REPUBLIC OF INDIA
STATE OF MIZORAM, MINOR IRRIGATION DEPARTMENT

THE STUDY
ON
DEVELOPMENT AND MANAGEMENT OF LAND AND WATER RESOURCES FOR SUSTAINABLE AGRICULTURE IN MIZORAM
IN
THE REPUBLIC OF INDIA

FINAL REPORT

SUMMARY

MAY 2015

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

NIPPON KOEI CO., LTD.

KRI INTERNATIONAL CORP.

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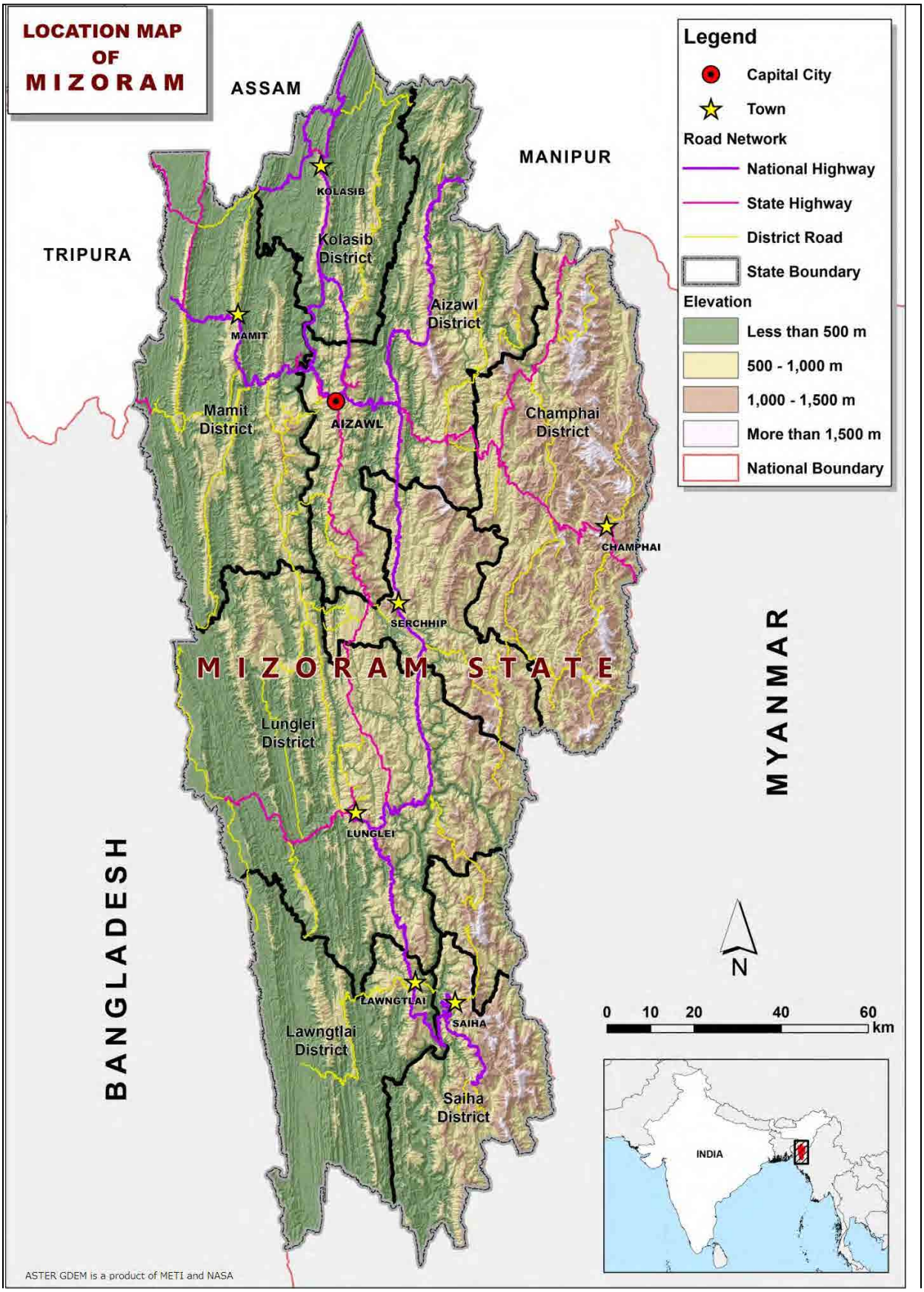
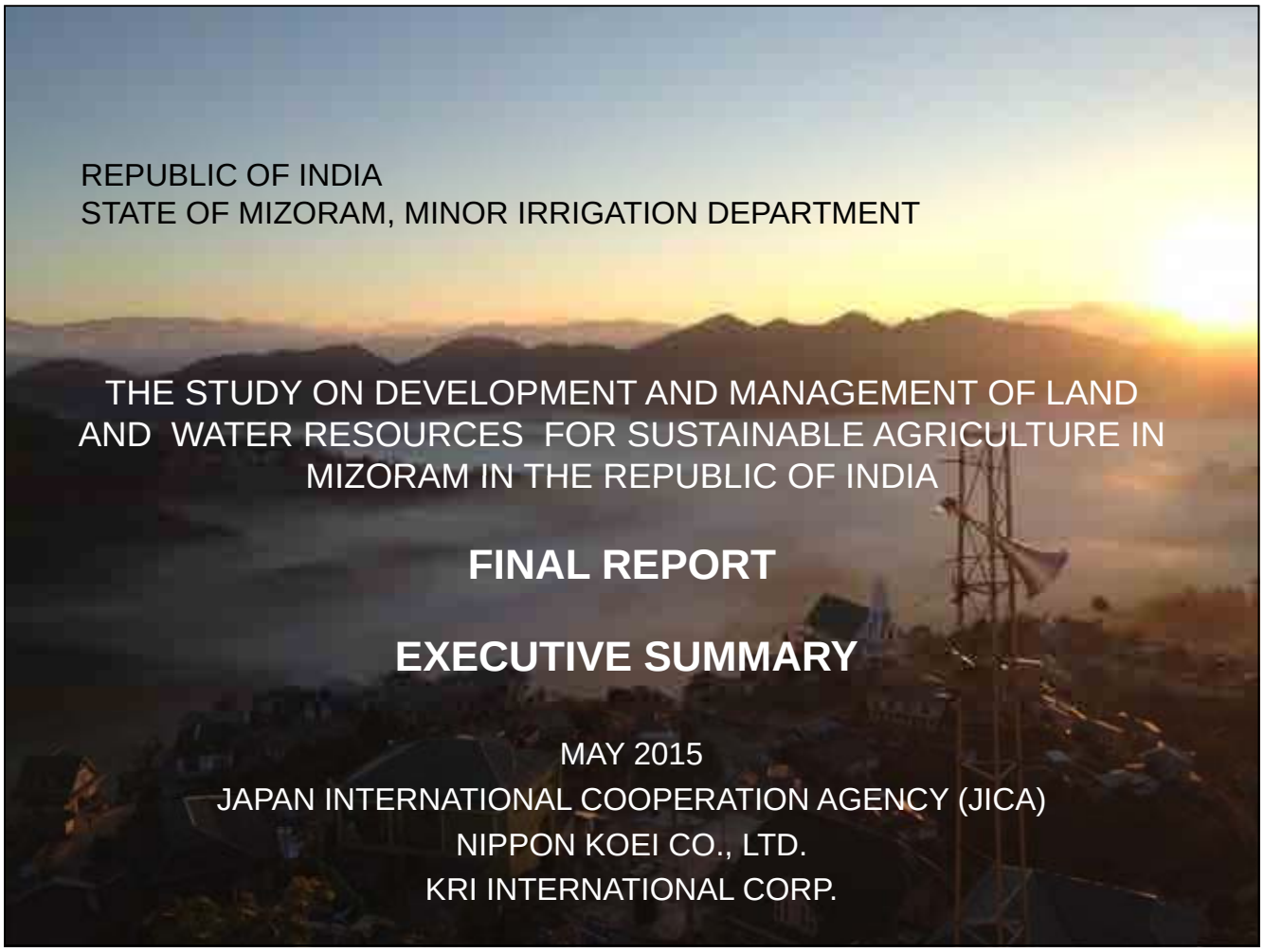


