mind-set (should be changed)
10.	More ideas, benefits	Indecisiveness (policy, development purpose, etc.)
11.	Shared responsibility	Vested interest is existing
12.	Identification of problems	Lack of leadership
13.	Identification of deliverables	Lack of coordination (among departments)
14.	Identification of project scope	Lack of support from higher authority
15.	Identification of location specific needs	Nepotism (favouritism)
16.	Reflect ground realities	Lack of commitment
17.	Good planners versus bad implementation	There is no cheap and easy shortcut
*From the abovementioned constraints, all points except fund constraint can be overcome		

Source: JICA Study Team

Comments of the Participants

Exchange of Opinions about the Participatory Approach

Source: JICA Study Team

Photo 9.5.1 Technical Training Scene

(4) Future Agenda and Recommendations

The feedback of the participants of the seminar is summarised in Table 9.5, and based on the feedback, future agenda is summarised, as follows:

- Apprehensive power of the officers is high and positive for better development of Mizoram State, and effectiveness of the participatory development method is well understood.
- On the other hand, as the development policy and objectives of Mizoram are not precise, and the direction of tasks as well as attainment of degree of each officer is unclear, necessary support and services needed by the target areas and farmers were not provided. Most of the officers agreed with this issue.
- It is essential to build up the capacity of relevant officers for better implementation of the development policy and objectives. At the same time, it is necessary that development policy and objectives in Mizoram should be clearly defined. The present government's administration system, including development planning, coordination system for implementation of plan, and so on, should be urgently improved. In order to achieve these things, upgrading of officers' capability and a basic and comprehensive development environment should be consolidated.
- In the seminar, many officers requested to implement a model project adopting the participatory development method. It seems that there are many constraints for the officers to take initiative in implementing a model project by themselves, as shown in Table 2.1.1-3. The JICA Study Team assumed that these officers consider that a model project should be implemented by a third party so that they could magnify the achievement provided by the model in Mizoram State by eliminating the constraints in a short time.
- Most of CBOs including Water Users' Associations (WUAs) and farmers' organisations were established through the initiative of the State Administration. However, the department considers such organisation as requirement for administrative purpose. Organisational activities such as strengthening of CBOs and securing sustainability of its activities are not included. The government department has neither a specialised section nor experts for the implementation of the participatory development method. It is suggested to include

peripheral activities such as environment conservation, poverty reduction, and safety in order to secure the sustainability of development activities.

Table 9.5 Comments from the Participants of the Seminar

1.	The training program is well-organised and enjoyable.
2.	This kind of systematic approach will help in preparing the DPR more easily.
3.	If practical programs are carried out at the ground level these will be more fruitful.
4.	Participatory mode is appreciated, its impact could be more beneficial especially for Mizoram State.
5.	Todays' training is quite beneficial and useful for the preparation of the DPR.
6.	Participatory approach seems applicable in Mizoram.
8.	It depicts our present status (about phase A of the process of the project).
9.	Training is delightful and fruitful.
10.	It gives future prospect in Mizoram.
11.	It is resourceful.
12.	Hopefully with the seminar, it will change the mind-set of the officials.
13.	The first day of the training is found to be satisfactory and understandable.
14.	The concept of community participatory approach in the formation of development plan is found to be one of the best approaches in order to achieve sustainability in agricultural development.
15.	Gives new ideas and insights to achieve better relationship with the community.
16.	Participatory approach is found to be applicable in Mizoram and gives good results but with proper awareness.

Source: JICA Study Team

9.5.2 Technical Training for Irrigation

Three trainings related to technical matters were carried out, namely, preparatory technical training, site survey training, and training for preparation of the model DPR. The contents and outlines of these trainings are described below.

(1) Preparatory Technical Training for the Model DPR

The preparatory technical training for the model DPR was conducted in order to give necessary knowledge in the preparation of the model DPR. The outline of the preparatory technical training is given in Table 9.5.4.

Table 9.5.3 Summary of Preparatory Technical Training

Objectives	・ ・Explain and confirm the objectives and procedures of the model DPR activities. ・ ・Train basic knowledge necessary for DPR preparation. ・ ・Discuss opportunities between the JICA Study Team and relevant MID engineers.
Period	Two days; From 18/ 9/ 2014 to 19/ 9/ 2014
Venue	Administrative Training Institute (ATI)
Participant	JICA Study Team: Engineer Hiraiwa, and Engineer Ueno MID: 35 MID engineers from head and division offices (SE, EE, SDO, JE, etc.)
Training Agenda	・ ・Outline of the model DPR activities ・ ・Outline of the four model DPR sites and activity schedule ・ ・Explanation and sharing the results of inventory survey ・ ・Methodology of site surveys ・ ・Irrigation plan/ facility design/ O&M plan ・ ・Construction plan and quality control plan ・ ・Operation training of basic software tools
Training Style	・Seminar style
Distribution Materials	・ ・Print out of presentation materials ・ ・Supplementary reference materials for survey, planning, design, and supervision works ・ ・CD-ROM data for each division office

Source: JICA Study Team

Thirty-five MID participants completed the two-day programs. Participants including those who came from division offices understood the objectives and procedure of the proposed model DPR activities. Moreover, current problems of the existing DPR and improvement points were shared with MID participants. After each agenda was explained by the JICA Study Team, the study team and MID discussed the existing situation and applicability of proposed ideas. Some of the proposed ideas were modified and became realistic. Through this training, MID participants became ready and prepared to start the model DPR activities on site.


Source: JICA Study Team

Photo 9.5.2 Technical Training Scene

(2) Site Survey Training for the Model DPR

The preparatory site survey training for the model DPR was done to give necessary knowledge in the conduct of the site survey for the preparation of the DPR. The outline of the site survey training is given in Table 9.5.5.

Table 9.5.4 Summary of Site Survey Training

Objectives	・ On-the-job training (OJT) for the implementation of the DPR preliminary technical survey and DPR preparatory survey especially for the newly proposed items like measurement of water discharge, soil test, confirmation of proposed facility locations, etc. ・ To grasp the existing conditions of model sites. ・ Prepare the first draft facility layout drawing	
Period	Laului	Two days; From 23/9/2014 to 24/9/2014
	Dumlui	Three days; From 14/10/2014 to 16/10/2014
	Kanghai	One day; 28/10/2014
	Ngenrual	One day; 28/10/2014
Survey area	Four model DPR areas and its surrounding area	
Participants	Laului	8 engineers (EE, SDO, JE, etc.) from Aizawl and Serchip 6 beneficiary farmers 5 JICA Study Team members
	Dumlui	10 engineers (EE, SDO, JE, etc.) from Kolasibl, Champhi, and Lunglei 6 beneficiary farmers 3 JICA Study Team members MID engineers of Champhai and Lunglei were also invited to hold joint site survey training.
	Kanghai	6 engineers (EE, SDO,JE,etc.) from Champhai 5 beneficiary farmers 2 JICA Study Team members
	Ngenrual	6 engineers (EE, SDO,JE,etc.) from Lunglei 5 beneficiary farmers 2 JICA Study Team members
Activities and Survey Items		
Laului	<u>Activities</u> ・ Site survey and confirmation of existing conditions.	

	・ Soil test training. ・ Training of discharge water measurement. Surveyed items ・ Overall existing conditions of the Laului scheme area. ・ Water resource of Nos. 1 and 2. Intake point is abundant during rainy season. ・ Sediment around intake especially after flooding. ・ Sediment of canal around the landslide area. ・ Accessibility from main road during rainy season. ・ Conditions of targeted irrigation area (existing paddy and proposed land development area). ・ Landslide damage of access road. Site visit to existing farm pond constructed by the Department of Agriculture (DOA). And confirmed existing conditions and problems like leakage, loose compaction, erosion, etc.
Dumlui	Activities ・ Discussion about the Dumlui scheme development policy and basic conditions. ・ Site survey and confirmation of existing conditions. ・ Soil test training. ・ Training of discharge water measurement. ・ Collection and confirmation of existing fishery conditions. ・ Training on the preparation of facility layout map. Surveyed items ・ Target area boundary and direct beneficiaries. ・ Existing problems and needs of beneficiary farmers. ・ Existing condition of WUAs (number of members, area, activities, etc.). ・ Overall site conditions and access road conditions by car. Existing land use ・ Existing water flow (irrigation and drainage) and shown in the map. ・ Existing irrigation facility conditions and needs of rehabilitation. ・ Disaster risk condition and locations like flooding, erosion, and landslide. ・ Landowners' boundary. ・ Conformity of topographic survey results (contour, facilities location, directions). Fishery related items □Interview with fishpond owners in Dumlui and collection of basic information of fishery activities. Explanation on basic fishery knowledge, current problems, and ideas improving fishery development by the JICA fishery expert to the participants.
Kanghai	Activities ・ Site survey and confirmation of existing conditions. ・ Soil test training. Surveyed items ・ Overall existing conditions of the Kanghai scheme area. ・ Target area boundary. ・ Existing condition of targeted drainage and damages along the drainage. ・ Accessibility from the main road during rainy season. ・ Site conditions of the proposed farm pond area and leveling topographic survey. ・ Existing land use and existing facility conditions. ・ Collection and confirmation of existing pond and paddy fishery conditions.
Ngenrual	Activities ・ Site survey and confirmation of existing conditions. ・ Soil test training. ・ Training of discharge water measurement. Surveyed items ・ Overall existing conditions of the Ngenrual scheme area. ・ Site conditions around river diversion and intake facilities. ・ Existing access road and land development conditions. Existing river and streams conditions.

Source: JICA Study Team


Checking the site conditions


Measurement of discharge water


In-situ soil classification test

Source: JICA Study Team

Photo 9.5.3 Site Survey Training

(3) Training for Preparation of the Model DPR

The training for the preparation of the model DPR was conducted to give physical knowledge in the preparation of the DPR. The outline of the training is given in Table 9.5.6.

Table 9.5.5 Outline of Training for the Preparation of the Model DPR

Objectives	・ Prepare the four model DPR sites. ・ Discuss and modify details of model DPR newly proposed items. ・ OJT especially on newly proposed items. ・ Capacity development for the preparation of DPR.
Period	Five days; From 10/11/2014 to 14/11/2014
Venue	MID Chief Engineer's (CE) Office (Aizawl)
Participants	Total of 15 persons from MID CE office: 1 person (AE), Kolasib Division: 4 persons (EE, 2 SDO, JE) Aizawl Division: 4 persons (EE, 2 SDO, JE), Lunglei: 3 persons (EE, 2 SDO) Champhai Division: 3 persons (EE, 2 SDO)
Items	・ Training schedule and contents. ・ Review of completed workshops at the four model DPR sites. ・ Explanation about newly proposed items of the model DPR. ・ Preparation works of the model DPR.
Distribution Materials	・ Orientation materials for the training. ・ Standard example of the DPR (soft and hard copies). ・ Standard structure drawing (soft copy).

Source: JICA Study Team

Not only sub divisional officers (SDOs) but also executive engineers (EEs) from four division offices had participated in the five days training. The JICA Study Team and MID participants had positive and fruitful discussions and trainings. After the five-day training, each division group can prepare about 70% of the model DPR and the remaining works will be submitted to the JICA Study Team through email next week. Newly proposed DPR items and forms were modified and improved so that MID division engineers can use them practically and in time for the preparation of the future DPR even after this JICA project.

Source: JICA Study Team

Photo 9.5.4 Training of Model DPR Preparation

(a) Contents of Training

1st day (10th November)	
1 Explanation about the Training	
	Schedule about Training and after the Training
	Objective
	Works to do
2 Explanation about proposed model DPR contents	
3 Review of the Proposed Model DPR Procedure	
	Contents of each step
	Proposed Forms, Sheet and Checklist
4 Finalization of Preliminary technical site survey sheet	
	Kolasib, Champhai, Lunglei
5 Preparation of facility layout plan for each model site	
	Explanation how to prepare basemap
	Facility layout plan works for each model site
6 Preparation works for structure drawings	
	Clarification of structure drawings to prepare
	Setting of MID tile box form
	Preparation of profile from toposurvey result
	Improving points for more durable structures

2nd day (11th November)	
1 Review of cropping pattern and schedule	
2 Irrigation water plan	
	Setting of calculating condition
	Water requirement calculation
	Estimation of discharge water from stream
	Explanation about Irrigation plan sheet
	Cropwat operation Training
3 Drainage water	
	Rational formula and example
	Crest overflow calculation
4 Setting of facility Designing conditions	
	Facility and structure Planning
	Filling of design checklist 1 and 2
	Confirmation of each facilities Designing conditions
5 Rough cost estimation	
	Rough cost estimation based on facility layout plan and facility plan
6 Cost and benefit calculation	
	Setting of calculating conditions
	Traial of Cost and benefit calculation

3rd day (12th November)	
1 Construction and Quality Control Planning	
	Review of the proposed plan
	Preparation of Construction plan
	Preparation of Quality Control Plan
2 Water Users Association and O&M plan	
	Review of WS result and preparation WUA document
	Preparation of draft O&M plan (Filling of O&M sheet)
3 Preparation of Annex materials	
	DPR Checklist
	Agriculture Plan (WS result)
	Checklist for Environmental conformity
	Project application from beneficiaries (prepare the draft)
	Rabi water distribution and monitoring plan
	Evaluation plan
	Photographs
	Certificates

4rd day (13th November)	
1 Final consensus building procedure	
	Facility layout map
	O&M plan
	Agriculture action plan
	Preparation of draft Model DPR agreement
2 Scheduling of model DPR activities	
	Scheduling until finalization of model DPR
3 Others	
	Ground water utilization plan and trial
	Preparation of presentation materials for Model DPR activities and the result
	Discussion and Review of Model DPR procedures and contents
4 Preparation of Model DPR together with JICA team	

5th day (14th November)	
1 Preparation of Model DPR	
	Work together with JICA team

Source: JICA Study Team

9.6 Major Findings during Verification

9.6.1 General

It is notable that the potential capacity of the farmers to understand the explanation of the facilitators and the execution of expected actions were high in the four areas, since the validation for the model DPR was conducted in those areas. Four young officers nominated by MID as candidates to serve as facilitator of the workshop became skilled and able after the field training. Their attitude was good as they stayed and encouraged participant farmers to express their opinions without insisting their ideas and/or opinions, which is a basic and important approach in the participatory workshop.

The major activities and outcomes in Step 5 to Step 7 in verification of the model DPR are summarised in

Table 9.6.1. Since inputs, i.e., labour, time, and funds, are huge as compared with the general and participatory approaches to formulate the DPR, the strong sense of purpose, motivation, and good understanding may exceed the value of the inputs since these are inevitable for the success of the participatory development, and without such sense of purpose, motivation, and understanding, it will be difficult to obtain success or such accomplishment. Accordingly, it is essential for relevant departments to have a common guideline on participatory development.

Table 9.6.1 Major Activities and Outputs in Steps 5–7 in Model (or Improved) DPR

Step	Major Activities	Outputs
Step 5: Establishment of WUA	・ Introduce WUAs in advanced areas through video clippings and other means, and promote understanding of the necessity. ・ Promote understanding on operation and management (O&M) of irrigation facilities and WUA organisation. ・ Management including showing a model that promotes farmers' self-management in the next stage.	・ Recognise the necessity of WUA by farmers and establishment of WUA by farmers' own initiative. ・ Set the vision and purpose of WUA and propose management system including rules, and selection of leaders. ・ Understand and share WUA's activities by relevant department and the necessity of government support. ・ Stakeholders understand the management method and activities of WUA, and present brief activity plan of WUA.
Step 6: Joint Site Inspection	・ Prepare a construction plan and/or improvement of irrigation system and O&M jointly by farmers and relevant officers in the field. ・ Review the agricultural activity using irrigation water in general. ・ Present necessity of sustainable O&M of irrigation facilities in the field, and promote farmers' initiative to prepare the plan.	・ Propose specific plan of irrigation development and obtain consent on land acquisition, community contract, and so on between WUA and officers. ・ Understand and share the necessity of O&M by WUA and agricultural activities by group ・ Provide appropriate O&M plan by farmers
Step 7: Agriculture Action Plan	・ Schematise the present cropping pattern and grasp the constraints and potential on agriculture through problem analysis and preparation of resources map. ・ Collect information on monthly market prices of crops, crop cultivation technology, and discuss profitable cropping pattern showing the irrigation development area and group activities on agriculture production. ・ Discuss and list the necessary actions for the proposed cropping pattern, collect information on supports provided by officers, and formulate appropriate cropping pattern by farmers.	・ Prepare the current cropping pattern and conduct problem analysis on agriculture. List issues and potential through the above activities ・ Understand relevant basic information and prepare proposed cropping pattern taking the results of Steps 5 and 6 in this table. ・ Prepare agriculture action plan (AAP) indicating each action clearly to materialise AAP based on the proposed cropping pattern.

Source: JICA Study Team

9.6.2 Awareness and Preparation of WUA Rules and Regulations

(1) General

Although WUAs have been established in two out of four areas where the model DPR was carried out, the organisational structure, management system, and initiative of members of the WUAs are very weak (refer to Table 2.2.2-3). The reason of such weakness is that, as WUAs were organised mainly by initiatives of the government officers, the purpose and various information of WUA have not been shared amongst member farmers. Farmers do not understand the necessity to organise amongst themselves and the advantages of WUA, due to lack of training, extension, and monitoring activities.