Source : JICA Study Team

Location map of Mizoram



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INTRODUCTION

Objectives of the Study

- Formulation of a master plan for land and water resource development and management for sustainable agriculture
- Improvement of planning process of minor irrigation project (In terms of corroboration with related government agencies and beneficiaries)

Goals

- The State Government of Mizoram adopts the master plan as its official policy
- Minor irrigation schemes bring the expected outputs from its potential

Implementation Setting Up

- Counterpart Team >> MID (Nodal Department, Project Director/CE), DOA, DOH, SWCD, DOF, DOEF, DOS, AHVD, RDD, CWC, ID, TCD
- Joint Coordination Committee >> Chaired by Chief Secretary

Input

- Japanese Government >> Dispatching Experts, necessary direct cost, training expenditure in Japan
- Mizoram Government >> Nominate counterpart, office space and furniture

Time Schedule

- Phase-1 : October 2013 to August 2014
  (Preparation of Master Plan + Capacity Development Training in Japan)
- Phase-2 : September 2014 to March 2015
  (Improvement of DPR preparation procedure for Minor Irrigation Scheme)

SOCIOECONOMIC CONDITIONS OF MIZORAM STATE AND DEVELOPMENT PLANS

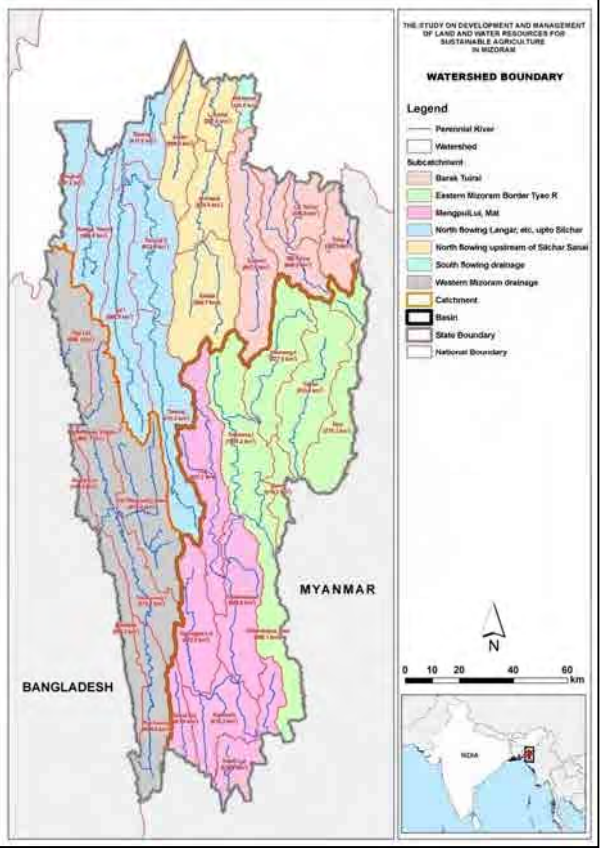
GEOGRAPHICAL AND NATURAL CONDITION

- *Mizoram is located in the east end of Indian territory, lying between Latitude 21° 58' and 24° 35' North and Longitude 92° 15' and 93° 29' East, and sandwiched between Myanmar in the east and south and Bangladesh in the west with about 722 km long borders.*
- *A land-locked state having an area of 21,087 km^2, topographically characterised as the steep hill ranging from 100 m to 2,210 m above mean sea level*
- *Separated by 6 major rivers which flow either northward, southward, or westward creating deep gorges*
- *Climate is relatively mild with temperature not exceeding 30° C on an average. It rains heavily from May to September with more than 2,600 mm of annual rainfall.*

- *Present land use*

Classification	Area (km^2)	Ratio (%)
City, urban, village and infrastructure	*143*	*0.6*
Forest	*16,586*	*78.7*
Agriculture	*252*	*1.2*
- Wet Rice Cultivation (WRC)	*(122)*	
- Upland crops	*(43)*	
- Agroforest and plantation	*(87)*	
Jhum	*3,960*	*18.8*
Water body, etc.	*146*	*0.7*
Total	*21,087*	*100.0*

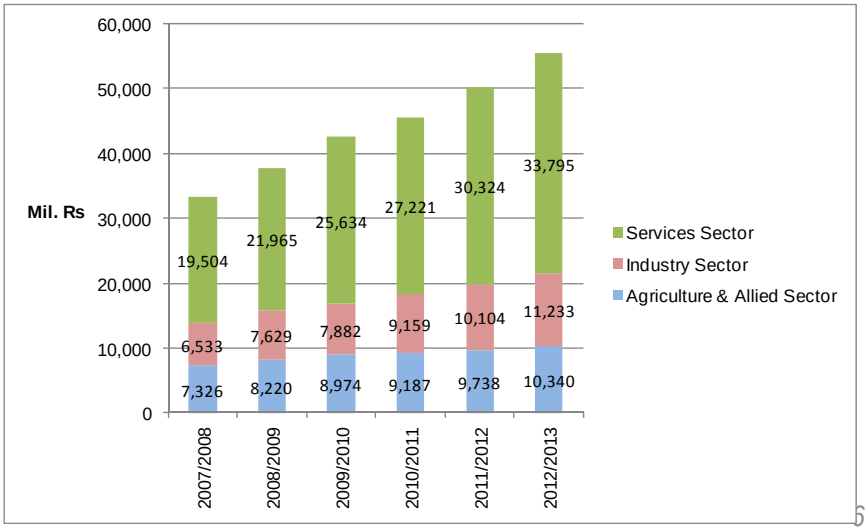
Source : JICA Study Team



SOCIO ECONOMIC CONDITION

- *GSDP of Mizoram has been continuously increasing over the years. While around 60% of GSDP is derived from the services sector, around 20% each came from the agriculture and allied sector, and the industry sector*
- *The population of Mizoram was reported to be 1,091,014 with density of 52 persons per km2 (Census 2011), its growth rate from 2001 to 2011 was 22.78%, equivalent to 2.07% per annum.*
- *Nearly all (94.4%) were categorized as Scheduled Tribes and the majority (87.0%) of the population is Christian*
- *The literacy rates of males and females are 93.72% and 89.4%, respectively.*

- *Per capita income of Mizoram is INR 61,732 for 2012/2013, while that of the national level is INR 66,747 (both are current).*
- *The poverty ratio of Mizoram was 20.4%, which is lower than India's average of 21.92% and is ranked 23rd of the lowest (2011/12)*