It may not be too strong a word that WUA has been organised as a pre-requisite for DPR formulation. Taking this situation into account, the JICA Study Team has decided to show to the potential members a video presentation of WUA in the Philippines, as a sample in which WUA functions and management system were presented in order for the farmers to understand its activities and advantages during the workshops to prepare them for the model DPR. As a result, officers of MID observed and commented that there were remarkable changes of participants in the workshops.

Farmers realised through the video presentation that improvement of irrigation facilities are the basis for income increment in agriculture and it is inevitable for farmers to conduct self-motivating O&M of the

irrigation facilities. Furthermore, such understanding did provide positive impacts to prepare an appropriate cropping pattern and subsequent agriculture action plan (refer to Table 9.6.5).

(2) Outline of the Workshop

The WUA has been organised by the initiative of MID at the time when DPR was prepared in Mizoram. O&M of irrigation facilities and cleaning of access road were carried out by members of WUA in traditional community works. On the other hand, agriculture operation system shall change from the traditional paddy cultivation during rainy season to renovated system with the use of irrigation in order to increase productivity and farmer's income, especially cultivation improvement with proper O&M of irrigation and increment of productivity during dry season. For this purpose, continuation of planned on-farm water management and agricultural activities, and members' initiative for organising WUA are important.

Participants of the workshops in the four areas are listed in Table 9.6.2. In the last column of the table, beneficiaries of the DPR areas are shown. Participant farmers are not limited to the residents of the DPR objective areas, but also included are farmers in the same riverine system and common paddy areas. Such area shall be managed by a WUA and at the same time farmers shall consider the viewpoint of establishing a WUA and re-organisation. On the other hand, in the Dumlui area, Kolasib District, most of farmland owners are not farmers, and only 2 out of 23 families are directly engaged in agricultural production, and most of farmlands are cultivated by tenants who are immigrants from Assam State. Accordingly, most of farmland owners do not possess appropriate knowledge and skills on cultivation, which is one of the reasons on land tenure system and agricultural production. Such land holding and cultivation system are found in great number in Kolasib District and part of Marmit District, and as a result, low productivity of cultivation is prevailing in those areas despite the high potential of irrigation.

There is no legal system of tenancy and contract cultivation, and situations similar to Kolasib District might be experienced to other neighbouring districts in Mizoram State. It is urgent to establish a legal system on land tenure in Mizoram State.

Table 9.6.2 Number of Participants in the Workshop

Description	Dumlui / Kolasib			Laului / Aizawl			Kanghlai / Champai			Ngengrual / Lunglei		
	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total
Farmers	12	5	**17**	17	5	**22**	37	1	**38**	40	8	**48**
Officers	9	3	**12**	9	0	**9**	9	1	**10**	14	0	**14**
MID	6	3	**9**	5	0	**5**	5	1	**6**	10	0	**10**
DOA	1	0	**1**	2	0	**2**	1	1	**2**	3	0	**3**
DOH	2	0	**2**	2	0	**2**	1	0	**1**	1	0	**1**
DOF	0	0	**0**	0	0	**0**	2	0	**2**	0	0	**0**
Total	21	8	**29**	26	5	**31**	46	2	**48**	54	8	**62**
Beneficiaries of DPR Areas			**23**			**11**			**41**			**17**

Source: JICA Study Team

The workshop was conducted according to the agenda shown in Table 2.2.3 below. It is very important to obtain advanced information on land tenure, distance between house and farmland, and agriculture operation system as they are different from one area to another. Based on such collected information, activities and time allocation of the workshop were adjusted. The workshop was scheduled to end at 3:30 p.m. considering the time required to return home, as residential areas are dispersed in the three areas. Further, it is necessary to have consensus from participants to have a continuous few days' workshop by meeting together in one place, which is one of the important points for the preparatory works.

Table 9.6.3 Model Agenda for WUA Workshop

Session -1		
1.	Introduction of today's agenda and objective	9:00 - 9:15
2.	Review of the last day's work (especially the action plan)	9:15 - 9:35
3.	Introduction to the present WUA	9:35 - 10:10
	- Explain according to given items	
4.	Comments on the present WUA activities (refer to the action plan)	10:10 - 10:25
5.	**Film showing** (*need electricity / generator)	10:25 - 10:50
6.	Break	10:50 - 11:00
7.	Open discussion about the video	11:00 - 11:30
8.	Introduction of CBO development concept and discussion	11:30 - 12:00
9.	Lunch (snack)	12:00 - 1:00
Session – 2 (Afternoon Session)		
10.	Game or sing a song	1:00 - 1:15
11.	WUA and its rules and regulation	1:15 - 1:45
	- Group discussion: What is the vision / objective and tasks/functions of the WUA?	
	- Presentation by each group	
	- Finalise vision, draft rules, and regulation	
12.	Implementation of model, general/committee meeting by the WUA	1:45 - 2:30
	- Selection of committee members and office-bearers, if necessary.	
	- Speeches from each office-bearer	
	- ***Assent and seconded WUA's vision and tasks, draft rules and regulations**, etc.	
	- Hand over necessary documents to DOI for the next step.	
13.	Tea break	2:30 - 2:45
14.	Review of the three-day workshop	2:45 - 3:00
15.	Closing remarks by the WUA Chairman, MID, JICA Study Team	3:00 - 3:30
16.	Closing	3:30

Source: JICA Study Team

(3) Findings (Results and Discussion)

1) Current Conditions of WUAs and Other CBOs

There are existing WUAs in the two out of the four areas, which carry out the model DPR. The general outline is shown in Table 9.6.4. The following points on the existing WUA are observed in the workshop:

- Village community organisations and small groups including WUAs were mainly set up by the initiative of the government institution. However, it was identified that most of WUAs (CBOs) are not necessarily self-motivating, but are receiving bodies support from the departments.
- Management and other basic organisation system of the two WUAs are inadequately functioning as indicated in Table 9.6.4. Although the WUA in Laului is registered in accordance with the Mizoram Society Act, there is no significant difference of management compared with the WUA in Kanghalai, which is not registered at all. It is unclear for farmers to understand the advantages of the registration under the said act.
- In the workshop, farmers duly understood the necessity of WUA and its activities through the video presentation of WUA in the Philippines and discussion amongst farmers thereafter (farmers' impression and opinions of the video are shown in Table 9.6.5). Further, the vision, short-term objectives, and by-laws of WUA have been drafted during the workshop for the two WUAs and in the areas where WUAs are yet to be established. Furthermore, selection of committee members and office bearers was carried out, thus the first step of WUA has been started. Therefore, it is urgently required for the relevant departments to prepare and implement assistance to farmers for their self-motivating actions on WUA activities.
- WUA in Dumlui held a committee and general meeting just after the workshop and started the WUA activities, such as requesting assistance from DOA and DOH. At the same time, in the Dumului WUA, as the model, it was agreed upon after the workshop between farmers and officers of MID and DOA to provide possible assistance including finding a solution to settle the problem between landowners and tenants or farm labourers. On the other hand, the team organised a meeting with landowners and farm labourers from Assam through MID and DOA. In the meeting, common issues were discussed and the following three points were

identified for early possible solutions, which are (a) planning of crop and variety and cropping period in order to alleviate labour requirements and increase productivity by taking collective activity of landowners, (b) establishment of join shipping for agricultural products, and (c) improvement of relation between landowners and farm labourers.

Table 9.6.4 Current Conditions of WUA in Two Areas for Model DPR Implementation

No.	Description	Laului, Aizawl District	Kanghlai, Champai District*	
1	Name of WUA	Laului MI project	Kanghlai (Group-1)	Kanghlai (Group-2)
2	Year of Organized	2006	2004	2004
3	Registration	Under Mizoram Societies Registration Act, Taxation Dept.	**Not yet**	
4	Vision / Purpose of WUA	Yes, but **there are no documents in writing**	Yes. But it is concerned to Dept. of Cooperation, but there is no document in writing	Yes. But it is concerned to Dept. of Cooperation, but there is no document in writing
5	Main role and responsibility	Producing sufficient agricultural production for each family	Repair and maintenance: irrigation canals and ap. road	Repair and maintenance: irrigation canals and ap. road
6	Planning for O&M	No	No	No
7	No. of members	60	19	38
8	Past main activities	Repair of irrigation facilities and cleaning (some labour charge provided by MID)	Maintenance of irrigation system and voluntary social work	Maintenance of irrigation system and voluntary social work
9	Any welfare / loan activity	No	No	No
10	Any collective action by WUA	Yes (road cleaning and minor repair, etc.)	Yes	Yes
11	Availability of books for record	**Yes, but not sufficient and no proper system**	Yes	Yes
12	Admission fee	-	Yes	Yes
13	Membership fee	INR 300/year	Yes	Yes
14	Bookkeeping	Yes, but **not proper system**	Yes	Yes
15	Regular meeting	**Not frequent**	2-3 times/year	3 times/year
16	Auditing and Audit report	**No.** Report is given by the Financial Secretary during WUA meeting	No. Report is given by the Secretary during meeting	No. Report is given by the Secretary during meeting
17	Account book	Yes. **But no proper system**		
18	Funds	INR 2,000	INR 18,000	INR 13,000
19	Rules and regulation	Yes**, but not in writing**	No	No
20	Assistance	Irrigation facilities by MID, water harvesting tank by DOA, and seed supply by DOH	MID, DOA and DOH	MID and DOA
21	Others / problem etc.	1) Possible for double cropping per year but not practised yet due to insufficient water, 2) Barren land is also available for cultivation	-	-

**Note: Two WUAs recently merged into a single WUA in Kanghlai, Champai District, however, they split up the WUA into two groups for practical purpose for now. Therefore, each group's condition is mentioned in this table.*
Source: JICA Study Team

Table 9.6.5 Farmers' Impressions and Opinions on the Video Presentation on WUAs in the Philippines

Classification	Farmers' Opinion / Impression			
Organisational Element	1	Having proper planning method by corroborating with the government	8	Keeping good financial records with transparency
	2	Having planned pest management and other activities under WUA	9	Keeping good documents and records of their works
	3	WUA and community having good leadership	10	Forming a proper group under WUA
	4	Select suitable crops by members	11	Having a good work plan
	5	Having a good system by giving awards to successful farmers	12	Electing leaders every year
	6	Continuing regular meeting by WUA leadership	13	Searching for problems that can damage their crops
	7	Having a good cooperation in their works amongst members	14	Trying to succeed in their objectives
Normative Element	1	Having good unity by WUA members	10	Taking strict actions
	2	Obedience to leader in proper manners	11	Devotion in their works

	3	Transparency amongst members	12	No favouritism
	4	Having strong determination toward their purpose	13	Trying to take initiation without assistance (no dependency)
	5	Having willingness to pay if necessary	14	Keeping high sense of ownership of members
	6	Obeying their leaders	15	Having a commitment to work together
	7	Leaders help to solve problems each other	16	Having good meeting and system
	8	Being faithful	17	Having frequent meetings to solve problems/make plans
	9	Having good rules and regulation		
Resources Element	1	Having good guidance from the government	5	Having good waterways best for wet rice cultivation (WRC)
	2	Make proper use of time	6	Hardworking
	3	Having own funds by collecting fees, etc.	7	Having a good relationship so as to get government assistance
	4	Having good approach road		

Source: JICA Study Team

(4) Future Agenda and Recommendations

The following future agenda on WUA was identified. There are many issues to improve for the WUA's successful implementation.

- It was possible to motivate farmers to propose a positive improvement of WUA by showing a video presentation in the workshop. Taking this into account, strengthening of organisation could be carried out by providing basic information and training. It was observed that periodic cleaning of access road had been conducted by the community without inputs from outside, which would be a traditional community cooperation activity. Accordingly, it would be significant for strengthening WUA to coordinate with experts of Mizoram University in connection with the adoption of existing traditional community activities.
- It is appropriate that the function and purpose of WUA are not only for irrigation but also for multipurpose activities including agriculture, marketing, welfare, and so on, taking farmers' opinions in the workshop into consideration. In the workshop, one farmer from the Ngengrual area in Lunglei District opined that WUA should be organised to cover the whole paddy land area including riverine systems and upland fields since the existing WUA covers only farmers in a riverine system in paddy areas and paddy production. Also, WUA activities should include agriculture, marketing, and cottage industry based on agricultural products. In the Ngengrual area, although committee members were not elected during the workshop period, before the ratification meeting in Step 12, it was determined that is necessary to have a WUA to cover the whole area and to select committee members. In this manner, in the workshops, in which farmers are main players, there are many different opinions, and it is important and effective to consider such opinions in WUA set up.
- In Mizoram, although it is important that WUA should be registered under the Mizoram Registration Act, 2005, Taxation Department and the Mizoram Cooperative Societies Act, 2006, sequence of the organisation and registration are not clear, therefore, they rely solely on farmers' initiatives. Therefore, polite and kind guidance empathising with farmers position by officers are required. As discussed in the preceding section, human resources in Mizoram is notable, organisation system design, and formulation of guidelines shall be prepared with maximum utilisation of available human resources.

9.6.3 DPR Preparatory Survey and Investigation

(1) Proposed survey forms

- The DPR-related survey can be divided into two steps. First is the "preliminary technical survey (Step 3)," which aims to collect necessary information to evaluate and select the candidate scheme. Second is the "DPR preparatory survey (Step 6)," which aims to collect necessary information in order to prepare DPR.
- It was found that there are missing survey items and non-conformities in the existing DPRs, as MID does not have special and prescribed rules for the DPR survey works so far. Therefore, the DPR survey forms and checklist for Step 3 and Step 6 were prepared by the JICA Study Team together with MID to collect necessary information effectively and exhaustively.

- The JICA Study Team prepared the first draft of the abovementioned form and checklist. Then, the draft was modified and finalised through training programs, discussion and trials with MID engineers. Currently, the MID engineers can use and fill out the forms for future DPR.
- MID does not have special tools for site testing and laboratory for tests of construction materials. Therefore, the JICA Study Team proposed and showed practical and simple site survey methodologies that the MID division office engineers can implement without any special tool or special software.

(2) Evaluation of water resource

- Three cropping seasons, namely, *Rabi, Kharif,* and summer, have been designated in the existing DPR. However, it was found out that majority of irrigation scheme farmers are engaged only in paddy farming, and two cropping seasons can be more realistic and practical. The JICA Study Team observed that overestimation of the available water resources during the dry season creates a big gap between reality and the existing DPR. Therefore, the JICA Study Team introduced a new methodology to evaluate water resource availability in the dry season.
- The water resource availability in the dry season has to be decided by comparing the value of water discharge measurements and the estimated value from river basin wise specific discharge calculation (refer to the DPR Preparation Guideline for details).
- MID and the JICA Study Team have conducted measurement of water discharges at the model DPR sites and confirmed that the MID division office engineers can conduct water measurement and estimate the water resource availability in the dry season.

Source: JICA Study Team

Photo 9.6.1Typical Stream Discharge in Dry Season

- As for measurement of discharge water, it was found out that "pipe and bucket methodology" is the most suitable and simple way to measure small discharges in streams in the dry season, whereas, the floating method is suitable for larger scale discharges in the rivers.
- Generally, water resource availability in the dry season is not big enough to cover a large area of the irrigation scheme. Therefore, the development of groundwater resources, as a supplementary water resource for dry season irrigation, should also be studied more since the irrigation scheme area in Mizoram is located on a valley between hills where groundwater potential is high and such resource has not been utilised yet (refer to Master Plan, Project 2-8; Improvement of Water Resource Utilization for Existing Irrigation Schemes).
- As for estimation of water resource availability in the monsoon season, it was observed that the current estimation methodology can be applied for future DPR, considering the site survey results and inventory survey results.

(3) Preparation of base map

- MID has only an old topographical map of 1:50,000 scale, which is not suitable for small irrigation planning. The JICA Study Team introduced a new base map that can be used not only for survey but also for planning, design, and construction works.
- The proposed base map was created from digital elevation model (DEM) data and aerial photograph data, and the map would make MID engineers possibly work in a computer from the survey to construction stage with UTM coordinates in computer-aided design (CAD).
- It was found out that many young MID engineers and SDOs can do basic CAD operation and they can prepare a field survey map, boundary map, facility layout map, etc., based on the base map.

- The CE office is responsible in preparing the DPR base map since only the CE office has geographic information system (GIS) application software to create contour lines. After the map preparation, the CE office shall send the data to each division office.
- The JICA Study Team prepared the reference guide on how to prepare the base map and gave hands-on training to relevant officers at the CE office.

(4) *Global Positioning System* **(GPS) Topographic Survey**

- Although MID has not utilised GIS tools for DPR survey works in the past, GPS tools provided by JICA were utilised for the model DPR field survey to identify the locations. Then, the GIS data taken from the model site were transferred to the abovementioned base map and Google Earth, and the results were reflected in the survey result map and facility plan. Through trainings, MID engineers have learned interactive works between GPS, base map, and Google Earth. It was observed that the engineers' capacity for collection of site condition data, facility layout planning, and map preparation was improved a lot.
- Every division office has a levelling machine such as as dumpy level. Levelling survey is conducted by MID staff for irrigation works. On the other hand, the total station (TS) survey has not been utilised so much for MID works, although MID has two TS machines and surveyors in Aizawl.
- TS surveys were conducted at the three model DPR sites except Laului. Then demonstration of data conversion from TS data to CAD data and utilisation for designing of pond, land development, and drainage improvement were shown. The MID engineers were trained by the JICA Study Team.
- Although TS survey results are effective and helpful for facility planning, current resources are very limited. The JICA Study Team suggested that the scheme, which includes irrigation pond or land development, should be prioritised for TS survey.
- MID surveyors need more field experience and practical training to improve their TS survey skills, although they can do basic TS survey works. It is also recommended to provide at least one GPS machine with high accuracy to the topographic survey team to improve the accuracy of benchmark survey. Accuracy of a handy-type GPS is not enough for a detailed survey, such as a boundary decision survey.

(5) Detailed Site Survey

1) Land Ownership and Location

- Unlike the existing DPR, the proposed DPR preparation survey includes clarification of land ownership on the base map and at the site before facility layout planning.
- Besides, confirmation with landowners about the facility layout is to be conducted in the DPR preparation stage. Then, it is expected that land issues will be reduced significantly.

2) Disaster Risk Survey (Landslide, Flooding, and Erosion)

- Risk of damage to irrigation facilities by disasters is high in Mizoram because of its geological characteristics and condition. The inventory survey results showed that 70% of minor irrigation (MI) schemes need rehabilitation (big or small), especially canal and intake facilities, and more than half of the schemes have experienced flood damages (permanent:16%, temporary:48%).

Source: JICA Study Team

Photo 9.6.2 Typical Canal Sedimentation

- Therefore, it is essential to conduct a disaster risk survey and reflect the results in facility

planning to reduce the burden of O&M activities and improve durability of facilities.

- From field survey, it was found out that landslide, flooding, and erosion are three major factors of facility and farmland damages.
- MID engineers and the JICA Study Team conducted disaster risk survey at model DPR sites and grasped potential risk area. The disaster-risk area map was prepared on the base map. It is also important that the survey should be conducted together with farmers and history of disasters occurred in target area should be collected by them, as only MID engineers cannot grasp the real situation within short period of site survey.

3) Conditions of Existing Facilities

- Although MID has implemented construction of new facilities under irrigation schemes in the past, it is expected that there will be more irrigation schemes that includes rehabilitation in the near future, as major wet rice cultivation (WRC) potential areas have already been developed, except in remote areas, and upgrading of completed scheme areas is also necessary to promote irrigation for winter crops.
- MID engineers and the JICA Study Team conducted site survey to check the conditions of existing facilities and prepared the rehabilitation facility plans of the DPR model sites. It was found out that EEs of each division office have enough capacity to estimate the conditions of existing facilities and prepare the rehabilitation plans, while SDOs need a little more experience.

4) Setting of Facilities Layout

- Basically, the layout of irrigation facilities including alignment of canals has been decided in the construction stage and not in the DPR preparation stage under the current MID schemes. However, it is one of the major reasons for the creation of a big gap between the DPR works and actual construction works.
- To improve the above problem, MID engineers and the JICA Study Team conducted site survey and decided on the candidate locations of irrigation facilities with base map and GPS at the field survey stage. It was found out that the methodology for deciding the candidate locations of irrigation facilities from field survey and planning stage can be conducted by SDOs of division offices for future DPR.

5) Soil Survey

- Although soil survey is important for irrigation planning and one of the checklist items of the DPR guideline, soil survey has not been conducted recently, after the soil inspection laboratory of DOA had stopped its operation.
- Therefore, the JICA Study Team introduced a simple soil classification test that can be conducted on site without using special testing tools. Through the field survey of the model DPR site, MID engineers have learned about this site soil survey together with evidence photographic technique. MID engineers can conduct the survey for future DPR.
- As for the bearing capacity of soil, it was found out that there are no large-scale irrigation structures that need high bearing capacity, and no damages caused from the shortage of bearing capacity were found through survey and interviews. Therefore, pit excavation to check soil foundation condition can be applied just like in the existing DPR.

9.7 Preparation of Agriculture Action Plans

(1) General

Four model DPR schemes are mainly used in cultivating rice in the *Kharif* (rain) season for the main purpose of self-consumption. To increase agricultural income and improve agricultural growth, it is necessary to promote horticulture and other field crops in the *Rabi* (dry) season by maximum utilisation of limited irrigation water. Therefore, it will be required to improve on-farm water management, cultivation technology, and marketing methods for farmers/WUAs. Therefore, collaborative activity or approach for farmers/WUAs by relevant departments is indispensable for agricultural development or even for the preparation and implementation of the DPR. This agriculture action plan will serve as a platform on how to implement the proposed cropping pattern with assistance of relevant departments. In addition, officers of

relevant departments will find and develop practical coordination systems based on this agriculture action plan by area.

(2) Outline of the Workshop

1) Purpose

Two outcomes are expected in this workshop, namely, preparation of the 'proposed cropping pattern' according to the irrigation development plan that will be attached in the DPR, and the preparation of the agriculture action plan based on the proposed cropping pattern. In the past, the proposed cropping pattern has been prepared mainly by relevant department officials without adequate discussions with farmers. Ordinarily, only one proposed cropping pattern is sufficient for compliance on official procedures of DPR preparation. Furthermore, the prime objective of DPR preparation is to increase agricultural productivity of Mizoram through farmers' main concerns on agriculture and their spontaneous actions. Therefore, an activity for preparation of the agriculture action plan would be important on account of implementing the proposed cropping pattern. Thus, preparation of this agriculture action plan shall be put at the centre of activities of this workshop.

2) Participants and Background

Participation of farmers from the four areas is shown in Table 9.6.2, and the number of beneficiary farmers for the DPR area is shown at the bottom line of the same table. In case of Dumlui and Kanghlai, farmers' participation was less compared with the number of DPR beneficiaries. In case of Dumlui, some landowners who do not have enough knowledge on agriculture did not come during the agricultural session. In Champai, state ministers and other politicians visited the area, and some farmers from Kanghlai participated the events. Since Ngenrual of Lunglei District suffered the most critical condition on farming amongst the four areas, many participants attended the workshop, and their expectation for DPR implementation is very high. Officers of the Department of Fisheries (DOF) participated only for the two areas in Dumlui / Kolasib and Kanghlai / Champai, because only these areas have been practising fish culture in the paddy areas.

Source: JICA Study Team

3) Agenda of the Workshop

At the first workshop, expected output could not be obtained because necessary information with farmers and officers is not enough to prepare the practical cropping patterns and agriculture action plan within a fixed workshop time. Therefore, crop-wise market price data, crop-wise cultivation technique, and others were prepared by the team and explained to the farmers in the second workshop.

Table 9.7.1 Model Agenda of Workshop for the Agriculture Action Plan

Session -1		
1.	Welcome and Keynote Speech by MID and the JICA Study Team	9:00 - 9:20
2.	Introduction of participants	9:20 - 9:30
3.	Introduction of workshop	9:30 - 9:50
	- Explanation of 3-day agenda and goal	
	- Preparation of ground rules, etc.	
4.	Forming Group (if necessary)	9:50 - 10:00
	- Nominating a group leader and assistant (if necessary)	
5.	*Preparation of **Current Cropping Pattern**/Map Resources List	10:00 - 10:40
	- Current cropping pattern: irrigated paddy land (paddy and horticulture), permanent cropping land, Jhum cultivation (paddy and other crops): Needs data for Horticulture	
6.	*Problem Analysis	10:40 - 12:00
	- Prioritisation of problems	
	- Presentation and discussion with resource persons	
	- Make clear core problems and share them among participants	
7.	Lunch (snack)	12:00 - 12:40
Session -2 (Afternoon Session)		
8.	Review last activities and explain this session's activities and goal	1:10 - 1:25
9.	*Preparation of Cropping Pattern	1:25 - 1:55
	- **Review** area map, resources list, and **priority issues**	

	- **Review the current cropping pattern**	
	- **Explanation of present irrigation system and improvement plan,** etc.	
	- **Receiving information** from **DOA / DOH / DOF**, **market price, etc.**	
	- **Selection of useful (strategic) crops** for cultivation through discussion	
	- Preparation of profitable cropping pattern	
10.	Presentation of cropping pattern	1:55 – 2:25
	- **Receiving comments from resources person**	
	- Discussion amongst farmers	
11.	Finalisation of cropping pattern	2:25 - 2:40
12.	Break	2:40 - 2:55
13.	*****Preparation of action plan	2:55 - 3:55
	- **Review of priority problem list and resources list,** etc.	
	- Preparation of action plan	
14.	Presentation of action plan and discussion	3:55 - 4:25
	- **Receiving comments** from relevant resources persons	
	- **Discussion amongst farmers and resources persons**	
15.	Finalisation of Action Plan	4:25 - 4:55
16.	Wrap-up and closing session	4:55

Source: JICA Study Team

(3) Findings (Results and Discussion)

1) Current and Proposed Cropping Pattern and Background

Current cropping pattern and general information

Current cropping patterns and proposed cropping patterns of the four model DPR areas (paddy field) are shown in Table 9.7.2. Current cropping patterns other than the model DPR area such as permanent cropping land, *Jhum* (slash and burn shifting cultivation) land, and fish culture are attached in the last part of this Chapter in order to grasp farmers' farming conditions. In case of Dumlui, the JICA Study Team met the Assam tenant farmers together with the landowners, MID, and DOA officials on one special day different from the workshop, and collected some detailed information on crops for cultivation and other agriculture related matters and add those information to Table 9.7.2.

Main types of cultivated crops in *Kharif* (rain season) are paddy mainly for self-consumption, and small amount of crops and vegetables in ***Rabi*** (dry season) are cultivated for the purpose of marketing and self-consumption by utilising available irrigation water. In addition, depending on how long the distance from residential areas and paddy fields, access is difficult, thus, farm management becomes poor. But, overall management of rice cultivation is not so difficult compared with other field crops and vegetables, because it is still possible to get a modest yield by good management. In case of Laului of Aizawl District, farmers from one of the three villages are usually spending three hours to go to the paddy field from their residential areas. In this case, it is necessary to have creative and appropriate countermeasures as well as to introduce a cooperative system amongst farmers, and officers of related departments are required to respond to their needs, accordingly.

Current cropping patterns of paddy are similar amongst four areas of which cultivation is depending on rainwater, and there is no rice cultivation in *Rabi* (dry season) due to shortage of irrigation water.

Proposed cropping pattern and general information

Proposed cropping pattern on profitability is finally checked at Step 11 after calculation of income and cost of each crop. Therefore, the proposed cropping pattern prepared by farmer groups were partially modified, and these modified cropping patterns and its reasons were explained at Step 12 for beneficiary farmers by a ratification process, and the proposed cropping patterns were ratified by farmers/WUAs.

One of the critical problems on farming is on labour shortage and high labour cost throughout the model DPR areas. In this point of view, the JICA Study Team added a mixed cropping system for *Rabi* (dry season), which was also proposed by farmers from the Laului area of Aizawl District in a long discussion at the workshop. In case of mixed cropping system, it is possible to reduce the labour for land preparation and part of cultivation management. In addition, farmers from Laului are going to use maize as supporting crop for French beans to reduce both labour cost and material cost.

Some characteristics of each area observed through the workshop are summarised as follows:

Dumlui / Kolasib District

In this area, as mentioned earlier, the Assam labourers are hired by landowners for all agricultural works, and selection of crops for cultivation is sometimes influenced by the tenant's preferences. Also, some

landowners have no control over rice cultivation. While for winter crops, all landowners give tenants a free hand to cultivate any kind of crops with tenant's resources, and they can even sell those products freely in the market as their income. In terms of rice cultivation, landowners and Assam labourers share the yield proportionally according to previous verbal agreement. However, there is no definite systematic arrangement or tenancy system for arable lands. Without a systematic legal arrangement based on detailed survey, it will be difficult to improve the agricultural productivity in a proper way, although Kolasib has high potential areas for irrigation development in the state. Accordingly, the current cropping pattern of Dumlui in Table 2.2.4-6 is dependent on the Assamese ideas at a large extent.

Laului / Aizawl District

Farmers from three different villages engaged in farming are with the same irrigation scheme. Meanwhile, farmers' interest on agriculture is different with those who have village-wise background. In case of Sailam Village, since their main source of income is woven fabric in the cottage industry and labour work, they would like to cultivate paddy as much as possible for self-consumption (including relatives) as the labour requirements of paddy cultivation are relatively small and they lack interest in other crop cultivation. On the other hand, the primary source of income of Thenzawl Village is agriculture and they are very keen to develop irrigation facilities for winter crops.

Kanghlai / Champai District

Champai District is famous for their delicious rice in Mizoram, and they are cultivating many kinds of local varieties, as shown in Table 9.7.2. Traditionally, Mizoram people prefer to eat Japonica-type sticky rice rather than Indica-type. Rice-fish culture is also a remarkable production system to increase their household income in Champai, because such system is not followed in other areas in Mizoram. In addition, only farmers from Kanghlai among the four model DPR areas are using inorganic fertilisers for rice cultivation and organic fertiliser for horticulture on the paddy land.

Rice-fish culture is a common practise among paddy farmers in the Kanghlai scheme area, as mentioned above. However, there are no data/information on production quantity and areas under fish-rice cultivation. DOF does supply subsidised fingerlings but its distribution is irregular and insufficient; besides, it does not coincide with the timing for fish culture. Therefore, the farmers mostly depend on locally-produced fingerlings from private traders.

Ngengrual / Lunglei District

This scheme and residential village located in the rural area near the border of Lawngtlai District is alongside the national highway and close to Lawngtlai Town. In this location, many farmers grow vegetables in *Jhum* (slash and burn shifting cultivation) areas rather than in paddy lands (see Table 2.2.4-6). Although farmers are cultivating few vegetables on paddy land, they have enough knowledge and experience in horticulture and other field crops through *Jhum* cultivation.

Table 9.7.2 Current and Proposed Cropping Pattern of the Four Areas

Current Cropping pattern

Kolasib: Dumlui	Month											
Name of Crop	J	F	M	A	M	J	J	A	S	O	N	D
Paddy (local)												
Cabage												
Culiflower												
Tomato												
Soyabean												

Aizawl: Laului	J	F	M	A	M	J	J	A	S	O	N	D
Paddy (local)												
Leafy Mustard												

Champai: Kanghlai	J	F	M	A	M	J	J	A	S	O	N	D
Paddy (MANIPUR)												
Paddy (YAMIN)												
Paddy (tawi sang)												
Paddy (vui tawi)												
Field Pea												
Leafy Mustard												

Lunglei: Ngengrual	J	F	M	A	M	J	J	A	S	O	N	D
Paddy (DRRH2)												
Paddy (IR64)												
Paddy (Local)												
Field Pea												
Leafy Mustard												
Pumpkin (leaves)												

Proposed CroppingPattern

Kolasib: Dmului	Month											
Name of Crop	J	F	M	A	M	J	J	A	S	O	N	D
Paddy (local)												
Mixed Crop: Maize & French bean												
Green Chilli												
Mixed Crop: Culiflower & Leafy Mustard												

Aizawl: Laului	J	F	M	A	M	J	J	A	S	O	N	D
Paddy (local)												
Mixed Crop: Maize & French bean												
Leafy Coriander												

Champai: Kanghlai	J	F	M	A	M	J	J	A	S	O	N	D
Paddy (MANIPUR)												
Paddy (YAMIN)												
Paddy (tawi sang)												
Paddy (vui tawi)												
Fish (at paddy field)												
Onion												
Mixed Crop: Potato and Field Pea												
Mixed Crop: Leaf Mustard & French bean												

Lunglei: Ngengrual	J	F	M	A	M	J	J	A	S	O	N	D
Paddy (DRRH2)												
Paddy (Local)												
Mixed Crop: Maize & French bean												
Field Pea (pea)												
Leafy Mustard												
Green Chilli												

Source: JICA Study Team

(4) Agriculture Action Plan

The agriculture action plan was prepared to ensure that the implementation of agricultural activities is in accordance with the proposed cropping pattern. Therefore, related activities such as improvement of access roads, irrigation facilities, training or strengthening of WUAs, etc. are incorporated in the plan with the support of officers of relevant departments. Since this type of workshop is the first for the farmers and relevant officers, officers cannot provide proper information to farmers on preparation of the plan in the first workshop. In the second workshop, the following information were appropriately prepared and provided to the farmers during the workshop:

- Crop-wise market price information in each district;
- Basic information of the crops (cultivation technique, marketability and crop characteristics, pH conditions, etc.);
- Crop-wise water requirements; and
- Cultivation calendar of paddy (only for Ngengrual, Lunglei).

Farmers actively prepared the agriculture action plan based on their ideas. However, some items do not match with the annual budget and plans of DOA, DOH, and the Soil and Water Conservation Department (SWCD). Unfortunately, farmers are not satisfied with the recommended plans and ideas presented by these departments. The prepared agriculture action plans are attached in Annex 2.

From the 11th Five-Year Plan, the Central Government prepared the Comprehensive District Agriculture Plan (C-DAP) for each district of the state by reorienting the strategies of agricultural development towards meeting the needs of farmers and appropriate use of natural resources through the participatory development approach. Even though the DPR preparation area is small, it is difficult and would take time to consolidate each department's resources in preparing one development plan reflecting farmers' demands appropriately. In addition, MID does not have enough budget or does not have jurisdiction to take up all development works concerning irrigated paddy schemes in a comprehensive manner. Therefore, it is necessary to have lateral coordination and consolidation with relevant departments to develop a target area for accelerating comprehensive agricultural development.