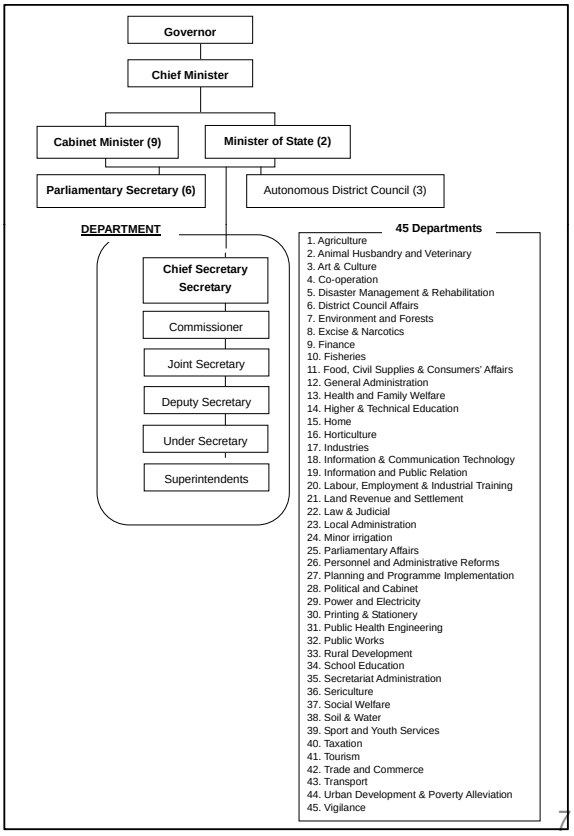


STATE ADMINISTRATION

- *The state is divided into eight administrative districts. Each district is headed by a deputy commissioner / district collector / district majesty that has the authority of district-level administration and judiciary. 23 sub divisions, 26 rural development blocks and 757 villages are exist in 2011/12*
- *There are three Autonomous District Councils (ADCs), viz. Mara, Lai, and Chakma, under the Sixth Schedule to the Constitution of India. MADC (Mara), is located in the entire of Saiha District, while LADC (Lai) and CADC (Chakma) are in Lawngtlai District.*

Name of District	No. of Sub-Divisions	No. of RDBs	No. of Villages
Mamit	3	3	85
Kolasib	3	2	45
Aizawl	3	5	91
Champhai	3	4	105
Serchhip	3	2	44
Lunglei	3	4	138
Lawngtlai	3	4	156
Saiha	2	2	93
Total	23	26	757

Source: General Administration Department, Government of Mizoram, Administrative Atlas Mizoram ,Census of India 2011.



STATE FINANCE

- *The fiscal soundness of the state has been gradually improving, owing to both improvement of tax awareness and better grants-in-aid from the central government.*
- *However grants-in-aid from the central government have accounted for as high as 75% of the total revenue received, while tax revenue has accounted for around 20% only.*
- *Tax-GSDP ratio of Mizoram has remained as low as 1.5, being far lower level than the average of all states at 8.0.*

Overall Fiscal Position of Mizoram (Million INR)

		2008-09	2009-10	2010-11	2011-12	2012-13*
I	Opening Balance	-765.93	-851.03	-1,308.65	5,330.48	10,941.19
II	Revenue Account					
1	Receipt	26,531.30	29,635.05	33,747.11	40,118.12	52,596.85
1)	Tax Revenue	4,780.06	5,021.10	7,208.56	10,064.50	9,947.15
2)	Non-Tax Revenue	1,586.73	1,265.02	1,467.08	1,680.35	2,067.52
3)	Grant-in-aid from GOI and Contribution	20,164.51	23,348.93	25,071.47	28,373.27	40,582.18
2	Expenditure	23,137.96	27,027.03	32,550.33	37,238.56	46,730.34
1)	General Services	8,037.50	9,477.56	10,108.22	12,200.48	14,106.78
2)	Social Services	8,981.83	11,056.84	12,373.48	13,459.18	17,176.06
3)	Economic Services	6,118.64	6,493.49	10,076.79	11,578.90	15,557.50
3	Surplus or Deficit	3,393.34	2,608.02	1,196.78	2,879.55	5,866.50
III	Capital Account					
1	Receipt	1,306.30	2,512.07	5,394.97	4,935.49	4,268.94
1)	Internal debt of State Govt.	995.81	1,937.19	5,102.82	4,434.67	3,907.00
2)	Loans and Advances from GOI	61.87	321.69	32.49	222.80	94.40
3)	Loans and Advances (Recoveries)	248.62	253.18	259.67	278.02	265.54
2	Expenditure	5,547.43	9,630.74	9,024.13	8,146.02	14,328.21
3	Surplus or Deficit	-4,241.13	-7,118.68	-3,629.16	-3,210.53	-10,059.27
IV	Public Account (Net)	762.69	4,053.03	9,071.51	5,941.69	1,788.43
V	Overall Surplus or Deficit	-85.10	-457.62	6,639.13	5,610.71	-2,404.34
VI	Closing Balance	-851.03	-1,308.65	5,330.48	10,941.19	8,536.85

Source: Figures of 2008-09 and 2009-10 are from Statistical Abstract of Mizoram: 2011, and those of 2010-11, 2011-12 and 2012-13are from Annual Financial Statements, website of Finance Department, Government of Mizoram.

STATE 12TH 5 YEARS PLAN

- *Mizoram's vision and strategy : 12th 5 years plan is to achieve growth with equity based on enhanced livelihood options through agricultural and rural development, better resource management, and development of human resources including relevant skills upgrading.*
- *Components of the Development Strategy : (i) empowerment of people; (ii) creation of development opportunities; (iii) development of sectors with comparative advantages; (iv) strengthening infrastructure and connectivity; and (v) capacity development.*

Proposed Outlay for 12th 5 years Plan

Sector		Actual Allocation for the 11th Plan		Initially Proposed Outlay for the 12th Plan		Revised Proposed Outlay for the 12th Plan*		Approved Outlay for the 2012/13 Annual Plan	
		INR crore	%	INR crore	%	INR crore	%	INR crore	%
I	Agriculture and Allied Activities	954.0	15.1	1,823.6	11.9	1,447.0	11.9	504.9	22.0
II	Rural Development	229.8	3.6	610.3	4.0	483.0	4.0	49.3	2.1
III	Special Area Programme	325.0	5.2	488.4	3.2	387.9	3.2	94.2	4.1
IV	Irrigation and Flood Control	261.8	4.2	750.1	4.9	594.6	4.9	115.4	5.0
V	Energy	382.7	6.1	1,066.7	7.0	846.3	7.0	97.1	4.2
VI	Industry and Minerals	130.7	2.1	230.0	1.5	183.6	1.5	93.9	4.1
VII	Transport	536.3	8.5	2,119.8	13.8	1,630.7	13.4	338.8	14.7
VIII	Science, Technology and Environment	36.5	0.6	24.4	0.2	70.5	0.6	1.3	0.1
IX	General Economic Services	495.2	7.9	2,077.1	13.6	1,647.7	13.6	181.5	7.9
X	Social Services	2,318.9	36.8	5,642.0	36.8	4,476.1	36.8	715.8	31.1
1	Education	685.7	10.9	1,946.0	12.7	1,543.1	12.7	325.2	14.1
2	Medical and Public Health	495.2	7.9	854.0	5.6	677.3	5.6	85.4	3.7
3	Water Supply and Sanitation	318.6	5.1	1,311.2	8.6	1,039.7	8.6	84.3	3.7
4	Housing	118.4	1.9	292.5	1.9	232.3	1.9	43.1	1.9
5	Urban Development	459.1	7.3	656.0	4.3	521.7	4.3	148.4	6.5
6	Other Social Services	242.0	3.8	582.3	3.8	462.1	3.8	29.5	1.3
XI	General Services	629.1	10.0	494.5	3.2	391.6	3.2	107.9	4.7
	TOTAL	6,300.0	100.0	15,326.8	100.0	12,160.0	100.0	2,300.0	100.0