1) Future Agenda and Recommendations

Farmers' Capacity

As mentioned before, the farmers' degree of interest on the participatory approach and capability for planning and other activities during the workshop are recognised when further agricultural development in Mizoram is considered. Since the extent of information and knowledge of farmers are limited, there are some difficulties encountered in the preparation of the proposed cropping pattern as well as in the agriculture action plan, in a comprehensive manner. It could be considered that quality/quantity of training and extension works for farmers are insufficient at present. In addition, some officers of DOA and DOH cannot provide proper suggestions or guidance to farmers considering their current situation. However, the JICA Study Team can meet with a DOA officer who can discuss with farmers in a way similar to the participatory approach, and promote group action to increase farmers' household income. In terms of capacity building, upgrading the skills of the officers is also important.

Shortage of Basic and Valid Information on Agriculture

In Mizoram, one big constraint is the unavailability of basic and valid data from DOH and DOA to calculate crop budget. Also, almost all of the farmers do not record any of their agricultural operations, which is critical in the preparation of the benefit assessment with cropping pattern in each DPR area. To prepare the cost benefit analysis for each crop, the basic data shown in Table 9.7.3 are necessary. In this report, the data of household survey implemented by the JICA Study Team in each DPR area were utilised to make up the farm budget as basic data for calculation. However, since almost all basic data were estimated based on the survey results, literature, etc., it is very difficult to reflect the reality of cultivation/ production costs in each area at present. Therefore, periodical updating of basic data concerning agricultural activities is indispensable from planning to implementation of agricultural activities including verification process on agricultural development and countermeasures to overcome the shortcomings.

Table 9.7.3 Basic Data for Cultivation / Production Cost

Item	Area-wise / Cultivation method-wise / Operation-wise of each Crop				Remarks
Cost	Labour cost	No. of Labourers	Hired	Male (MD* or MH*)	Model format concerning data collection is shown in Annex 3.
				Female (do.)	
			Family	Male (do.)	
				Female (do.)	
	Input cost	Seeds, fertiliser, agrochemical, other materials			
	Other cost	Machinery			
		Draft animal			
		Transportation, irrigation charge, tools, etc.			
Income	Yield and by-product				
	Unit selling price				
	Calculation: Gross and net profit / profit per capita for analysis				
Note: MD: Man Day, MH: Man Hours*					

Source: JICA Study Team

Income Generating Opportunities for Irrigated Paddy Fields

The JICA Study Team estimated the annual profit per capita per hectare of the current cropping pattern and calculated the profit of the proposed cropping pattern, as shown in Table 9.7.4, taking advantage of irrigated paddy land into account. In consideration of the development of income generation, irrigated paddy fields can be regard as the most valuable income-generating source in rural areas in Mizoram. To increase the farm household income, the following activities shall be considered:

- Prepare an action plan to determine the basis of the data;
- Each farmers should have concrete targets such as habitual practise of record keeping; and
- Each farmer shall calculate their profit from agriculture and other income generating activities.

Table 9.7.4 Comparison of Profit Per Capita

Area	Average Number of Family Members	Current Cropping Pattern (INR/capita/year/ha)	Proposed Cropping Pattern (INR/capita/year/ha)
Dumlui, Kolasib	4.7	11,703	35,268
Laului, Aizawl	4.8	5,735	14,307
Kanghlai, Champai	4.8	8,826	34,008
Ngengrual, Lunglei	4.7	7,638	26,660

Source: JICA Study Team

Legal System and Procedures

The following legal system and procedure has to be considered to materialise sound and sustainable development:

- Tenant and share cropping legal system to improve agricultural productivity.
- Expropriation system/negotiation process of land to construct irrigation infrastructure in private land.
- Preparation of clear and improved WUA registration procedure form and guideline written from farmers' perspective.
- Validation of collaborative development system and procedures among relevant departments for irrigated agricultural land development.

9.7.2 Irrigation Planning, Facility Design, and Construction Planning

(1) Irrigation Planning

- With regard to setting of scheme target area, sometimes MID's idea is different from the farmers. For example, in case of Laului, initially MID had the intention of developing a large slope area for horticulture crops. However, it was found out during the workshop that farmers do not have strong will to develop the same. This case shows that the construction of irrigation facilities is not enough to promote a new farming system, and technical support such as training and extension services from DOA and DOH is also necessary at the same time.
- The following items for improvement were proposed for training by the JICA Study Team, considering the current problems of the existing irrigation plan:
  - Setting of target irrigation areas and cropping patterns through participatory workshops and site surveys.
  - Realistic estimation of water resource availability in the dry season.
  - Standardisation of irrigation calculation forms.
  - Review and standardisation of irrigation efficiency rate and crop wise water requirement.
- As for the estimation of water resource availability in the monsoon season, the current methodology for estimation can be applied for future DPR. It was found out that water shortage in the monsoon season comes mainly from water distribution problems and not from shortage of irrigation water.
- Generally in Mizoram, paddy irrigation water is inefficiently distributed from paddy to paddy as the MID scheme cannot afford to construct secondary and tertiary field canals.
- Most of the existing WUAs do not seem to have special water distribution rules and regulations. It is expected that WUAs do not have a strong need for these rules and regulations as Mizoram has relatively large precipitation during the monsoon season and a short history of irrigation farming unlike other countries.
- However, from now on, the above mind-set of Mizoram farmers has to be changed to make the most out of the limited dry season's irrigation water, and to promote winter crops and improve farmers' income generation.
- The JICA Study Team introduced and gave training on calculation of winter crops irrigation schedule using the Food and Agriculture Organization's (FAO's) software (CROPWAT) and

monitoring of field soil moisture using tensiometer. This time MID engineers can learn and gain theoretical knowledge. However, they still need support from experts to strengthen their practical knowledge and capacity on saving water for irrigation (refer to Master Plan, Project 2-9; Improvement of Water Resource Utilization for Existing Irrigation Schemes).

- Furthermore, mutual cooperation with DOA and DOH is also important to promote cultivation of winter crops.

(2) Facility Plan and Design

- So far, MID does not have irrigation facilities of such scale that need structural calculation analysis and detailed design.
- However, the irrigation facility plan and design in Mizoram has to give attention to damages from floods, erosion, and landslides because of its geological conditions. Besides, the improvement of facility planning and designing is not enough to improve the durability of irrigation facilities. Promotion of better O&M activities and strengthening of WUAs have to be simultaneously conducted.
- Through model DPR training, each division engineer can prepare a facility layout drawing of the scheme using CAD based on the base map and results of site survey activities. It is observed that each division SDO can prepare facility layout drawing for future DPR.
- Insufficient design and design errors are found in some existing DPR. Therefore, the JICA Study Team proposed a design checklist, which composed of three-stage checks, namely, design conditioning stage, drawing stage, and cost calculation stage. The checklist has to be prepared by SDO while checking and signing of the confirmation has to be done by EE. Through the model DPR training, it was discovered that the proposed check system is effective and can be applied for future DPR.
- As to water storage facility, MID has enough experience to plan and construct reservoir tanks. However, it was observed that MID needs improvement on pond (small irrigation dam) plan and design. MID learned irrigation pond planning and designing, through the model DPR training in Kolasib and Champhai.
- It is still difficult to construct relatively large-scale ponds, as the capacity of contractors is not high and supervisors cannot properly control the quality of soil compaction. It is recommended to keep supporting the design capacity development of MID and for actual implementation experience (refer to Master Plan, Project 2-8; Improvement of Water Resource Utilization for Existing Irrigation Schemes)
- Meanwhile, other important challenge of pond planning is the land issue. In the past, MID has not experienced a case on payment or compensation for land acquired for the development of irrigation facilities. Instead the land utilisation agreement used to be made among WUA, landowners, and MID before construction of pond.
- However, in the case of the Champhai Model Scheme, negotiation with pond landowners is still ongoing, as land owners request for compensation for land however MID does not want to compensate. This Champhai Model Scheme is not a special case, as irrigation pond plan has to be replicated in the future.
- Cost of land acquisition and compensation cannot be spared from the central sponsored budget and it has to be spared from the state budget.
- It is anticipated that land acquisition issue is a factor that can hinder the promotion of dry season irrigation, which is crucial for winter crop cultivation and increasing farmers' income in Mizoram. Besides, this matter should be tackled not only by MID but also at the state government level.
- Considering damages of existing irrigation facilities that were found in the site surveys, simple but effective ideas were added to existing irrigation structures. For example, haunch at the corners of the channel, pipe or concrete cover in landslide risk section, installation of desiltation tank after intake, simplified and cost saving structure of intake, installation of division pipe in division box, channel for winter crop irrigation, etc.

(3) Facility O&M Plan

- So far, MID and WUA have not prepared the O&M plan of irrigation facilities. This is one

of the major reasons why many existing facilities have deteriorated and O&M activities of WUAs are not sufficient. To improve this situation, the JICA Study Team prepared an O&M plan standard form, and MID and WUA filled out the form and together prepared the O&M plans for the four model DPR schemes. It was discovered that this method and procedure can be implemented by MID and WUA for future DPR.

- With regard to O&M and rehabilitation of existing facilities, MID does not have concrete policy and strategy for sustainable irrigation development and MID does not have enough experience in management of existing facilities. Therefore, it is recommend that MID capacity in this field should be strengthened with the support coming from the experts. (Refer to Master Plan Project 2-12; Capacity Development of O&M of Fundamental Infrastructure)
- Generally, Mizoram's irrigation facilities are of small scale and their locations are scattered because of its hilly geological conditions. It means there is a small number of beneficiary farmers given responsibility to frequently take care of each scattered facility. This tendency becomes more significant in hilly and high elevation scheme such as in Laului. Therefore, actual O&M capacity of each beneficiary area should be assessed carefully at the time of scheme selection and O&M planning.
- Meanwhile, generally, farmers are getting older around Mizoram such as the case in Japan. In the long run, this problem is expected to become to hinder sustainable irrigation development in Mizoram. This issue should be tackled together with relevant departments to discuss the growing number of younger population as possible successors.
- Inventory survey results showed that most of existing WUAs are not collecting water user's fee and do not have enough capacity for suitable O&M of irrigation facilities. While the O&M plan is to be prepared using the designated forms, mind-set of famers dependent on government support has to be improved and strengthened by supporting WUA activities from MID during and after the project.

(4) Cost Estimation

- As for the cost estimation, each division office engineer has enough capacity to calculate the scheme cost. Schedule of Rates of Mizoram Public Works Department (PWD) (Building) has been used and the rates are updated and distributed to each division office every year accordingly. Facility drawings were attached to cost calculation sheets so that evidence of quantity can be referred easily through Model DPR training.
- The JICA Study Team has studied about the possibility of reducing the scheme cost so that more needed irrigation facilities can be constructed under MI scheme. It was observed that over cost estimations and over designed facilities in some completed DPRs were committed and there is a little space to extract the extra cost. Required budget condition under the Accelerated Irrigation Benefits Programme (AIBP) scheme seems to be disadvantageous for hilly and small-scale irrigation like Mizoram. MID efforts to cope with restricted AIBP conditions could be found in past DPRs. One possible idea to reduce scheme cost is the partial adoption of farmers' participatory construction works. However, it needs time and drastic change in the mind-set of farmers and officers as well.
- As mentioned above, MID has been using the Schedule of Rates of Mizoram PWD (Building) for cost estimate of irrigation facilities. However, the Schedule of Rates is not including in the appropriate rate for relatively large-scale earthwork like open machinery use excavation for pond. The JICA Study Team had suggested to CE that MID should review and revise some of unrealistic rates in the near future.

(5) Construction and Quality Control Planning

- The existing DPR does not include a concrete construction and quality control plan. Documents on supervision works seem not to be kept either in MID offices. Besides, laboratory for construction materials testing could not be found either. Outsiders sometime pointed out the quality of MI construction works is a problem. The abovementioned situations are observed as a background of the problem.
- MI construction works are supposed to follow PWD technical specifications according to the

contract. However, it is too difficult and unrealistic to follow PWD technical specifications completely, considering the capacity of contractor and conditions in Mizoram. Besides PWD technical specifications is not always suitable for minor irrigation construction works. Therefore, it can be observed that the current system is not properly functioning. Considering abovementioned situation, the JICA Study Team proposed more practical and realistic construction and quality control planning and methodology that MID can practise for future DPR, and can utilise for site supervision works. Each division engineer learned and practised the preparation of construction and quality control planning through model DPR training. Now that MID engineers have completed theoretical training, and practical site supervision training is recommended next in order to strengthen the supervision capacity of MID engineers.

- Meanwhile, it is also important to change the procurement system to select better contractors and minimise political influence no MID works in order to improve the quality of construction works.

9.8 Summary of the Model DPR

The prepared four DPRs are available in ANNEX in Main Report. The summary of the four DPRs for MI schemes is shown in Table 9.8.1. The table summarises the location, farmland, irrigation, and farmers. Characteristics of the schemes are shown below.

9.8.1 Laului MI Scheme

The Laului MI scheme is located across Lau Lui in two districts (Aizawal and Serchhip) and three villages (Sailam, Sialsuk, and Thenzawl). The distance from the villages is more than 20 km. Topography of the scheme is hilly and steep. The farmland is located on the hill bottom, so the cultivated command area (CCA) is comparatively small at 12.2 ha. The river has a large catchment area at 21.0 km^2, so water resource is abundant. Therefore, the cropping area of *Rabi* (dry season) is similar in size as *Kharif* (rainy season). *Kharif* crop is only paddy, *Rabi* crops selected are maize, French bean, and leaf coriander based on farmer's request during the workshop and net profit. The water resource of the scheme is only the river. The diversion weirs and the canals (mainly main canals) are constructed as irrigation facilities. The cost per ha of the scheme is 3.45 *lakh*/ha. The benefit-cost (B/C) ratio is comparatively high at 5.02. The farming scheme is owner farming. The beneficiaries are identified and the WUA is established.

9.8.2 Dumlui MI Scheme

The Dumlui MI scheme is located in Kolasib Village in Kolasib District. The distance from the village is comparatively short at 6 km. Topography of the Dumlui MI scheme is hilly and steep. The farmland of the scheme is located on hill bottom, so CCA is small at 9.0 ha. The river of the scheme has a small catchment area at 0.7 km^2, so the water resource is not abundant. Therefore, the cropping area of *Rabi* is smaller than *Kharif*. The crop of *Kharif* is only paddy, Rabi crops selected are maize, French bean, green chilli, cauliflower, and leaf mustard based on farmer's request during the workshop and net profit. Available water resources in the scheme are the river and three ponds. The diversion weir is rehabilitated and the canals are constructed as irrigation facilities. The cost per ha of the scheme is high at 4.56 *lakh*/ha because of construction of the ponds, therefore, the B/C ratio is comparatively low at 2.05. The farming scheme is tenant farming. The beneficiaries are identified and the WUA is established. The final agreement is not yet concluded between MID and landowners of the ponds.

9.8.3 Kanghlai MI Scheme

The Kanghlai MI scheme is located in Tlamgsam Village in Champai District. The distance from the village is short at 2 km. Topography of the Kanghlai MI scheme is a basin. The farmland is located on the basin, so CCA is large at 65.0 ha. The river has a relatively small catchment area at 1.8 km^2, so the water resource is not abundant. Therefore, the cropping area of *Rabi* is smaller than *Kharif*. *Kharif* crop is only paddy, and *Rabi* crops selected are onion, potato, field pea, leaf mustard, and French bean based on farmer's request and net profit. Available water resources are the river and four ponds. The canals (mainly field canals) and ponds are constructed as irrigation facilities. The cost per ha of the scheme is low at 2.03 *lakh*/ha. The net profit of fishery is high, so the B/C ratio is comparatively low at 2.86. The farming scheme is owner farming. The

beneficiaries are identified and the WUA is established. The final agreement has not yet been concluded between MID and landowners of the ponds.

9.8.4 Ngengrual MI scheme

The Ngengrual MI scheme is located in Thingfal Village in Lunglei District. The distance from the village is comparatively short at 5 km. Topography of the Ngengrual MI scheme is hilly and steep. The farmland is located on the bottom of the hill, so CCA is comparatively small at 14.7 ha. The river has a comparatively large catchment at 9.0 km^2, so the water resource is abundant. Therefore, the cropping area of *Rabi* equals *Kharif*. *Kharif* crop is only paddy, and *Rabi* crops selected are maize, French bean, field pea, leaf mustard, and green chilli based on farmer's request during the workshop and net profit. The water resource of the scheme is only the river. The diversion weir and the canals (mainly main canals) are constructed as irrigation facilities. The cost per ha of the scheme is high at 5.10 *lakh*/ha. The B/C ratio is comparatively high at 3.74 The farming scheme is owner farming. The beneficiaries are identified and the WUA is established. Regarding the scheme, MID develops the irrigation facilities, DOA develops the land consolidation, and SWCD improves the river (Ngengrual Lui) to prevent floods.

Table 9.8.1 Summary of Model DPRs

MI Scheme Name			Laului	Dumlui	Kanghlai	Negngrual
Location	District		Aizawl/Serchhip	Kolasib	Chanphai	Lunglei
	Village		Sailam, Sialsuk and Thenzawl	Kolasib	Tlamgsam	Thingfal
	Distance from village (km)		28	6	2	5
Farm land	GCA (ha)		18.0	11.2	65.0	18.0
	CCA (ha)		12.2	9.0	65.0	14.7
	Cropping area (ha)	Kharif	12.2	9.0	65.0	14.7
		Rabi	12.2	2.5	6.7	14.7
	Fishery (ha)		0.0	0.5	16.0	0.0
	Proposed crop	Kharif	Paddy	Paddy	Paddy	Paddy
		Rabi	Maize, French bean, Leaf coriander	Maize, French bean, Green chilli, Cauliflower, Leaf mustard	Onion, Potato, Field pea, Leaf mustard, French bean	Maize, French bean, Field pea, Leaf mustard, Green chilli
Irrigation	Gross catchment area (km^2)		21.0	0.7	1.8	9.0
	Water resource	Kharif	River	River, Pond	River	River
		Rabi	River	Pond	River, Pond	River
	Irrigation facility	Weir (no.)	3	1	0	1
		Canal (km)	2.49	1.17	5.11	2.40
		Pond (no.)	0	3	4	0
	Total cost (lakh)		42.1	41.0	132.1	75.0
	Cost per ha (lakh/ha)		3.45	4.56	2.03	5.10
	B/C ratio		5.02	2.05	2.86	3.74
Farmer	Farming		Owner	Tenant	Owner	Owner
	Beneficiary		11	10	41	17
	WUA name		Laului	Dumlui	Kanghlai	Ngengrual

Source: Prepared by the JICA Study Team

9.9 Finalisation of the Model DPR Procedure

Based on the field test in the four model sites, the proposed DPR procedure is finalised as "DPR Preparation Guideline".

The guideline consists of main procedure from Step 1 to Step 12 with necessary forms to be used. The important references used in the field verification are also attached in the guideline. The prepared draft guideline was shared with MID, DOA, and DOH staff for comments in January 2015 and will be finalised in February 2015, as shown in Appendix 5.

Chapter 10 Conclusion and Recommendation

10.1 Conclusion

The Chapter concludes the JICA Study on Development and Management of Land and Water Resources for Sustainable Agriculture in Mizoram and recommends nine points for implementation of Master Plan and utilisation of DPR preparation guideline.

10.1.1 Master Plan for Land and Water Resources Development and Management for Sustainable Agriculture

- Through assessment of present socioeconomic condition and administration of the State, the Study Team identified the major challenges of the State of improvement of viability of the rural economy and environment, improvement of tax and revenue status of the state government and improvement of food security.
- Among many sectors, the agriculture sector is one of the most important sectors in the State and it plays vital roles in the State economy contributing nearly 20% of GSDP and absorbing 50% of main work forces. Although the state government allocated nearly 20% of the state plan budget to this sector during the 11th five years plan for enhancement of this sector, the potential threats for stagnation of the agriculture sector can be observed in the aspect of low productivity and limited harvesting area and low value of agricultural products. With the assessment of the Study Team, the causes of low productivity and limited cultivation area are (1) decline in soil fertility, which is mainly due to soil loss/erosion; (2) difficulty in using quality seeds and planting materials due to farmers' insufficient knowledge, inadequate support services, and lack of funds; (3) poor farm management due to little knowledge and poor access to extension services; (4) shortage of irrigation water and flood damage, (5) shortage of man power due to aging of farmer and low motivation to farming. The causes of low value of agricultural products are summarized as (1) mismatching in the market demand and production; (2) rigid market system and value chain controlled by Assam traders and wholesalers' and retailers' association; (3) less knowledge and motivation for profitable agriculture; (4) improper post-harvest processing; and (5) weak in agro-based industries. In addition, the Study Team also assessed the present constraints in the government supporting services as (1) inadequate planning and monitoring system, (2) undeveloped extension system, (3) lack of coordination among related departments and (4) low capacity of development partners.
- The Study Team proposes the vision of "achievement of strong, sustainable and attractive agriculture " under the Master Plan with target of growth rate of agriculture GSDP is 4% per annum and increase the self sufficiency rate of paddy at 50% by the year 2035. The Study Team proposes to achieve the master plan target taking advantage of diversity of the land and resources and geographical advantages by setting zonal development direction based on the divided seven zones in the view point of urbanization, agriculture productivity, progress of settle agriculture, forest conservation and utilization of the farm land.
- Considering the constraints faced in each zone, three development approaches namely (1) Institutional Development for Effective Agricultural Development Planning and Implementation, (2) Enhancement of Sustainable Agriculture Production through Proper Resources Utilisation and Management and (3) Establishment of Good Agriculture Value Chain with 27 projects are proposed.
- The Study Team recommended to implement the 27 projects with stage-wise spending 20 year period. The 1st Stage named "Develop Foundation" which is generally considered initial 7 years aiming to develop the capacity of the government officers, develop the system of good planning and supporting services and develop the fundamental infrastructure. The 2nd stage named "Enhance Skill and Technology" is generally considered next 7th to 10th year aiming to increase

the production through extension of agriculture skills and technologies to the cultivators in the State. The 3rd Stage named "Create Added Value" is generally considered 10 to 20 years aiming to increase the value of the product through restructuring the rigid market system to establish the appropriate value chain and enhancement of agriculture related industries and enterprises. The necessary cost to implement 27 proposed projects is estimated at INR 173 crore per annum which is equivalent to 40% of the present available budget on agriculture and irrigation development in the State.

- The JICA Study Team assessed the impacts of the master plan in environmental and social aspects based on the evaluation of the strategic directions and objectives of the programmes. The master plan has a wide range of important to moderate positive impacts, and only very few moderate to low negative impacts. These results assume that the mitigation measures have been integrated in planning and implementation. The main positive impacts are the reduction of greenhouse gas emissions, the conservation of soil and control of erosion, the conservation of protected areas and biological diversity, the improvement of livelihood and alleviation of poverty, and the allocation of benefits to the indigenous people. The negative impacts concern only water quality, water use, and rivers habitats. They are ranked as small to moderate.

10.1.2 DPR Preparation Guideline

- Although the minor irrigation facilities are one of the most important agriculture infrastructure in the state and 439 minor irrigation schemes have been developed in the past years. However, the inventory survey carried out in October 2013 to February 2014 showed that 49% of the created irrigation potential under the minor irrigation facilities was not in use and only 7% of the facilities are properly maintained by the established Water Users' Associations (WUAs). Based on the observation made out by the inventory survey, MID and the JICA Study Team discussed and analysed why the existing minor irrigation schemes did not bring maximum output. Then, it was found out that some points should be improved in the selection of the project and DPR preparation procedure.
- JICA Study Team proposed an improved 12 steps procedure after closed discussion with MID and other relevant departments. The improved procedure is mainly focused on the (1) standardization of procedure, (2) incorporation of beneficiary, other departments knowledge and idea in to DPR, and (3) identify the responsibility and mandate of stakeholders in the project management.

10.2 Recommendation

Based on the above conclusions of the Study, the JICA Study Team proposes the following recommendation.

10.2.1 Utilisation and Implementation of Master Plan

- Utilise the Master Plan prepared by the JICA Study as a "Road Map", not only for agriculture planning of the State but also in such a way as tailoring the activities of Centrally Sponsored Schemes to fit actual requirement of the State and/or creating State's own CSS
- Initiate following activities immediately by the state level stakeholders without additional assistance from the central government or external resources.

No.	Name of Project	Implementing Organisation	Activity
1-1	Establishment of an "Agriculture Development Committee"	Chief Secretariat	・ Establish preparatory committee ・ Preparation of roles and regulation of ADC with some trials
1-2	Establishment of State-wide System for Collecting and Managing Agriculture-related Data and Information	DES	・ Data collection system development such as forms and database
2-2	Enhancement of Environmentally-balanced Slope Area Cultivation	DOA	・ Provide necessary technologies and equipment or facilities to the farmers to prevent soil erosion with agronomic, vegetative, and structural ways

2-3	Enhancement of WRC and Promotion of Winter Crop	DOA	・ Legislation of tenant farming system of WRC land owning system
2-9	Improvement of Farm Accessibility and Transportation	DOA, MID	・ Preparation of the guidelines for planning, design and construction of the work to be executed by DOA.
2-10	Capacity Development of O&M of Fundamental Infrastructure	MID, DOA	・ Establishment of O&M unit in MID and providing necessary training or study tour for PIM ・ Introduction of WUA registration system in MID
3-2	Production of Import Substitution Crops Throughout the Year	DOH	・ Selection of capable horticultural farmers' organisation to be supported ・ Selection of the suitable variety of the import dominant horticulture crop such as onion, cabbage, tomato, brinjal, capsicum, cauliflower, potato, garlic, pineapple and mango through the way of PVS
3-6	Development of State Brand and Establishment of Sales Outlets in Other States	TCD	・ Establishment of state brand strategy management and implementation committee
3-7	Development of Horticulture Agro-industry	DOH	・ Establishment of steering committee with ICAR, KVK, state departments, Mizoram University, food processor, distributors, producers' group.
3-9	Development of Business-oriented Post-harvest Skills	KVK, DOA	・ Identify capable youth group and/or any private enterprises to be supported

- Take an immediate action for applying internal and/or external technical assistance resources to implement capacity strengthening projects for irrigation and agriculture allied officers in agriculture development planning and monitoring, production and marketing technologies extension including operation and management of irrigation facilities.
- Empower every village stakeholders ranging from farmers to local government officers to prepare the regional agriculture plan reflecting the development direction proposed by Master Plan and farmers needs and capacity for practical implementation of the Master Plan
- Enhance the resources managed settle agriculture on the lands after converted from jhum based agriculture as the post NLUP activities through extension of the conservation oriented agriculture technologies and necessary fundamental infrastructure development such as irrigation facilities, land and access road development in the potential area where land and water resources are available

10.2.2 Utilization of DPR Preparation Guideline

- Take strong initiative of head of the departments concerned especially DOA, DOH and DOF as a system or mandate for implementation of guideline as well as following up and/or update the agriculture action plan prepared
- Establish section in MID to handle the WUA mobilization and following up for better operation and maintenance of the facilities
- Conduct basic training for facilitation and participatory planning for the staff concerned in each department
- Collect continues data and update for market price, basic information of the farm land, farm management practice for preparation of better agriculture action plan

Appendix 1 Scope of Works (S/W) and Record of Discussion for S/W

RECORD OF DISCUSSIONS

FOR

THE STUDY

ON

DEVELOPMENT AND MANAGEMENT OF LAND AND WATER RESOURCES

FOR

SUSTAINABLE AGRICULTURE IN MIZORAM

IN

THE REPUBLIC OF INDIA

AGREED UPON BETWEEN

MINOR IRRIGATION DEPARTMENT

OF

THE GOVERNMENT OF MIZORAM

AND

JAPAN INTERNATIONAL COOPERATION AGENCY

New Delhi, 9th April, 2013

Mr. Ranbir Singh
Secretary
Minor Irrigation Department,
Government of Mizoram,
India

Mr. Shinya Ejima
Chief Representative
JICA India Office

Witness:

Mr. Vijay Kumar
Economic Advisor
Ministry of Water Resources,
Government of India

Abhay Kumar Sharan, US
Department of Economic Affairs,
Ministry of Finance,
Government of India

Minor Irrigation Deptt.
Government of Mizoram
Receipt No. 35
Date 16/4/13

Based on the minutes of meetings on the Detailed Planning Survey for the Study on Development and Management of Land and Water Resources for Sustainable Agriculture in Mizoram (hereinafter referred to as "the Study") signed on 24th, February 2012 between Minor Irrigation Department, Government of Mizoram (hereinafter referred to as "MID") and the Japan International Cooperation Agency (hereinafter referred to as "JICA"), JICA held a series of discussions with MID and relevant organizations to develop a detailed plan of the Study.

Both parties agreed the details of the Study as described in the Appendix 1 and to request their respective governments to proceed with the necessary procedures for implementation of the Study.

Both parties also agreed that MID, the counterpart to JICA, will be responsible for the implementation of the Study in cooperation with JICA, coordinate with other relevant organizations and ensure that the self-reliant operation of the Study is sustained during and after the implementation period in order to contribute toward social and economic development of India.

The Study will be implemented within the framework of the Colombo Plan Technical Cooperation Scheme and the Note Verbales to be exchanged between the Government of Japan and Government of India.

Appendix 1: Description of the Study
Appendix 2: Minutes of meetings on Detailed Planning Survey

Appendix 1

DESCRIPTION OF THE STUDY

Both parties confirmed that there is no change in the description of the Study agreed on in the minutes of meetings on the concerning Detailed Planning Survey on the Study signed on 24th, February 2012 (Appendix 2).

I. BACKGROUND

In response to the official request of the Government of India (GoI) titled "Study for Comprehensive Development and Management of Land and Water Resources in Kolashib District, Mizoram", the Government of Japan has decided to conduct a study together with GoI. Accordingly, the Japan International Cooperation Agency (JICA), the official agency responsible for the implementation of the economic and technical cooperation programmes of the Government of Japan, will undertake the study in close cooperation with the authorities concerned.

The present document sets forth the details and procedures for cooperation.

II. OUTLINE OF THE STUDY

1. Title of the Study

   Study on Development and Management of Land and Water Resources for Sustainable Agriculture in Mizoram

2. Expected Goals which will be attained after completion of the Study

   (1) Goal of the Proposed Plan

   - Master Plan will be adopted as policy of Government of Mizoram (GoM)
   - Model for formulating the Detailed Project Report (DPR) will be adopted by Minor Irrigation Department (MID) in coordination with agro-allied departments and beneficiary farmers

   (2) Goal which will be attained by utilizing the Proposed Plan

   - Area irrigated under minor irrigation project and rice production under wet rice cultivation will be increased based on Master Plan and improved model for formulating DPR.
   - Ratio of organization of water users association will be increased based on improved model for formulating DPR.

3. Outputs

- Master Plan will be formulated
- Integrated and participatory models for formulating DPR will be developed
- Planning capacity of MID and other agro-allied departments will be strengthened

4. Activities

[Phase 1]

A) Collection of basic information
   - Review of literature and existing data
   - Baseline survey (on nature and environment, food self-sufficiency, rural socio-economy, land use, agriculture, agro-infrastructure, agriculture extension system, marketing, hydrology etc.)

B) Formulation of Master Plan

C) Review of DPRs prepared by MID

[Phase 2]

D) Development of integrated and participatory models for formulating DPRs for selected project sites

5. Input

(1) Input by JICA

JICA will take, at its own expense, the following measures according to the normal procedures under the Colombo Plan Technical Cooperation:

(a) Dispatch of Mission

Mission will be dispatched including experts covering the areas such as;

- Irrigation engineering
- Rural infrastructure engineering
- Agronomy
- Horticulture
- Inland fishery
- Environmental and Social Consideration

(b) Training

GoM requested that the counterpart personnel be exposed and trained in Japan in order to achieve technology transfer. The number, field and duration of the exposure and training shall be discussed after the commencement of the Study.

(c) Machinery and Equipment

Equipment necessary for the implementation of the Study such as vehicles for the JICA mission will be provided.

Input other than indicated above will be determined through mutual consultations between

JICA and MID during the implementation of the Study, as necessary.

(2) Input by GoM

GoM will take necessary measures to provide the following at its own expense:

(a) Services of GoM's counterpart personnel and administrative personnel as referred to in II-6;
(b) Suitable office space with necessary equipment;
(c) Supply or replacement of machinery, equipment, instruments, vehicles, tools, spare parts and any other materials necessary for the implementation of the Study other than the equipment provided by JICA;
(d) Information as well as support in obtaining medical service;
(e) Credentials or identification cards;
(f) Available data (including maps and photographs) and information related to the Study;
(g) Running expenses necessary for the implementation of the Study;
(h) Expenses necessary for transportation within India of the equipment referred to in II-5 (1) (c) as well as for the installation, operation and maintenance thereof; and
(i) Necessary facilities to the members of the JICA missions for the remittance as well as utilization of the funds introduced into India from Japan in connection with the implementation of the Study.

6. Implementation Structure

The organization chart of the Study is given in the Annex I. The roles and assignments of relevant organizations are as follows:

(1) GoM

(a) Assignment of Project Director

Chief Engineer, MID will be assigned as Project Director to be responsible for overall administration and implementation of the Study.

(b) Assignment of Nodal Officers

In order to ensure integrated approach adopted in the Study, a nodal officer will be nominated from each agro-allied departments.

(2) JICA Mission

The JICA mission will give necessary technical guidance, advice and recommendations to GoM on any matters pertaining to the implementation of the Study.

(3) Joint Coordinating Committee

Joint Coordination Committee (hereinafter referred to as "JCC") will be set up, chaired by the Chief Secretary with secretaries of the concerned departments as members, which will

monitor the progress and provide necessary support for smooth implementation of the study. A list of proposed members of JCC is shown in the Annex II.

(4) Counterpart Team

To conduct the Study smoothly and efficiently and to maximize the benefits of government intervention especially towards the end of Phase 1, a counterpart team shall be organized by GoM. Several agro-allied departments to be identified during the course of formulating Master Plan shall assign officials to work as part of counterpart team. Counterpart team is expected to work together with the JICA study team to receive on-the-job training and to offer adequate information and data to carry out the following tasks;

(a) Review of the DPR prepared by MID

(b) Development of integrated and participatory models for formulating DPRs for selected project sites

7. Study Area

The Study will cover the entire Mizoram state.

8. Duration

Duration of the Study will be 20 months.

9. Reports

JICA will prepare and submit the following reports to the GoM in English.

(1) 30 copies of Inception Report at the commencement of the first work period in India

(2) 30 copies of Progress Report (1) about 6 months after the commencement of the first work period in India

(3) 30 copies of Interim Report at the time of the completion of the Phase 1 of the Study

(4) 30 copies of Progress Report (2) at the time of completion of the second work period in India

(5) 40 copies of Draft Final Report before the last work period in India

(6) 60 copies of Final Report within 1 month after the receipt of the comments from GoM on the Draft Final Report

10. Environmental and Social Considerations

GoM agreed to abide by 'JICA Guidelines for Environmental and Social Considerations' in order to ensure that appropriate considerations will be made for the environmental and social impacts of the Study.