AGRICULTURE AND RURAL SETTING

AGRICULTURE PRODUCTION (1/3)

- *Present Agricultural Policy of Mizoram : A clearly defined agricultural policy is not found in the statements of the Government of Mizoram. DOA (R&E) prepared a long-term vision, namely, Vision 2020 Krishi Vigyan Kendras (KVKs), in July 2011, however, specific approaches and measures are completely lacking in Vision 2020 KVKs.*
- *Organisation of Agro-allied Departments : There are eight agro-allied departments in Mizoram: i) Department of Agriculture (Crop Husbandry), ii) Department of Horticulture, iii) Department of Soil and Water Conservation, iv) Department of Agriculture (Research and Education), v) Department of Fishery, vi) Department of Animal Husbandry and Veterinary, vii) Department of Irrigation, and viii) Department of Sericulture.*
- *Paddy Production : Paddy farming is practised in two types, i.e., Jhum cultivation in sloping lands and WRC in terraces. The total paddy production from both types of farming was around 67,000 t in 2010/11. During the three-year period from 2003-04 to 2005-06, the total annual production of paddy remained above 100,000 t. However, in 2006-07 and 2007-08, paddy production suddenly dropped due to the Mautam incident. The self sufficiency rate of paddy was as low as 27 % in 2010/11.*

Cultivation Area, Production, and Productivity of Paddy (2003/04–2012/13)

Item	Unit	2003/04	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11
Jhum									
Cultivation Area	(ha)	43,447	40,969	40,100	41,459	44,947	40,792	36,841	28,562
Production	(ton)	72,181	64,420	63,100	13,935	11,355	44,489	43,985	37,854
Productivity	(t/ha)	1.7	1.6	1.6	0.3	0.3	1.1	1.2	1.3
WRC									
Cultivation Area	(ha)	15,749	16,116	16,360	11,386	9,594	11,198	10,363	12,130
Production	(ton)	42,449	43,240	44,640	15,806	4,333	24,428	22,147	29,575
Productivity	(t/ha)	2.7	2.7	2.7	1.4	0.5	2.2	2.1	2.4
Total									
Cultivation Area	(ha)	59,196	57,085	56,460	52,845	54,541	51,990	47,204	40,692
Production	(ton)	114,630	107,660	107,740	29,741	15,688	68,917	66,132	67,429
Productivity	(t/ha)	1.9	1.9	1.9	0.6	0.3	1.3	1.4	1.7
Self sufficiency rate	(%)	53	49	48	18	7	29	27	27

Source: DOA

AGRICULTURE PRODUCTION (2/3)

- *Maize and Pulse Production : The production of maize in 2012-13 decreased to 40%, due to the decrease of cultivation area and Productivity to 59% and 68%, respectively, comparing to the figure in 2003/04. The total production of pulses has been increasing since 2003/04 except Mautam period. The major pulses growing in Mizoram: cowpeas, french beans, mung beans, field peas, rice beans etc. Landrace varieties are prevailing, and seed replacing ratio is low. Growing pulses mostly without chemical fertilizers etc. Among oilseed crops, mustard, rapeseed, and sesame are the predominant ones and are widely cultivated in Jhum and upland fields. Several varieties of sesame are mixed with other crops in Jhum land by traditional method.*
- *Horticulture Crop Production : Cultivation area of horticulture crops (2012-2013): i) Fruits - 49,684ha (45% of the total), ii) Vegetable 37,738ha (34%), iii) Spices 22,532ha (20%), iv) Medicinal/aromatic plants and flowers 1,187ha (1%). Most of the seeds are saved by farmers. In Jhum, various vegetables and spices are mixed with paddy. Most of the vegetables are consumed at home. Meanwhile, chilli and ginger are cultivated for selling because they are highly profitable crops in Mizoram. Greenhouses and dairy cows are being introduced / promoted by DOH to increase the agricultural production. Only a few farmers have procured subsidised mini-power tillers for land preparation in terraced fields.*
  - *Fruits : Cultivation area of fruits: Banana occupies the largest area, 21%, followed by as mandarin orange, lime/lemon, pineapple, grape, hatkora, sweet orange, papaya and mango. The sum of cultivation area of mandarin orange, lime/lemon, hatkora, and sweet orange occupies about 40% of the total; Mizoram is rich in citrus products.*
  - *Vegetables : Cultivation area of vegetables: Local vegetables 30% of the total, followed by chayote (12%), bitter gourd (10%), okra (8%), cabbage (8%), cowpea (7%), beans (7%), Brinjal (6%), tomato (2%), and broccoli (2%). Amongst the 8 districts, Aizawl District has a large area. The northern part of Aizawl, southern part of Kolasib, and northern part of Saiha also have a large cultivation area of vegetables. The surrounding Aizawl City, has the largest area for squash production and tomato etc. because of big demand.*
  - *Spices : Cultivation area for spices: chilli 40% of the total, followed by ginger (32%), turmeric (27%). Ginger is monocropped in some jhum fields from the first year and beyond; however, appropriate measures for land conservation are not practised, and soil losses at the harvesting time have become a major issue*

AGRICULTURE PRODUCTION (3/3)

- *Flowers Production : Several exotic flowers have been imported and introduced by DOH since 2000. Anthurium and roses are being exported in the form of cut flowers to other states in India. This positively led ZOPAR Exports Private Ltd., which is based in Bangalore, to expand their business in Mizoram. ZOPAR has been producing cut flowers from their own greenhouses, and has contracted flower growers to increase production of cut flowers. Anthurium growers have formed a society named Zo Anthurium Growers' Society, which operates smoothly to take care of marketing of all cut flowers they produce. DOH provides Shade net, green house and seedling.*

Major Varieties of Flowers in Mizoram

Flower	Varieties
Anthurium	Tropical, Fire, Yang
Rose	Gold Strike, Peach, Avalanche, Corvette, Bonear, Taj Mahal, Avalanche, Bordeaux
Mokara Orchid	Nora Blue 'Pink', Dinah Shore, Om Yai, Thailand Sunspot, Nora Blue 'Purple'
Gerbera	Stanza, Brilliance, Pre-Intenzz, Jaffana, Walhalla, Balance, Paradisco

Source: Department of Horticulture, Government of Mizoram

Grading of Anthurium

Packaging of cut flowers

- *Industrial and Other Crops Production :*
  - *Oil palm is still a new crop for farmers in Mizoram. A variety of tenera is the ruling hybrid variety, and planting it during the monsoon season (June-December). Oil palm is a long juvenile period of three years.*
  - *Rubber: The varieties of RRIM 600 and RRII 105 recommended by the Rubber Board of India for Mizoram under the NLUP. It grows well at elevation below 450 m above sea level, in such low-lying areas mostly in Kolasib, Mamit, Lunglei and Lawngtlai districts.*
  - *Coffee: Mizoram State is at high elevation, the Coffee Board of India recommended Arabica coffee of Sln 12 (Cauvery) variety is being produced since the past few years.*
  - *Broom: This belongs to the grass family and grows anywhere in the state as natural vegetation. Due to its tuff root system, broom plants act as good soil conservation measure for topsoil.*

MINOR IRRIGATION DEVELOPMENT

- *The minor irrigation schemes service water to two types of agriculture, i.e., WRC, and upland and horticulture crops. The prevailing crops irrigated are water rice in relatively flat land, and irrigation schemes for upland and horticulture crops on sloping land are nominal.*
- *Almost all of irrigation systems are of run-off-the-river diversion type with gravity distribution, whilst pump irrigation directly from the water sources is limited to as few as only three out of the present 439 schemes in Mizoram.*
- *Most schemes rely on small streams as water sources. Running water in these rivers becomes scarce during the Rabi and summer periods; therefore, there is virtually no irrigated agriculture practised in Mizoram, except for schemes having water storage facilities.*

- *Management and Operation and Maintenance (O&M) of Irrigation Facilities : Irrigation facilities are handed over from MID to water user associations (WUAs) after the completion of construction works. Management and O&M of irrigation systems, including collection of water user's fees, use of the collected fees, etc. will be vested in the WUAs along with ownership of the assets*

- *Present Condition of Irrigation Scheme :*
  - *WUAs do not have basic information: e.g. scale of facilities, CCA, catchment area, and quantity of intake water.*
  - *There is a gap between the CCA in the DPR: only 31% of CCA schemes are more than the DPR plan, and the average CCA ratio (survey result/DPR) is 77%.*
  - *The average cultivated area in the dry season is about 2.6 ha, which is 6% of 18,228 ha*

District	No. of Schemes	CCA (ha)
Mamit	41	1,639
Kolasib	78	3,745
Aizawl	63	2,379
Champhai	88	3,806
Serchhip	51	2,528
Lunglei	60	2,129
Lawngtlai	33	1,387
Saiha	25	615
Total	439	19,775

Source: Minor Irrigation Department

AGRICULTURE SUPPORTING SERVICES

- *Mainly, DOA (CH and R&E), DOA, SWCD are the allied sectors providing agriculture concerned services.*
- *Both Crop Husbandry (CH) and Research & Education (R&E) of DOA are undertaking agricultural extension and advisory services. Extension activities and other support services are being implemented with the ATMA system in collaboration with KVKs. DOH operates a nurseries and horticulture centre where quality planting materials are being produced. SWCD is responsible for introducing rubber and coffee as new industrial crops, and for prevention of soil and water conservation through ranger and etc.*

Outline of Agricultural Support Services Provided by Agro-allied Departments

Description	DOA (CH)	DOA (R&E)	DOH	SWCD
General Roles in Agricultural Support Services	Provide technical know-how Supply inputs and services	Transfer improved agricultural technology	Disseminate new technologies in horticulture farming	Promote proper land use through soil and water conservation
Research and Education	Entrust DOA (R&E)	Undertake research works and on-farm trial on food and horticulture crops, livestock, livelihood improvement at KVKs	No research activities Collaborate with ICAR and KVKs, however virtually no progress so far	Entrust research works on coffee and rubber to the Coffee Board and the Rubber Board, respectively
Extension of Technology	Undertake training and field demonstration Manage ATMA deployed in eight districts	Undertake training at the Integrated Training Centre Demonstrate outcomes from on-farm trial at KVKs Train and educate farmers at KVKs	No specific schemes for extension services Provide farmers with technical guidance by horticulture officers at circle offices	No specific schemes for extension services Distribute nursery stocks of coffee and rubber, subject to technical guidance by the Coffee Board and Rubber Board, respectively
Seed Multiplication	Produce certified seeds including sugarcane	Produce certified and improved seeds at experiment farm and KVKs	Produce nursery stock for fruits Try tissue culture of banana (no function yet)	Produce nursery stocks for rubber and coffee
Provision of Agro-machinery	Provide farmers with subsidy for buying tractor, ploughing machine, etc.	NA	Provide farmers with subsidy for buying mini-ploughing machine	NA
Market Information	NA	NA	Facilitate market infrastructure by CSS fund, but no market information	NA
Agricultural Credit	Provide subsidy, but no credit	NA	Provide subsidy, but no credit	NA
Cooperative (Farmers' Organisation)	No function to support farmers' organisation, but provide various schemes through farmers' organisation	No function to support farmers' organisation, but provide various schemes through farmers' organisation	No function to support farmers' organisation, but provide various schemes through farmers' organisation	No function to support farmers' organisation, but provide various schemes through farmers' organisation

POST-HARVEST PROCESSING AND AGRO-PROCESSING

- *The post-harvest processing carried out by farmers are very outdated and conventional in general and seems low motive for farm mechanization including post-harvest processing among farmers. Manual practice for harvesting, threshing and drying is popular even for paddy and same for other products as they are packed in bags or baskets without any processing after harvesting and forwarded.*
- *According to the statistical data in the Industry Department (ID), 631 numbers (8.8%) of enterprises as type of "Food Processing" among all 7,211 enterprises were registered.*
- *Mizoram Food and Allied Industries Corporation (MIFCO) Ltd. is one of the State Owned Enterprises under the Industry Department and established 1989. Their business has been operating under unprofitable condition.*
- *Community Development Action & Reflection (CDAR) was established as a NGO in 2004 for supporting young women in poor farmer's families to become self-support. There are 5,440 farmers as members in 69 villages in five districts and all farmers are authorized as organic producers. Hnamchhantu Pawl (HCP) has also developed their collecting, processing and marketing business of the broom products.*
- *According to the farm household survey, farmers consider that lack of labour (71%) is the biggest constraint to proper post-harvest management of their products. Then the mechanization should progress for saving labour but farmers seem not to have a way of thinking that machineries and equipment could reduce labour cost and improve profitability of farming.*