III. UNDERTAKINGS OF GOM AND GOI

1. GoM and GoI will take necessary measures to:
   (1) ensure that the technologies and knowledge acquired by the Indian nationals as a result of Japanese technical cooperation contributes to the economic and social development of India, and that the knowledge and experience acquired by the personnel of India from technical training as well as the equipment provided by JICA will be utilized effectively in the implementation of the Study; and
   (2) grant privileges, exemptions and benefits to the members of the JICA missions referred to in II-5 (1) (a) above and their families, which are no less favorable than those granted to experts of third countries performing similar missions in India under the Colombo Plan Technical Cooperation Scheme.
   (3) provide security-related information as well as measures to ensure the safety of the members of the JICA missions;
   (4) permit the members of the JICA missions to enter, leave and sojourn in India for the duration of their assignments therein and exempt them from foreign registration requirements and consular fees;
   (5) exempt the members of the JICA missions from taxes and any other charges on the equipment, machinery and other material necessary for the implementation of the Study;
   (6) exempt the members of the JICA missions from income tax and charges of any kind imposed on or in connection with any emoluments or allowances paid to them and/or remitted to them from abroad for their services in connection with the implementation of the Study; and
   (7) meet taxes and any other charges on the equipment, machinery and other material, referred to in II-5 (1) (c) above, necessary for the implementation of the Study.

2. GoI will bear claims, if any arises, against the members of the JICA missions resulting from, occurring in the course of, or otherwise connected with, the discharge of their duties in the implementation of the Study, except when such claims arise from gross negligence or willful misconduct on the part of the members of the JICA missions.

IV. EVALUATION

JICA will conduct the following evaluations and surveys to mainly verify sustainability and impact of the Study and draw lessons. GoM is required to provide necessary support for them.

1. Ex-post evaluation 3 years after the completion of the Study, in principle
2. Follow-up surveys on necessity basis

V. PROMOTION OF PUBLIC SUPPORT

For the purpose of promoting support for the Study, GoM will take appropriate measures to make the Study widely known to the people of India.

VI. MUTUAL CONSULTATION

JICA and GoM will consult each other whenever any major issues arise in the course of Study implementation.

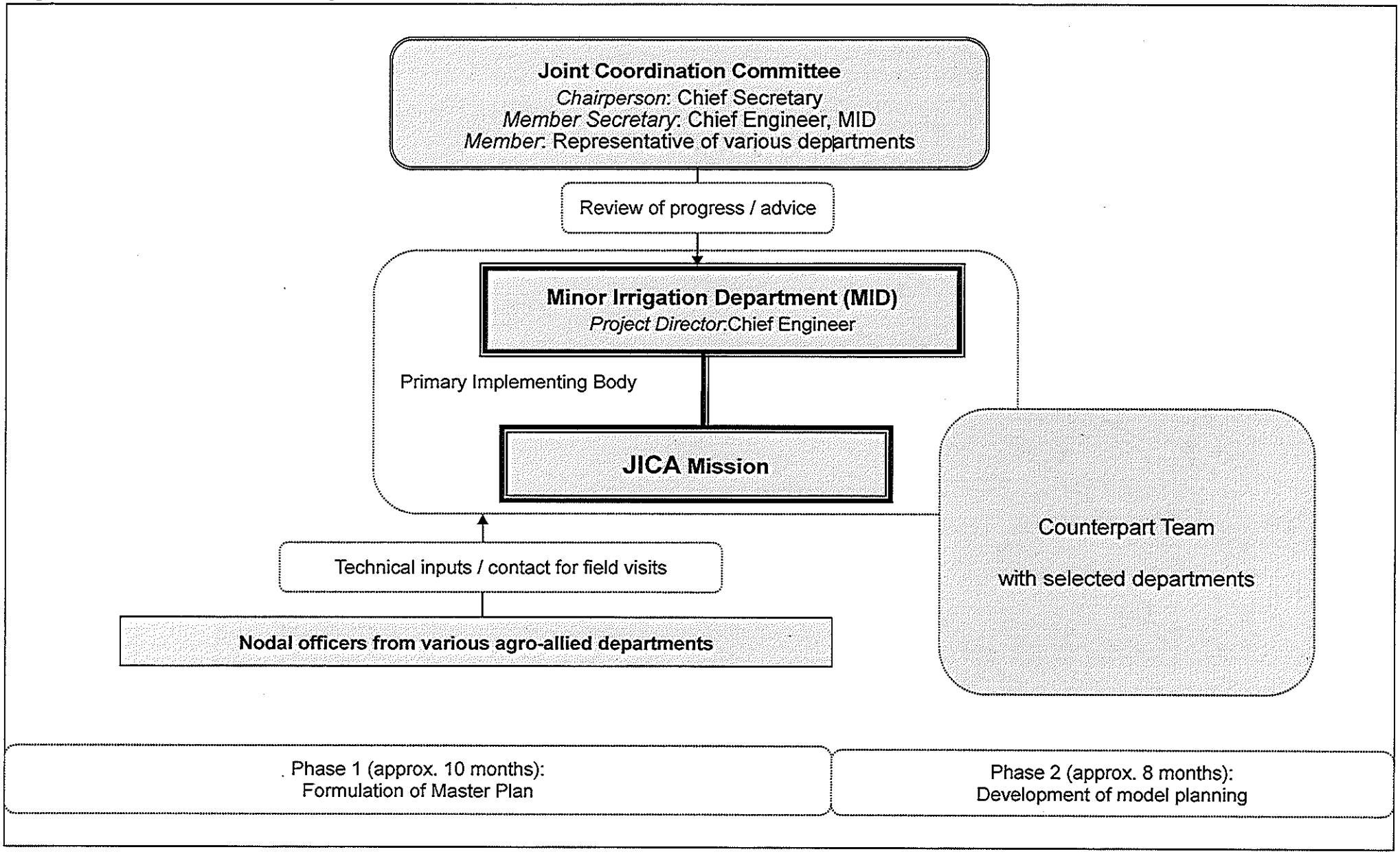
VII. AMENDMENTS

The record of discussions may be amended by the minutes of meetings between JICA and MID. The minutes of meetings will be signed by authorized persons of each side who may be different from the signers of the record of discussions.

Annex I Organization Chart of the Study

Annex II List of JCC Members

Organisation Chart of the Study



* Agro-allied departments to be actively involved in the Study will be identified at the time of commencement of the Study.

Annex II

List of members of Joint Coordination Committee

Chairperson
Chief Secretary, Government of Mizoram

Vice Chairperson
Secretary, MID, Government of Mizoram

Member: Representative from the institutions mentioned below

1. Planning and Programme Implementation Department
2. Finance Department
3. Agriculture Department
4. Horticulture Department
5. Minor Irrigation Department
6. Soil and Water Conservation Department
7. Animal Husbandry and Veterinary Department
8. Fishery Department
9. Sericulture Department
10. Environment and Forest Department
11. Rural Development Department
12. Ministry of Water Resources, Government of India
13. JICA

Member Secretary
Project Director/Chief Engineer, MID

MINUTES OF MEETING
OF
THE DETAILED PLANNING SURVEY
FOR
THE STUDY
ON
DEVELOPMENT AND MANAGEMENT OF LAND AND WATER RESOURCES
FOR
SUSTAINABLE AGRICULTURE IN MIZORAM
IN
THE REPUBLIC OF INDIA
AGREED UPON BETWEEN
MINOR IRRIGATION DEPARTMENT
OF
THE GOVERNMENT OF MIZORAM
AND
THE JAPAN INTERNATIONAL COOPERATION AGENCY

Aizawl, 24th February, 2012

Mr. N. Darzika
Secretary,
Minor Irrigation Department,
Government of Mizoram,
India

Mr. Sei Kondo
Leader of the Detailed Planning Survey Team,
Japan International Cooperation Agency (JICA)

In response to the official request of the Government of the Republic of India (hereinafter referred to as "GoI") titled "Study for Comprehensive Development and Management of Land and Water Resources in Kolashib District, Mizoram", and subsequent to a series of preliminary survey missions, the Detailed Planning Survey Team (hereinafter referred to as "the Team") organized by the Japan International Cooperation Agency (hereinafter referred to as "JICA") was dispatched and had a series of discussions with the authorities concerned of the Government of Mizoram from 4th February 2012 and is expected to continue till 1st March 2012 (List of Main Attendants is shown in Attachment I).

The discussions were conducted in a cordial atmosphere and both parties agreed to record the following points as summarized conclusions of the discussions.

1. Basic Mutual Understandings

Both sides recognized that the highest priority set by the Government of Mizoram (GoM) was to improve self-sufficiency in food production and ensure sustainable livelihood through various schemes especially New Land Use Policy (NLUP). NLUP is being vigorously implemented by concerned departments and it aims at tackling with such priority issues primarily through weaning away the farmers from unsustainable shifting (*jhum*) cultivation to permanent farming. JICA took note of the initiative taken by the State Government and ensured that the Study will share the priority area set by the State Government as overall goals of the Study.

Through the Team's series of discussions with departments related to agriculture, it was observed that impact of Government's intervention could be further enhanced through the following:

- **Planning in long term perspective:** Currently, planning in agro-allied departments' support for farmers starts only after assurance of available funds from State/Centre or individual demands by farmers. It would be desirable that departments concerned are equipped with long term perspective for agriculture development so that they are able to enhance the effectiveness of the development intervention in a sustainable manner.
- **Coordinated intervention by departments:** Intervention by the departments is not always done in geographically and functionally coordinated manners. There is a strong need for coordinated and concerted intervention by departments to specific farmers/localities combining provision of infrastructure including water and various services to farmers such as technology extension on various crops, finance, marketing and value addition. Such "cluster approach" would maximise impact of investments made by each department.

- **Adding value to irrigation:** Intervention by departments related to production (agriculture, horticulture, etc.) could be made considerably more effective and sustainable if combined with appropriate provision of water through the irrigation projects by Minor Irrigation Department (MID). Coordination among these departments in the planning and implementation stages of irrigation project will not only add significant value to irrigation facilities but also ensure sustainability in the long run.
- **Planning a sustainable irrigation project through an integrated and participatory approach:** In a typical irrigation project, MID prepares the Detailed Project Report (DPR) which includes feasibility study, design, cost estimates and cost analysis. The DPR, however, has a huge potential to incorporate social, economic and natural conditions of the area. This will not only ensure the sustainability of the facilities but also lead to improvement of the livelihood of farmers. On the one hand, feasibility study can be improved by incorporating analysis on water resources, farm managements, institutional development and farm budget analysis to correctly estimate cost and benefit of the project. On the other hand, design can incorporate inputs by beneficiary farmers through participatory approach to ensure operation and maintenance of the facilities developed.

On the basis of this observation, both sides agreed to set the objective of the Study as follows;

- To formulate a long term development and management plan (Master Plan) of land and water resources with a view to increase agricultural productivity and to improve livelihood of farmers in sustainable manner.
- To propose multiple development models reflecting diversity in social, economic and natural conditions.
- To develop an integrated and participatory model for formulating the DPR with participation of related departments and farmers based on technical, financial, and institutional analysis.

2. Agreement of Draft Record of Discussion

Based on the above mutual understandings and objectives, both parties discussed detailed contents of the Study and reached an agreement on the draft record of discussion as Attachment II.

3. Outline of the Study

Both sides agreed to frame the outline of the Study as follows.

3.1. Title of the Study

Study on Development and Management of Land and Water Resources for Sustainable Agriculture in Mizoram

3.2. Expected Goals which will be attained after completion of the Study

(1) Goal of the Proposed Plan

- Master Plan will be adopted as policy of GoM.
- Model for formulating the DPR will be adopted by MID in coordination with agro-allied departments[1] and beneficiary farmers.

(2) Goal which will be attained by utilizing the Proposed Plan

- Agricultural productivity will be increased.
- Livelihood of farmers will be improved.

3.3. Outputs

- Master Plan will be formulated.
- Integrated and participatory model for formulating DPR will be developed.
- Planning capacity of MID and other agro-allied departments will be strengthened.

3.4. Activities

[Phase 1]

A) Collection of basic information
   - Review of literature and existing data
   - Baseline survey (on nature and environment, food self-sufficiency, rural socio-economy, land use, agriculture, irrigation facilities, rural infrastructure, agriculture extension system, marketing, hydrology etc.)

B) Formulation of Masters Plan (draft contents subject to finalization at the time of commencement is attached as Attachment III)

C) Review and improvement of the DPR prepared by MID

[Phase 2]

D) Formulation of the DPR on selected project sites

3.5. Input

[1] Agro-allied departments to be actively involved in the Study will be identified at the time of commencement of the Study.

(1) Input by JICA

JICA will take, at its own expense, the following measures according to the normal procedures under the Colombo Plan Technical Cooperation:

(a) Dispatch of Mission

Mission will be dispatched including experts covering the areas such as;

- Irrigation engineering
- Rural infrastructure engineering
- Agronomy
- Horticulture
- Inland fishery

(b) Training

GoM requested that the counterpart personnel be exposed and trained in Japan in order to achieve technology transfer. The number, field and duration of the exposure and training shall be discussed after the commencement of the Study.

(c) Machinery and Equipment

Equipment necessary for the implementation of the Study such as vehicles for the JICA mission will be procured by JICA.

Input other than indicated above will be determined through mutual consultations between JICA and GoM during the implementation of the Study, as necessary.

(2) Input by GoM

GoM will take necessary measures to provide the following at its own expense:

(a) Services of GoM's counterpart personnel and administrative personnel as referred to in section 3.6;
(b) Suitable office space with necessary equipment;
(c) Supply or replacement of machinery, equipment, instruments, vehicles, tools, spare parts and any other materials necessary for the implementation of the Study other than the equipment provided by JICA;
(d) Information as well as support in obtaining medical service;
(e) Credentials or identification cards;
(f) Available data (including maps and photographs) and information related to the Study;
(g) Running expenses necessary for the implementation of the Study;
(h) Expenses necessary for transportation within India of the equipment referred to in

section 3.5 (1) (c) as well as for the installation, operation and maintenance thereof; and

(i) Necessary facilities to the members of the JICA missions for the remittance as well as utilization of the funds introduced into India from Japan in connection with the implementation of the Study.

3.6. Implementation Structure

The organization chart for the Study is given in the Attachment IV. The roles and assignments of relevant organizations are as follows:

(1) GoM

(a) Assignment of Project Director

Chief Engineer, MID will be assigned as Project Director to be responsible for overall administration and implementation of the Study.

(b) Assignment of Nodal Officers

In order to ensure integrated approach adopted in the Study, a nodal officer will be nominated from each agro-allied departments.

(2) JICA Mission

The JICA mission will give necessary technical guidance, advice and recommendations to GoM on any matters pertaining to the implementation of the Study.

(3) Joint Coordination Committee

Joint Coordination Committee (JCC) will be set up, chaired by the Chief Secretary with representatives of the concerned departments as members, which will monitor the progress and provide necessary support for smooth implementation of the Study. A list of proposed members of JCC is shown in the Attachment V.

(4) Counterpart Team

To conduct the Study smoothly and efficiently and to maximize the benefits of government intervention especially towards the end of Phase 1, a counterpart team shall be organized by GoM. Several agro-allied departments to be identified during the course of formulating Master Plan shall assign officials to work as part of counterpart team. Counterpart team is expected to work together with the JICA study team to receive on-the-job training and to offer adequate information and data to carry out the following tasks;

(a) Review and improvement of the DPR prepared by MID

(b) Formulation of the DPR on selected project sites

3.7. Study Area

The Study will cover the entire state.

3.8. Duration

Duration of the Study will be 20 months. Tentative work schedule is attached as Attachment VI.

3.9. Reports

JICA will prepare and submit the following reports to GoM in English.

(1) 30 copies of Inception Report at the commencement of the first work period in India

(2) 30 copies of Progress Report (1) about 6 months after the commencement of the first work period in India

(3) 30 copies of Interim Report at the time of the completion of the Phase 1 of the Study

(4) 30 copies of Progress Report (2) at the time of completion of the second work period in India

(5) 40 copies of Draft Final Report before the last work period in India

(6) 60 copies of Final Report within 1 month after the receipt of the comments on the Draft Final Report

3.10. Environmental and Social Considerations

GoM agreed to abide by "JICA Guidelines for Environmental and Social Considerations" in order to ensure that appropriate considerations will be made for the environmental and social impacts of the Study.

4. Undertakings of Indian Side

Both sides agreed that both GoM will ensure following undertakings.

4.1. Budget allocation

The budget for counterpart personnel related to the Study will be borne by each Indian institution.

4.2. Office space

Office space with enough furnishing for the JICA mission team to implement the Study shall be provided by GoM.

5. Procedure before Implementation of the Study

Both sides agreed that changed title of the Study had to be approved in the due procedure. In addition, record of discussion will be signed after taking necessary internal approval at both sides by competent authorities.