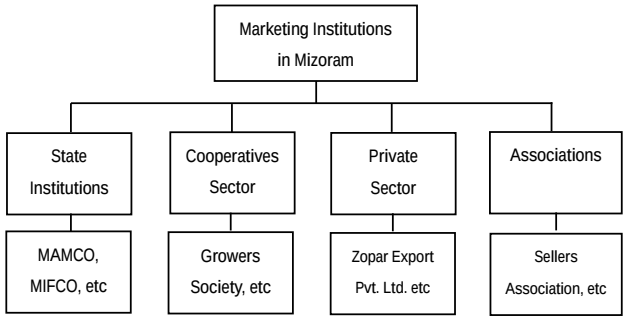
Rice Harvesting

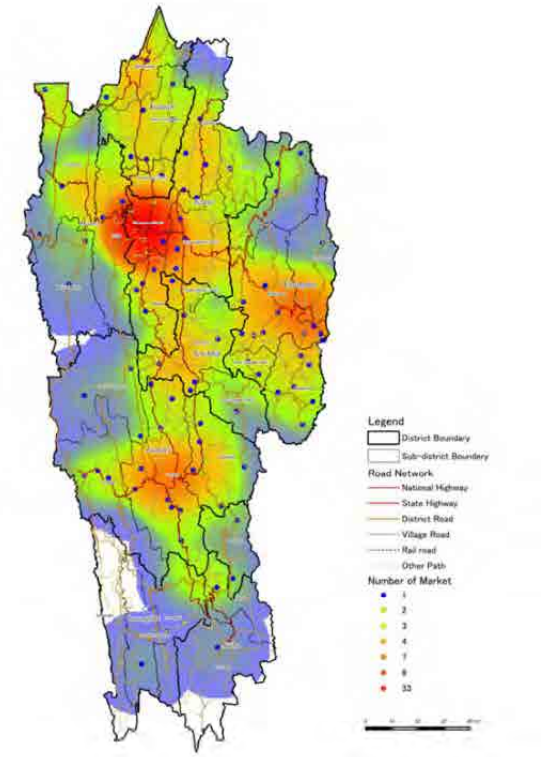
Engerberg type milling machine

Grinder for powder

AGRICULTURE MARKETING AND DISTRIBUTION (1/2)

- *Market Facilities : There are 220 markets in the State where the Trade and Commerce Department manage 22 major markets directly and the rest 198 markets indirectly through Local Councils in Mizoram Districts and Village Councils in other Districts.*
- *Boarder Trade to / from Other States : Currently 138 commodities are allowed to handle, and distributers need to receive the permission and pay fee to the TCD. The TCD have the four check gate offices at border gate sites.*
- *International Trade : Myanmar and Bangladesh are neighboring countries, The TCD is proposing three more border gates to Myanmar in Champhai District and Lawngtlai District as sub-gates to Zokhawthar and plans to construct Border Trade Centres (BCTs).*
- *Market Institution : The existing agriculture marketing institutions of the State are shown as follows. Almost institutions are existing under the present rigid distribution system, except CDAR and HCP etc*





Accessibilities to Market
Source: JICA Study Team

AGRICULTURE MARKETING AND DISTRIBUTION (2/2)

- *Traders from Assam State : Traders coming from other Assam States occupy a crucial part in the marketing of agricultural products. These agents play a significant role in the flow of agricultural products to and from the state.*
- *Associations : There is a complicated network of associations of different sorts in the state which are very influential in their respective areas in terms of price controls and prevention of the entry from outside.*
- *Distribution at Village Level and to Near Town Market :Basically farmers in Mizoram give a priority to their self-consumption on their agricultural production, and then their surplus produce is small volume and sold at a village market and roadside market in their area. Otherwise, transport their produce to the big market by public small bus.*
- *Long Distant Distribution : For the products like squash and ginger, the commission agents are usually agents of the wholesalers / brokers as buyers in other states (mainly Silchar in Assam).*
- *Distribution of Products Coming in to Mizoram : Agricultural products sold in the state have been depending heavily on outside sources and the local market is being dominated by such import products. Even though numerical output cannot be estimated due to lack and unreliable statistical data. The products coming into the State are transported in mainly through the border gate in Vairengte sharing about 80% among all four gates to other States.*
- *Value Chain Analysis :There is no regulated market mechanism for these commodities to check price increase and to facilitate regular flow of supply. The producers as well as the consumers are exposed to the market controlled by a network of intermediaries, which results in high prices and un-remunerative price earned by the producers.*
- *Market Information : The Department of Economic & Statistics (DES) collects data for both wholesale and retail price of various commodities. Wholesale price of 20 food items are collected from eight district capitals quarterly, while, retail prices of 101 food items and 71 non-food items are collected from 16 urban markets of Mizoram.*
- *Road Condition : Roads in the State are generally in bad conditions due to insufficient maintenance works, etc.*

INLAND FISHERY

- *Policy and Organisation*
  - *The Department of Animal Husbandry Dairying and Fisheries of the Ministry of Agriculture is the responsible both for inland and marine fisheries sectors and assisting, through the National Fisheries Development Board, both financially and technically.*
  - *In Mizoram, the Department of Fisheries (DOF), and its leading role are fingerling procurement and distribution, and training through demonstration for pond and open waters (rivers, reservoir) fisheries.*
- *Current Situation of Inland Fishery*
  - *There are 6 fish species commonly cultivated in Mizoram. 11 government fish seed producing hatcheries is available; of which only 4 hatcheries are operated by DOF while the rest are leased to Mizoram Cooperative Fish Farming Marketing and Processing Federation Ltd. (ZOFISFED). The total number of fingerlings distributed by DOF was 64.5 million in 2011/12.*
  - *The fish production during the period of 2005/06 to 2012/13 have been increased from 3,750t to 5,450t.*
  - *There are 13 DOF-owned fish farms, and 3 privately-owned fish hatcheries with breeding, hatching, and rearing ponds. The DOF fish farms are located in 7 districts except Champhai. Of the 13 DOF farms, 3 are demonstration farms, and the rest are fish seed producing farms being leased to ZOFISFED.*
  - *DOF has an Ice Plant Cold Storage facility in 3 places in the state and a 5-ton cold storage in Aizawl. Ice blocks sells at 50% subsidized price. DOF has a fish feed mill that was established in 2013 under RKVY however none of them are being operated. In addition, DOF is constructing two similar fish feed mills.*
- *Development Plan of Fish Farming (Aquaculture)*
  - *Ongoing Programmes of the DOF: i) Fish Seed Production cum Farming, ii) Freshwater Aquaculture, iii) Development of Inland Capture Fisheries, iv) Development of Cold Water Fisheries and Ornamental Culture, v) Development of Inland Fisheries Statistics, vi) Inland Fish Marketing, vii) Information Extension and Training, viii) National Scheme for Welfare of Fisherman, ix) National Mission for protein Supplement. DOF proposed to develop another 3,000 ha of new fishponds to have a total of 7,000 ha in the fish culture sector, wherein it expects the production level at the end of the 12th Five-Year Plan to be around 14,000 t.*

LIVESTOCK

- *Policy, Organization and Plan : The Department of Animal Husbandry and Dairying under MOA advise the state governments in the formulation of policies and programmes focussing on i) development of requisite infrastructure for improving animal productivity, ii) promoting infrastructure for handling, processing, and marketing of milk / milk products, iii) preservation and protection of livestock, and iv) strengthening of central livestock farms for development of superior germplasm for distribution to states. for the 12th 5-Year Plan are to i) achieve 50% of self-sufficiency in production of milk, meats, eggs, and fodder, and ii) increase self-employment by 20% and entrepreneurship by gainfully employed rural youth.*
- *Current Situation of Livestock Raising :*
  - *The population of poultry (1,253,000 nos.) in Mizoram is the largest, followed by the population of pigs (242,500 nos.), cattle (34,800 no.), goat (22,100 nos.), water buffalo (5,000 nos.). The livestock population during the past 35 years does not show a significant upward trend, except for pigs. Out of the total meat production (10,821 t) including poultry, pork accounted for the highest quantity with 56.8%, followed by beef with 25.8% and poultry meat with 16.9%.*
  - *The department has veterinary infrastructure for animal health, i.e., 5 veterinary hospitals, 35 veterinary dispensaries, and 103 rural animal health posts that provide treatment to animals. The department also vaccinates animals against the legal communicable diseases with free of charge. All vaccines are procured from West Bengal or Assam as there are no veterinary biological research institutes in Mizoram.*
- *Promotion Plan of Livestock Raising : Operating CSS programs: i) Cattle and Buffalo Development, ii) Piggery Development, iii) Poultry Development, iv) Dairy Sector, v) Institutional Arrangement, vi) Feed and Fodder Development, vii) Biogas Development*
- *Problems and Constraints to Development*
  - *More than 90% of feed ingredients are imported from outside the state.*
  - *Farmers have no interest to develop livestock farming beyond self-consumption level.*

SERICULTURE

- *Policy and Organization : The policies of sericulture development both at the national and state levels are to: i) create greater opportunities of employment and improved levels of income; ii) make continuous efforts in research and development; iii) improve productivity of silk production; and iv) improve all the process of sericulture from mulberry cultivation to production of high quality of raw silk. The DOS was established in 1985, and it is functioning with 264 personnel.*
- *Current Situation of Sericulture :*
  - *3,880 farmers involved in sericulture in Mizoram, of which 90% are engaged in Mulberry sector, followed by Eri at 4%, Oak Tasar at 4%, and Muga at 2% in 2012-13*
  - *The number of farmers is high in Aizawl district (46%), followed by Lunglei, Kolasib, Champhai, and Mamit.*
  - *Productivity of Mulberry cocoon per Dfls is 43.8 kg (the national average 60.0 kg in 2007).*
  - *Productivity of raw silk per area of mulberry plant is very low (National: 90.9 kg/ha, Mizoram:15.9 kg/ha).*
  - *Farmers bring their cocoons to each DOS district office and they are transported to the reeling centre operated by the DOS. Raw silks are sold to private weavers in and out of the state.*
- *Plan for Sericulture Development : The DOS proposed Rs. 7,149 lakhs for the 12th five year plan: i) increasing production of bivoltine Mulberry silk, ii) increasing of high yielding Mulberry variety, iii) upgrading of seed grainages, rearing and post cocoon technologies. Promoting national programme for the development of Eri, Muga, Oak Tasar, and Mulberry silk under CSS*
- *Problems and Constraints for Development*
  Major issues :i) Low yielding variety and cultivation conditions of mulberry, Inadequate supply of quality silkworm seed, inadequate of overall facilities, ii) Issues to be Sorted out Between CSB and State, iii) Research and Development Issues, iv) Seed Production and Supply.

FOREST CONSERVATION AND FOREST PRODUCTS

- *Policy and Institution : In the national level, the Ministry of Environment and Forests, GOI, is the nodal agency. Its policy is based on the Indian Forest Act, 1927 and the National Forest Policy, 1988. In the Mizoram, the Environment and Forest Department (EFD) is the responsible body in the state and overseeing forest products. The policy of EFD is to achieve well-stocked high-quality forests for maintaining ecological balance, and the state's laws and regulations are as follows: i)The Mizoram Forest Act 1955, ii) The Mizoram Forest Produce Mahal Rules 2002, iii) The Mizoram Establishment and Regulation of Saw Mills and Other Wood Based Industries Rule 2010, iv) The Mizoram State Biological Diversity Rules 2010, and v) Guidelines for Felling of Trees from Non-forest Areas 2002.*
- *Overview of Forest Conservation and Land Use Potential : The "Forest Survey of India" (FSI) conducts national forest survey regularly, the registered forest was increased from 15,935km^2 in 2001 to 16,717 km^2 in 2011. While, the total bamboo bearing area in Mizoram is assessed to be 9,245 km2 , occupying 6.6% of the entire country's bamboo area of 139,577 km2, and corresponding to 43.8% of state land (21,081 km2).*
- *Timber and Non-timber Products : Growing stock of timber is limited in the forest; therefore, there is very little scope for commercial felling of trees. The non-timber forest products are also out of systematic commercial activities except bamboos and broomsticks. The EFD appeals the promotion of medicinal plants; however, it seems to be still on a conceptual stage.*
- *Community Forest Management : The forest management has been traditionally administered by the village chieftain, having absolute decision-making authority, who is the supreme head of the village council. In 1998, the government introduced the JFM scheme to make local people participate actively in forest conservation.*
- *Ongoing Forest and Wildlife Conservation Programmes : On going programmes except NLUP are as follows; i) National Afforestation Programme, ii) Intensification of Forest Management, iii) National Bamboo Mission, iv) Wildlife Preservation Scheme and Eco-development Scheme. Under NLUP, EFD selected to implement the Bamboo Development Programme for 5 years. From 2011 to date, there are 2,609 families were benefitted, and total plantation area is 5,218 ha. The total fund disbursed for the two phases was about INR 2,600 lakhs*

LIVELIHOOD RELATED INFRASTRUCTURE

- *Road : The total road length of 7,537 km is composed of national highway of 986 km (13%), state highway of 700 km (9.3%) and the rest 5,851 km by district and village roads. Road density of 0.40 km/km2 is below India's national average of 0.66 km/km2*
- *Water Supply : In urban areas, water connections were provided for 28% of the total urban households. The Mizoram state has a relatively higher percentage of households having latrines (92%), in 2011 which is nearly double of the national average of 47%.*
- *Electricity : The total installed generation capacities as of 2011/12 are 0.50 MW diesel generation, 29.35 MW hydropower, and 22.92 MW thermal, totalling 52.77 MW covering only 5% of the power demand within the state and the remaining 95% is being imported mainly from the national power grid.*
- *School and Education : Mizoram is one of the most literate states in India. The number of educational institutions by levels are; 1,855 primary schools, 1,388 middle schools, 543 high schools, 113 higher secondary schools and 21 colleges.*
- *Health Centre : The number of health institutions by levels are; 27 hospitals, 12 community health centres, 57 primary health centres and 370 sub-centres. The one bed of government hospital including community health centres accounts for 844, which is nearly equivalent to the entire India average of 879.*
- *Telecommunication : Telecommunication has been developed recently. The number of mobile connections has increased by about 70%.*

BASIC CONCEPT OF MASTER PLAN FOR LAND AND WATER RESOURCES DEVELOPMENT AND MANAGEMENT FOR SUSTAINABLE AGRICULTURE

STATE LEVEL CHALLENGES AND ROLE OF AGRICULTURE SECTOR

State Level Challenges

Improve viability of the local economy and environment

- *Income per capita : Rs.61,732 (India Ave. Rs.66,747)*
- *Poverty indicator in the rural area : 33.56 (India Ave. 25.70) rural population is 49%*
- *Rapid urbanization / 48,580 educated job seekers are registered*

Improvement of tax revenue status of the state

- *75% of the amount received is grant-in-aid from the Government of India (GOI) and its contribution.*
- *Tax-GSDP ratio : 1.5 (India Ave 8.0 in 11th 5 year plan)*

Increase food security

- *Self-sufficiency rate of rice : 27% (2010-11)*

Agriculture Sector

- *Share of nealy20% to GSDP*
- *51% of main workers are cultivator*
- *21% of outlay is given to agriculture and allied activities including irrigation in 12th 5 years plan*