Attachment I:	List of Main Attendants
Attachment II:	Draft Record of Discussion
Attachment III:	Draft Contents of Master Plan
Attachment IV:	Organisation Chart of the Study
Attachment V:	List of JCC members
Attachment VI:	Tentative work schedule

6

Attachment I

List of Main Attendants

Name	Designation	Office
Government of Mizoram		
Van Hela Pachuau	Chief Secretary	Government of Mizoram
P. L. Thanga	Member & Secretary	State Planning Board
Saihlira	Advisor	State Planning Board
Renu Sharma	Commissioner & Secretary	Finance, LAD & Planning
H. Darzika	Secretary	Minor Irrigation Department
Lalthanliana	Chief Engineer	Minor Irrigation Department
Laldingliana	S. E.	Minor Irrigation Department
V. G. V. Nair	S. E.	Minor Irrigation Department
K. Hamlet	E. E.	Minor Irrigation Department
L. Malsawma Hauhnar	E. E.	Minor Irrigation Department
Laldinpuii	E. E.	Minor Irrigation Department
C. Lalzarliana	Director, Crop Husbandry	Agriculture Department
C. Lalniliana	Director, Research & Education	Agriculture Department
H. Lalthanpuia	Joint Director	Agriculture Department
H. Saithantluanga	Deputy Director	Agriculture Department
T. Sangkunga	Secretary	Horticulture Department
Samuel Rosanglura	Director	Horticulture Department
Lalliankima	Deputy Director	Horticulture Department
R. Zotawna	Joint Director	Horticulture Department
E. Saipari	Joint Director	Horticulture Department
F. Vanlalruata	Addl. Secretary	Finance Department
V. Lalremthanga	Addl. Secretary	Rural Development Department
Lalrozauva	Deputy Director	Sericulture Department
Laltleipuii	Assistant Director	Fisheries Department
B. Prasad	Joint Director	Animal Husbandry & Veterinary Department
Lalram Thanga	Principal Secretary	Soil & Water Conservation Department
Jerome Rokima	Director	Soil & Water Conservation Department
Government of India		
G. Bhattacherjee	SDO	Central Water Commission, North Eastern Investigation Division-II, Zemabawk, Aizawl
JICA Detailed Planning Survey Team		
Sei Kondo	Team Leader / Representative	JICA India Office
Yu Sasaki	Member (Planning and Analysis) / Lead Development Specialist	JICA India Office
Subroto Talukdar	Member (Planning) / Senior Development Specialist	JICA India Office
Yoshikazu Takahashi	Member (Irrigation and Water Resources Management)	Nippon Koei Co., Ltd.
Tomoki Nakamura	Member (Agriculture Economy and Farm Management)	Nippon Koei Co., Ltd.
Sanjeev Vasudev	Member (Agriculture Development Advisor)	STADD Development Consulting Pvt., Ltd.
Sanjay Barbora	Member (Environmental and Social Impact Advisor)	Consultant

Appendix 2 Minutes of Meetings

MINUTE OF THE FIRST MEETING OF THE JOINT COORDINATION COMMITTEE (JICA)

Venue	:	Chief Secretary's Conference Hall
Date	:	07th October 2013 (Monday)
Time	:	10:00 A.M.
Members present	:	List attached

Mrs. L. Tochhong, Chief Secretary, Government of Mizoram, and Chairperson, Joint Coordination Committee (JICA) chaired the meeting. At outset, the chairperson welcomed all present in the meeting and she presented memento to members of JICA Team of Experts. She informed the meeting that due to cancellation of flight the day before, three JICA officials could not attend the first JCC (JICA) meeting and she then invited Mr. Laldingliana, Superintending Engineer (Works & Design), Minor Irrigation Department to introduce the Team of Experts from JICA to the Committee. Mrs. L. Tochhong also requested each of the other members present to give self introduction.

The Chairperson then invited Mr. Shigeki Yamaoka, Rural Development Planning Specialist and the Team Leader to present the 'Inception Report' prepared by JICA Team of Experts and placed before the meeting of the Joint Coordination Committee (JICA) for approval. After greeting the meeting, Mr. Shigeki Yamaoka informed the meeting that the Development Study will cover the whole state of Mizoram and the study will be completed in 20 months. Then he explained main features of the Inception Report on 'Study on Development and Management of Land and Water Resources for Sustainable Agriculture in Mizoram' by way of PowerPoint Presentation. He informed the meeting that there are two objectives in this study viz.

1. Formulation of 'Master Plan for Development and Management of Land and Water Resources for Sustainable Agriculture in Mizoram', and
2. Improvement of planning process of Minor Irrigation Projects based on the master plan with coordination among concerned departments.

Mr. Shigeki Yamaoka also explained in detail the 'Plan of Operation' which consists of two stages with six (6) Approaches as under:

Stage 1 : Master Plan Formulation consisting of

1. Utilization of lesson learnt from New Land Use Policy (NLUP)
2. Assessment of development approaches suitable for geographical features
3. Realization of stable livelihood through integrated agriculture.
4. Introduction of environmental conservation measures in line with development plans

Stage 2 : DPR Preparation and DPR Model Creation Process which include

1. Encourage beneficiary participation from planning
2. Improvement of comprehensive DPR formulation process and contents.

o/c

He also explained that the whole project will be divided in two phases, the first phase will be from September 2013 to August 2014 and the second and final phase will be completed in April 2015. The first phase will mainly comprise of collection and analysis of documents and information relating to many fields like hydrology, socio-economic, agriculture production, market etc. as well as technology transfer to the concerned departments. Second phase will include development of integrated and participatory models for formulating DPRs for selected project sites, finalization of action plan and submission of final report. It is also reported that a total number of 12 personnel, expert in different fields will be involved in the study.

The nature and importance of Nodal Officer as well as Counterpart Team was highlighted in the report stating that 'Main counterpart members' will be from Minor Irrigation Department, Department of Agriculture and Department of Horticulture where as 'Sub counterpart members' will comprise of representatives from departments of Soil & Water Conservation, AH & Vety., Fisheries, Sericulture, Environment & Forest and Rural Development.

The chairperson then invited the members for discussion and interaction and after due deliberations, the Joint Coordination Committee (JICA) accepted the 'Inception Report'. The chairperson assured the JICA Team of Experts all the possible help and assistance from the government of Mizoram and then formally launched the 'Study on Development and Management of Land and Water Resources for Sustainable Agriculture in Mizoram' and concluded the meeting at 11:15 AM by saying that this Development Study will draw out a developmental roadmap for the State of Mizoram.

(LALTHANLIANA)
Chief Engineer, MID,
& Project Director for JICA Study,
Mizoram, Aizawl.

(SHIGEKI YAMAOKA)
Team Leader,
JICA Team,
Camp: Aizawl, Mizoram.

MIZORAM AGRICULTURE JICA STUDY TEAM

GOVERNMENT OF MINOR IRRIG

L.Tochhong 9/4/10/13

(L.TOCHHONG)
Chief Secretary,
Government of Mizoram
& Chairperson,
Joint Coordination Committee (JICA)
Mizoram, Aizawl.

(15)

No.B.20013/3/2011 –CE(MI)/JI : Dated Aizawl, the 14th Oct, 2013

Copy to:

1. Senior PPS to Chief Secretary, Government of Mizoram & Chairperson, Joint Coordination Committee(JICA) for information.
2. P.S to Addl. Chief Secretary to the Government of Mizoram & Vice-Chairperson, Joint Coordination Committee(JICA), for information.
3. All members, Joint Coordination Committee (JICA), Mizoram, Aizawl for information.
4. Addl. Secretary to the Govt. Mizoram, Minor Irrigation Dept. for information
5. Chief Representative, JICA India Office for information.
6. Team Leader, JICA Team of Experts, camp: Aizawl for information.

14/10

(LALTHANLIANA)
Chief Engineer, MID
& Member Secretary,
Joint Coordination Committee (JICA),
Mizoram, Aizawl.

GOVERNMENT OF MIZORAM
OFFICE OF THE CHIEF ENGINEER
MINOR IRRIGATION DEPARTMENT
MIZORAM : AIZAWL

Telefax : 0389 2316638
e-mail: mizorammid@yahoo.in ***Telephone 0389 2325280***

No.B.20013/3/2013-CE(MI)/41-48 Dated Aizawl, the 7th July, 2014

To,

All Members,
Joint Coordination Committee (JICA),
Mizoram, Aizawl.

Subject: Minutes of the 2nd Meeting of Joint Coordination Committee (JICA)

Sir,

I have the honour to forward herewith Minutes of the 2nd Meeting of Joint Coordination Committee (JICA) held at the Chief Secretary's Conference Hall on 25th June, 2014 at 1:00 p.m.

Yours faithfully,

Enclosed: As above

(LALTHANLIANA)
Project Director, JICA Study &
Chief Engineer,
Minor Irrigation Department

Memo No.B.20013/3/2013-CE(MI)/41-48 Dated Aizawl, the 7th July, 2014

Copy to:

1. Sr. PPS to Chief Secretary, Government of Mizoram & Chairperson, Joint Coordination Committee (JICA) for information.
2. P.S to Secretary to the Government of Mizoram, MID & Vice-Chairperson, Joint Coordination Committee(JICA) for information.
3. Addl. Secretary to the Government of Mizoram, MID for information.
4. Chief Representative, JICA India Office for information.
5. Team Leader, JICA Team of Experts, camp: Aizawl for information.
6. Director, Trade & Commerce Department, for information.
7. The General Manager, Directorate of Industries, for information.

(LALTHANLIANA)
Project Director, JICA Study &
Chief Engineer,
Minor Irrigation Department

MEETING MINUTE OF SECOND JOINT COORDINATION COMMITTEE (JICA)

Venue : Chief Secretary's Conference Hall

Time : Dt.25th June, 2014 (Wednesday), 1:00 pm.

Members present : List attached

Joint Coordination Committee (JICA) Chairperson, Mrs. L. Tochhong, Chief Secretary, Government of Mizoram, chaired the meeting and welcomed the members present, especially representative of the JICA (India) Office, Dr. Yu Sasaki and JICA Study Team and thanked all the members for making it convenient to attend the meeting. The chairperson then read out the Agenda to be considered in the meeting.

On invitation from the chair, Er. Lalthanliana, Chief Engineer, MID & Member Secretary, JCC (JICA) briefed the members about JICA sponsored study, 'Study on Development and Management of Land and Water Resources for Sustainable Agriculture in Mizoram' and how the Study is being carried out by the Study Team for the last nine months, by way of power-point presentation, and thanked all the Team members for their sincerity and hard work. He highlighted that in addition to intense works in the office, the Team had conducted extensive tours, covering the eight districts of Mizoram, including visit to various development projects sites and establishments like M.I Projects, MIFCO Fruit Juice Concentrate Plant, Winery, Coffee Demonstration Farm, KVKs, ICAR Research Complex, Agriculture Farms, Horticulture Centres, etc. with elaborate interviews/interaction with officials concerned and farmers/ villagers.

Er. Lalthanliana also expressed his hope and expectation that the Study develop sufficient capacity to formulate and implement schemes or programmes for 'Development and Management of Land and Water Resources' in an integrated and participatory manner 'for Sustainable Agriculture in Mizoram' and solicited cooperation and participation from the participating departments in implementing the Development Study and ultimately the 'Master Plan'.

The Chairperson then invited Mr. Shigeki Yamaoka, JICA Study Team leader to give power-point presentation on the 'Progress of Study'. Mr. Shigeki Yamaoka briefed the members about several meetings they have had with various departments under Government of Mizoram, the system of data collection, site survey for agricultural marketing & processing in Serchhip, Kolasib, Aizawl, Champhai and Lunglei districts. He also reported that house-hold survey of 360 samples from 24 villages and market survey of 20 commodities were out-sourced to Department of Economics, University of Mizoram. He further reported that inventory survey of 439 minor irrigation projects was carried out with the help of officials of Minor Irrigation Department.

Mr. Shigeki Yamaoka then reported basic concept of 'Master Plan' by stating that :

- Overall goals are:
  1) Improve viability of the local economy and environment
  2) Increase income of the state population
  3) Improve tax revenue status of the state government
  4) Increase employment opportunities
  5) Improve food security in the State

- Visions & Objectives: Achievement of sustainable, strong and attractive Mizoram agriculture with the following targets:
  Target year: 2035
  1) A growth rate of 4% or more per annum in the agriculture sector
  2) Self-sufficiency rate of paddy is 60%

- Strategy:
  1) Improvement of productivity
  2) Expansion and increase of harvested area
  3) Increase of values of the product.

Mr. S. Yamaoka then went on to explain Area-characteristic Zoning and their Development Direction. He reported that 24 sets of data were analyzed using Principal Component Analysis to determine 6 Principal Components, then Hierarchical Clustering method was employed to develop Cluster Map. Finally, Mizoram is divided into seven Area-characteristic Zones using the Cluster Map and Market Accessibility Map; each zone having separate recommended Development Direction. He then explained in detail, the 10 Programmes with 29 Projects for achieving Sustainable, Strong and Attractive Mizoram Agriculture.

Results on Problem Analysis on present minor irrigation schemes were presented in the meeting by S. Yamaoka and procedures for Model DPR preparation for Minor Irrigation Schemes. He reported that four sites have been identified for testing improved DPR Procedure.

There was active discussion and interaction from all the participating departments even while presentation was going on, as suggested by the chair person. The members appreciated the detailed and meticulous report given by JICA Study Team and expressed their hope and belief of the change this study could bring to Mizoram Agriculture.

The Chairperson invited Dr. Yu Sasaki, Lead Development Specialist, JICA India Office to give the overall comments. She expressed her great respect to the State government support for smooth implementation of the study and appreciated discussions made by various departments during JCC meeting.

Comments and advices were invited by the JICA Study team on the Progress Report -1 presented in the meeting, and the same may be submitted to the Minor Irrigation Department by 11th July, 2014.

Mr. S.Yamaoka then presented outline of Capacity Development Training scheduled in August-Sept, 2014 for 12 officers from Minor Irrigation Department, Department of Agriculture, Department of Horticulture and Soil & Water Conservation Department, Government of Mizoram. Schedule for succeeding term is also placed before the meeting and the committee took note of the activities and their schedules which are to be implemented in the 2nd Phase of the Study.

The meeting ended with a note of appreciation for the report from the chair and stresses importance of cooperation amongst participating departments in implementing the Master Plan.

27/6/14

(L.TOCHHONG)
Chief Secretary,
Government of Mizoram
&
27/6/2014 Chairperson,
Joint Coordination Committee (JICA)

MIZORAM AGRICULTURE JICA STUDY TEAM

SHIGEKI YAMAOKA
Team Leader
JICA Study Team

GOVERNMENT OF MIZORAM
OFFICE OF THE CHIEF ENGINEER
MINOR IRRIGATION DEPARTMENT
MIZORAM : AIZAWL

Telefax : 0389 2316638
e-mail: mizorammid@yahoo.in ***Telephone 0389 2325280***

No.B.20013/3/2013-CE(MI)/ Dated Aizawl, the 18th Dec, 2014

To,

All Members,
Joint Coordination Committee (JICA),
Mizoram, Aizawl.

Subject: Minutes of the 3rd Meeting of Joint Coordination Committee (JICA)

Sir,

I have the honour to forward herewith Minutes of the 3rd Meeting of Joint Coordination Committee (JICA) held at the Chief Secretary's Conference Hall on 29th Sept, 2014 at 2:00 p.m.

Yours faithfully,

Enclosed: As above

-sd/-
(LALTHANLIANA)
Project Director, JICA Study &
Chief Engineer,
Minor Irrigation Department

No.B.20013/3/2013-CE (MI)/ Dated Aizawl, the 18th Dec, 2014

Copy to:

1. Sr. PPS to Chief Secretary, Government of Mizoram & Chairperson, Joint Coordination Committee (JICA) for information.
2. P.S to Secretary to the Government of Mizoram, MID & Vice-Chairperson, Joint Coordination Committee (JICA) for information.
3. Addl. Secretary to the Government of Mizoram, MID for information.
4. Chief Representative, JICA India Office for information.
5. Team Leader, JICA Team of Experts, camp: Aizawl for information.
6. The Executive Engineer, CWC, NEID-II, Zemabawk for information.

18/12/2014

(LALTHANLIANA)
Project Director, JICA Study &
Chief Engineer,
Minor Irrigation Department

MINUTE OF THIRD MEETING OF

JOINT COORDINATION COMMITTEE (JICA)

Venue : Chief Secretary's Conference Hall

Time : Dt. 29th September, 2014 (Monday), 2:00 pm.

Members present: List attached

Mrs. L. Tochhong, Chief Secretary, Government of Mizoram and Chairperson, Joint Coordination Committee (JICA), chaired the meeting and welcomed the members present at the outset of the meeting, especially representative of the JICA (India) Office, Mr. Shinya Ejima, Chief Representative, and Mr. Subroto Talukdar, Lead Development Specialist, by giving them mementos.

On invitation from the chair, Er. Lalthanliana, Chief Engineer, MID & Secretary, JCC (JICA) gave Power-point Presentation on 'Capacity Development Training' held in Japan during 25th Aug – 3rd September 2014 which was participated by 13 officials, 6 officials from Minor Irrigation Department, 3 from Department of Agriculture, another 3 from Department of Horticulture and 1 official from Soil & Water Conservation Department, Government of Mizoram. He reported that they have visited several cities/places within five (5) Prefectures from where the trainees acquired invaluable knowledge on:-

1. Japanese present agriculture and history of agriculture development.
2. Japanese present irrigation development and management set up and history of irrigation development.
3. Stakeholders and their roles in agriculture and irrigation development and management.
4. Government present policies and roles in agriculture and irrigation development.
5. Direct marketing system and agro-tourism – concept and benefits of Michi-no-Eki.

He also reported, among other things, lessons learnt in Japan which may be replicated in Mizoram as below:-

A Participatory approach and Stakeholders participation in planning and implementation

1. System of bottom up planning
2. Involvement of farmers community on implementation of Agriculture plan
3. Mutual trust, understanding and good cooperation among the farmers, farmers' union and the government.

4. Empowerment of the WUA in a concrete/systematic manner through formulation and enactment of Land Improvement Bill/Act or Participatory Irrigation Management Bill/Act.

B Convergence Planning

1. The coordination of irrigation, agriculture, municipal council, prefecture government and national government seemed to be very good.
2. Planning of agriculture and allied subject together is very much important so as to have successful agriculture policies.
3. Consulting all the departments involved in agriculture production. Convergence of the departments is the key point in giving the support to farmers.
4. It is learned that to have agricultural revolution, we need to have clear vision/ future goals, so that necessary steps can be taken.

The chair thanked Er. Lalthanliana for a brief and informative presentation and then invited Mr. Shigeki Yamaoka, JICA Study Team leader to have Power-point presentation on 'Interim Report' on 'The Study on Development and Management of Land and Water Resources for Sustainable Agriculture in Mizoram'.

Mr. S. Yamaoka then highlighted the Over-all Schedule and the present position of the Study stating that the Study is progressing as per Over-all Schedule laid out at the 1st JCC meeting. He then reported the comments and advices received from various sources on the 'Progress Report 1' laid out at the 2nd JCC meeting held on 25th June 2015. He reported the seven (7) comments / advises made by Environment & Forest Department, Trade and Commerce Department and JICA India, and the steps taken in light of the comments/ advises. He also reported that projects are now classified into 'Priority A' and Priority 'B'. He clarified the 13 projects, out of 27 projects, classified as 'Priority A', describing the titles, objectives, implementing organizations, related organizations, necessary inputs, schedule and the budget for their implementation. These 'priority A' projects are suggested to be started within 5 years. He also suggested financial sources for the implementation of those projects from normal existing Central Sponsored Schemes.

The chair person then asked the members for comments on the 'Interim Report' with special reference to the funding sources suggested. The meeting is of the opinion that implementation of projects cannot be started during 2015-16 as suggested by the JICA Study Team since final Project Report will be submitted only in March 2015, by which all the Planning for the year 2015-16 should have been approved by the State. It was also mentioned by the Department of Agriculture that RKVY, suggested to be the financial source for implementation of 1-1, 1-2, 1-3 of Approach 1-Institutional Development for Effective Agricultural Development Planning &

Implementation is not assured in the future as Mizoram can avail this scheme only because of implementation of NLUP which brings the budget under Agriculture and Allied Sector over 20% of the Mizoram Annual Budget for 2014-15. Department of Horticulture is also of the opinion that MIDH may not be suitable for implementation of 3-1 of Approach 3-Establishment of Good Value chain for Agriculture Product as the Guideline for its implementation is very rigid.

After deliberations and discussion, the meeting approved the contents of Master Plan but with reservation as to the possibility of funding the 27 projects from the sources laid out in the report. The committee is of opinion that the State has to find a way of financing those projects from any source, which may also involve negotiations with the Central Government.

On invitation from the chair, Er. K.Hamlet, E.E (Works) Minor Irrigation Department gave power-point presentation on the progress of Model DPR preparation. He reported that inventory survey was carried out on 439 M.I. Projects to assess the present conditions and other relevant data. The problems detected are as follows:

1. Season-wise water Sufficiency rate is Kharif=72% , Rabi=14%, Summer =8%. About 30% of schemes need more water even during Kharif season and cultivatable area is very limited during dry season.
2. There is a gap between IPC of DPR and survey result. It is assessed that existing total IPC is about 19,300ha, which is 51% of DPR's IPC (37,730ha).
3. 70% of schemes seems to need rehabilitation (big or small), especially canal and intake facilities. And more than half of the schemes has experienced flood damages (Permanent:16%, Temporary:48%).
4. Only 26 (7%) out of 374WUAs collect water use fees from their members regularly. Most of WUAs are short of financial and technical capacity for sustainable irrigation management.

In order to address these shortcomings and rectify the problems, JICA Study Team has suggested 12 (twelve) steps to follow while formulating DPR, which will be participatory in nature. These steps for preparation of DPR will involve not only MID officials but also officials from Department of Agriculture, Horticulture and other relevant departments in addition to the beneficiaries. To test the proposed DPR preparation steps, JICA has proposed 4 (four) Model DPR sites, namely, Dumlui M.I. Project in Kolasib district, Laului M.I. Project in Aizawl district, Kanghlai M.I. Project in Champhai district and Ngengrual M.I. Project in Lunglei district.

It was also reported in the meeting that 3 days training has been organized from 17-19th September, 2014 regarding preparation of Model DPR which was attended by 61 government officials from Minor Irrigation Department,

Agriculture Department, Horticulture Department, Soil & Water Conservation Department and Fisheries Department. 3 days workshop will also be conducted at each of the four selected sites, which will involve walk through survey, making of agriculture plan etc. by beneficiaries.

Ms. L. Tochhong then invited Mr.Shinya Ejima, Chief Representative, JICA (INDIA) Office, to give comments on the reports presented in the meeting, as well as on any other matter. Mr. S. Ejima informed the meeting that in pursuance of the discussion between Mr. Narendra Modi, Prime Minister of India and Mr. Shinzo Abe, the Prime Minister of Japan, during visit of Japan by the former between 30th August to 3rd September 2014, priority is given by JICA for development of North Eastern States of India. He informed the meeting that Preliminary Study Team will be coming to Mizoram within a month or two to pave way for implementation of Technical Cooperation Project. He also informed the meeting that there is a possibility of sending volunteers in the field of agriculture, health care, language and Judo.

The chairperson, Ms. L. Tochhong thanked all the members for their active participation and informed them that she would not be able to chair the next JCC (JICA) meeting as she is going to retire on superannuation soon and wished all the members for successful implementation of the 'Master Plan'. She then winded up and closed the meeting at 4:10 pm.

17/2/2014

(LALTHANLIANA)
Chief Engineer, MID
& Secretary,
Joint Coordination Committee (JICA)

SHIGEKI YAMAOKA
Team Leader
JICA Study Team,
Mizoram; Aizawl

MIZORAM AGRICULTURE JICA STUDY TEAM

L. Tochhong 14/10/14

(L. TOCHHONG)
Chief Secretary,
Government of Mizoram
& Chairperson,
Joint Coordination Committee (JICA),
Mizoram; Aizawl

MINUTES OF FOURTH MEETING OF JOINT COORDINATION COMMITTEE (JICA)

Venue : Chief Secretary's Conference Hall
Time : Dt. 09th February, 2015 (Monday), 3:00 pm.
Members present: List attached

Mr. Lal Malsawma, IAS Chief Secretary, Government of Mizoram and Chairman of the Joint Coordination Committee (JICA) chaired the meeting; at the outset of the meeting, he welcomed the members present especially Mr. Akihiro Kimura, JICA representative from JICA (India) Office, New Delhi and members of JICA Study Team, and thanked all the members for making it convenient to attend the meeting.

On invitation from the chair, Mr. Shigeki Yamaoka, Leader, JICA Study Team gave PowerPoint presentation on 'Progress Report 2' covering;

i. DPR Preparation Guidelines for MI Schemes and typical schemes for four sites, one in each of the four Divisions under MID,
ii. Schedule for submission of draft Final Report, and
iii. Technical Cooperation Project proposal.

Using PowerPoint Presentation, Mr. Yamaoka explained the overall procedure of DPR Preparation Guidelines step by step. During the presentation, the following members of JICA Study Team also assisted Mr. Yamaoka in the fields of their specializations – Mr. Takuya Saisyo, Agronomist and Mr. Tatsuhiko Hiraiwa, Facility Design & Construction Planning.

Mr. Yamaoka highlighted the overall progress of project implementation schedule, and stated that draft Final Reports will be submitted in March 2015. The draft Final Report will contain Master Plan, DPR Preparation Guidelines and typical schemes for four sites and the Final Report will be ready and submitted before end of April 2015.

The Master Plan proposes three stages of Approach, viz.

1. Institutional Development for Effective Agriculture Development Planning and Implementation
   (1-1) Stakeholders Capacity Development and Convergence Planning
   (1-2) Enhancement of Basic Agriculture Supporting Services
2. Enhancement of Sustainable Agriculture Production through Proper Resources Utilization and Management
   (2-1) Enhancement of Fundamental Infrastructure
   (2-2) Enhancement of Resources Managed Farm Management System

3. Enhancement of Good Value Chain for Agriculture Product
   (3-1) Enhancement of Agro-industrialization
   (3-2) Improvement of Present Rigid Supply Chain
   (3-3) Enhancement of Market Oriented Farming Technologies and Supporting System.

He further stated that proposed TCP would focus on the Project No.1-3 'Capacity Strengthening Government Officers of Planning and Good Agriculture Extension" and Project No. 2-1 "Preparation of Regional Agriculture Development Plan" and the financial assistance requested by previous JCC would focus on projects under "Enhancement of Resources Managed Farm Management System" and projects under "Enhancement of Fundamental Infrastructure" in Approach 2. He also said that the discussion on preparation of DPR should start soon.

The chairman thanked Mr. Yamaoka for the presentation on implementation of the Development Study which lays stress on beneficiary participation and sense of ownership. He went on to mention that Mizoram Government is having scheme on promotion of farm mechanization in which certain group of farmers or Self Help Group may avail subsidies to procure tractors & equipments which is intended to induce sense of ownership make optimum use of the machineries and suggested that such scheme be incorporated in the TCP.

On invitation from the chair, Dr. C.Lalzarliana, Director of Agriculture (Crop Husbandry) stated that his department has had many discussions and interactions with JICA Study Team including Capacity Development Training in Japan and appreciated the reports prepared and submitted by the Team. He accepted that the project or Master Plan, if implemented as per plan, will encourage the farmers and he expected that they will cooperate with enthusiasm.

Mr. Akihiro Kimura, JICA Representative from JICA (India) Office, New Delhi stated that TCP proposal submitted by MID is under consideration by the Japanese Government and most probably the proposal will be approved soon and the TCP may be started. Based on the Master Plan, DPR may be prepared and pilot model can be created under TCP which will also include construction works. He further stated that the TCP maybe expanded in other areas also.

In response to the interaction of Ms. L.N.Tochhawng, Finance Commission, Mr. Kimura gave clarifications on the main procedure of project financing under JICA. He explained that the process is long, generally JICA needs at least two years, sometimes even four years for incorporation of new proposal in the list of projects to be financed, hence Mizoram Government may do well to prepare and submit Yen Loan Project Proposal early.

Mr. Kimura requested JCC members for suggestions or ideas in the contents of the Master Plan, achievement of Phase-2 work and TCP Proposal. The response from the JCC members was that the proposed contents of the Master Plan were essential and it should be implemented in the State. Mr. Kimura also enquired whether the State Government should implement the Master Plan with CSS and what can be done without the support of JICA or external resource. Mr. Lalthanliana, Chief Engineer, MID stated that implementation of the 27 projects contained in the Master Plan with only CSS will be very difficult since all the CSS have their own mandates with rigid operational guidelines and norms, whereas the proposed 27 projects are essential and should be implemented in the State. He further stated that they have had some practical experience in convergence planning during preparation of four DPRs for Minor Irrigation Scheme under Phase-2 of the present Study, and that they expect to learn more during the proposed TCP.

Mr. R Zotawna, Director, Department of Horticulture gave brief outlines on activities of his department and stated that the four model sites selected for preparation of DPR for Minor Irrigation Scheme will be included in the list of proposals in the Department's Annual Action Plan 2015-16. He further stated that the department will try its best to incorporate recommendations and principles of the Master Plan as much as possible in their Annual Action Plan.

After due deliberation, the Joint Coordination Committee (JICA) accepted the Progress Report-3 and the Schedule for submission of Draft Final Report in March, 2015.

The chairman stressed importance of coordination among all departments and there should be free flow of information amongst development departments, so that there is no overlapping of schemes and projects.

He thanked all the members for their active participation and then winded up the meeting.

27/02/2015

(LALTHANLIANA)
Chief Engineer, MID
& Member Secretary,
Joint Coordination Committee (JICA)

(SHIGEKI YAMAOKA)
Team Leader
JICA Study Team,
Mizoram; Aizawl

27/2

(LAL MALSAWMA)
Chief Secretary,
Government of Mizoram
& Chairman,
Joint Coordination Committee (JICA),
Mizoram; Aizawl

(79)

MINUTES OF FIFTH MEETING OF JOINT COORDINATION COMMITTEE (JICA)

Venue : Chief Secretary's Conference Room
Time : Dt. 01st April, 2015 (Wednesday), 2:00 pm.
Members present : List attached

Mr. Lal Malsawma, IAS Chief Secretary, Government of Mizoram and Chairman of the Joint Coordination Committee (JICA) chaired the meeting. At the outset of the meeting, he welcomed the members present especially Mr. Subroto Talukdar, Lead Development Officer, JICA (India) Office, New Delhi and members of the JICA Study Team and highlighted the main agenda for the meeting.

On invitation from the chair, Mr. Shigeki Yamaoka, Leader, JICA Study Team gave a PowerPoint presentation covering the following topics:

i. Overview of Development Study
ii. Master Plan for Development and Management of Land and Water Resources for Sustainable Agriculture
iii. DPR Preparation Guidelines for Minor Irrigation Schemes
iv. Conclusion and Recommendation
v. Possible Technical Cooperation Project

Mr. Yamaoka gave a presentation on the Overview of Development Study conducted by JICA Study Team which was started with Phase-I from October, 2013 to August, 2014 and Phase-II from September, 2014 to March, 2015. He highlighted the overall schedule on the Development Study and stated that the final reports will be submitted by end of April, 2015. He went on to explain the Master Plan and the DPR Preparation Guidelines for Minor Irrigation Schemes in detail. During the presentation, he was assisted by other members of JICA Study Team - on the topics of 'Principal Direction of Production and Productivity Improvement' and 'Zoning and Development Direction' by Mr. Takuya Saisho, Agronomist and Mr. Takahisa Amano, Land Utilization Planning/GIS respectively. He explained about the different state level challenges and role of Agriculture sector in the State economy.

The basic concept of Master plan is to improve the viability of the state economy and improve food security of the state by achieving a sustainable, strong and attractive agriculture in Mizoram. In order to achieve the goals, target yield for production and productivity of major crops are given which will be achieved after 20 years. He stated that Mizoram is divided into seven zones and that the zoning was done with Principal Components Analysis based on 24 sets of data like Land-use, Geographical data, etc. He further stated that recommended development direction is prepared for each zone and explained that the Master Plan proposes 27 development projects to be implemented in three stages - Stage 1:- Development Foundation, Stage 2 :- Enhance Skill & Technology and Stage 3 :- Create Added Value.

Mr. Yamaoka then explained the overall procedure of DPR Preparation Guidelines step by step. He pointed out the recommendation for utilization and implementation of the Master Plan and the DPR Preparation Guidelines. The Study Team recommends utilization of the Master Plan as a 'Road Map' for agriculture planning as well as tailoring the activities of CSS and collect data and update for market price, basic information of the farmland, farm management practice for preparation of better agriculture action plan.

The Chairman thanked Mr. Yamaoka for giving an excellent presentation and invites the members for comments. After hearing comments and reactions from the members, the Committee suggested that the time-line set for implementation of the Master Plan should include targets to be achieved after say one or five years so that there will be chance for review and evaluation of progress during the period of implementation. The Committee further suggested that suggestions if any may be submitted in writing to JICA Study Team through Project Director, JICA Study.

After due deliberation, the Joint Coordination Committee (JICA) approved the Draft Final Report of 'Study on Development and Management of Land and Water Resources for Sustainable Agriculture in Mizoram in Republic of India'

The Chairman invited Mr. Yamaoka to give presentation on the possible Technical Cooperation Project. Mr. Yamaoka stated that the proposed TCP titled 'Capacity Development of Planning and Implementation of Agriculture and Irrigation Development' will be implemented within a time frame of four years. The project mainly targets approach 1-3 of the Master Plan – Capacity Strengthening of Government Officers for Planning and Good Agriculture Extension.

The Chairman invited Mr. Subroto Talukdar, Lead Development Officer, JICA India Office to give remarks. Mr. Talukdar thanked all members of the JCC (JICA) for their participation and supports and thanked the JICA Study Team for giving holistic reports and presentation. He highlighted the different activities of JICA and opportunities for investment. He also stated that capacity development under TCP is important in order to utilize funds and it should be complimenting with other development schemes and stated that JICA officials will be coming to Mizoram in the month of June, 2015 for necessary data collection and discussion for initiation of the TCP.

On invitation from the chair, Mr. Lalthanliana, Chief Engineer, Minor Irrigation Department & Project Director, JICA Study expressed his heartfelt gratitude on achieving the final stage of the study and last and final meeting of the JCC (JICA). He thanked the JICA Study Team for their tremendous efforts and hard works to complete the Study in time. He also thanked all the participating departments for their full hearted supports and cooperation. He wished and hoped that Mizoram will be able to start a new chapter in overall development through implementation of the Master Plan. He requested all the participating departments for their supports and cooperation for the forthcoming possible TCP.

The chairman once again compliments the JICA Study Team and thanked all the members for their participation and then winded up the meeting.

(LALTHANLIANA)
Chief Engineer, MID
& Member Secretary,
Joint Coordination Committee (JICA)

(SHIGEKI YAMAOKA)
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JICA Study Team,
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MIZORAM AGRICULTURE JICA STUDY TEAM

(LAL MALSAWMA)
Chief Secretary,
Government of Mizoram
& Chairman,
Joint Coordination Committee (JICA),
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