Playing Important Role in the State Economy

→ *State Agriculture Sector should be strengthening and sustained*

STATE LEVEL CHALLENGES AND ROLE OF AGRICULTURE SECTOR

Agriculture Sector should be strengthening and sustained

Threats

Low productivity

- *Decline in soil fertility, which is mainly due to soil loss/erosion*
- *Difficulty in using quality seeds and planting materials due to farmers' insufficient knowledge, inadequate support services, and lack of funds*
- *Poor farm management due to little knowledge and poor access to extension services*
- *Shortage of irrigation water and flood damage*
- *Low motivation and aging of farmers*

Threats

Limited cultivation area

- *Difficulty in land acquisition*
- *Insufficient manpower due to aging of the farmers*
- *Poor farm management*
- *Shortage of irrigation water and flood damage*
- *Shortage of funds*
- *Difficulty of access to the farm*

Threats

Low product value

- *Mismatching in the market demand and production*
- *Rigid market system and value chain controlled by Assam traders and wholesalers' and retailers' association*
- *Less knowledge and motivation for profitable agriculture*
- *Improper post-harvest processing*
- *Weakness in agro-based industries*

STATE LEVEL CHALLENGES AND ROLE OF AGRICULTURE SECTOR

Agriculture Sector should be strengthening and sustained

(Good Government Supporting Services)

Threats

Inadequate planning & monitoring system

- Inadequate information and management system
- Less knowledge in planning and monitoring of government officers
- Placing priority on the disbursements of centrally sponsored scheme (CSS) and short-term outcomes

Threats

Undeveloped extension system

- Lack of linkage between extension and research institutions such as KVK, ICAR, or university
- Low technical capacity of extension officers
- Low mobility of field staff
- Little or no guideline for standardisation of government extension services suitable for the state
- No proper focal point between service providers and farmers

Threats

Less coordination amongst related departments

- CSS-oriented mandate allocation to each department
- Little coordination between bodies and systems at the state, district, block, and village levels

Threats

Low capacity of development partner

- Less NGO, consultants for development activities
- Subsidy or welfare oriented CBOs

→ **Should eliminate threats exist in the state agriculture sector**

SURROUNDING ENVIRONMENT OF STATE AGRICULTURE SECTOR

Enhancement of border trade among State, Myanmar and Bangladesh under "Look East Policy"

Major Border Gate : Mizoram and Myanmar
Zokhawthar (Champai District) and Zorinpui (Lawngtlai District)
: Mizoram and Bangladesh
Kawrpuichhuah (Lunglei District).

Major on-going programs

- Improvement of the access road to Zokhawthar, main border gate to Myanmar
- Construction of a border bridge on Korpui River and access road via Korpuichhuah village from Tlabung (The local authority has submitted the construction plan to Bangladesh side already.)
- Kaladan Multi Modal Transit Transport Project
- Trans Asia Highway Initiatives

Strengthening Infrastructure and Connectivity in North Eastern Region

The North Eastern Region Vision 2020 emphasises roads, railways, waterways, and power improvement to interlink potential growth centres. Under this programme, the railway line extension from Bairabi (Kolasib) to Sairang is proposed, and land acquisition is in progress aiming at the completion of the work by December 2017.. It is expected that the new railway line will play a vital role in the economic activities of the state including the agriculture sector. https://capex.cmie.com/

→ *There is opportunity economically backward region become the gateway in India to the fast developing ASEAN region in the future*

BASIC CONCEPT OF MASTER PLAN

Overall Goals

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

Vision

Achievement of Sustainable, Strong and Attractive Mizoram Agriculture

Target

Target Year : 2035
Target (1) : A growth rate of 4 % per annum in the agriculture sector in the State
Target (2) : The self-sufficiency rate of paddy is more than 50%

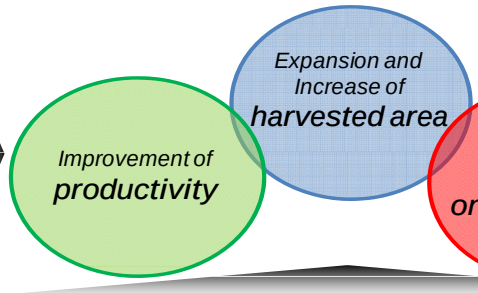
Strategy

Plenty and Variety of Resources

(1) 21,087 km^2 for 1,091,014 people

(2) Rang of altitude 30 to 2200 m

(2) Annual average rainfall 2600 mm



Geographical Advantages

(1) Look East Policy

(2) Trans-Asia Highway Initiatives

(3) Strengthening infra and connectivity in NE

Human Resources

Cohesiveness | High literacy rate | High education level

PRINCIPAL DIRECTION OF PRODUCTION AND PRODUCTIVITY IMPROVEMENT

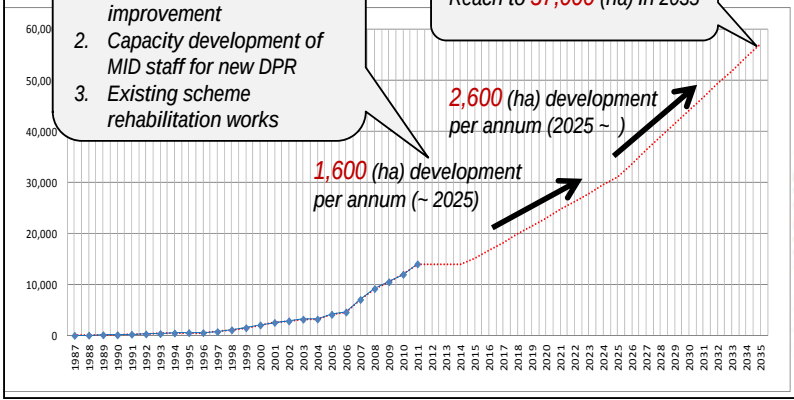
Crop	Cropping System	Production Area	Way to Improve Productivity	Target Yield for Major Crop (in 2010 > in 2035)
Paddy	Jhum	Keep the present decreasing rate without positive intervention	Improvement of farm management such as quality seed multiplication, measures against soil erosion, and enrichment and extension of the fallow period.	Paddy 1.66 t/ha > 2.0 t/ha
	WRC	Promote a more positive development for effective resources utilisation and management. Aiming at 43,000 (ha) new WRC development in 20 years	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 decreasing rate without positive intervention	Introduce improved Jhum practices. Introduce appropriate varieties.	Chilli (dried) 0.9 t/ha >1.2 t/ha Brinjal 7.1 t/ha>9.0 t/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 and mulching. Introduce new varieties. Introduce Integrated Nutrient Management (INM).	Ginger 3.9 t/ha >7.0 t/ha Turmeric 3.8 t/ha >7.0 t/ha
	Irrigated Upland	Expand the irrigation area by installing small irrigation system and constructing water conservation facilities. Expand the total cultivation period per year by introducing appropriate technologies and practices on cultivation timing diversification.	Implement soil and water conservation measures such as terracing and mulching. Introduce new varieties. Introduce INM.	Cabbage 13.3 t/ha >30.0 t/ha Okra 6.8 t/ha >12.0 t/ha Tomato 9.2 t/ha >25.0 t/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 12.6 t/ha >20.0 t/ha Onion 9.2 t/ha >16.0 t/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 and mulching. Introduce INM.	Banana 12.1 t/ha >25.0 t/ha M. Orange 2.6 t/ha >10.0 t/ha Lemon 3.2 t/ha > 9.0 t/ha Grape 8.7 t/ha >12.0 t/ha Pineapple 7.3 t/ha >15.0 t/ha

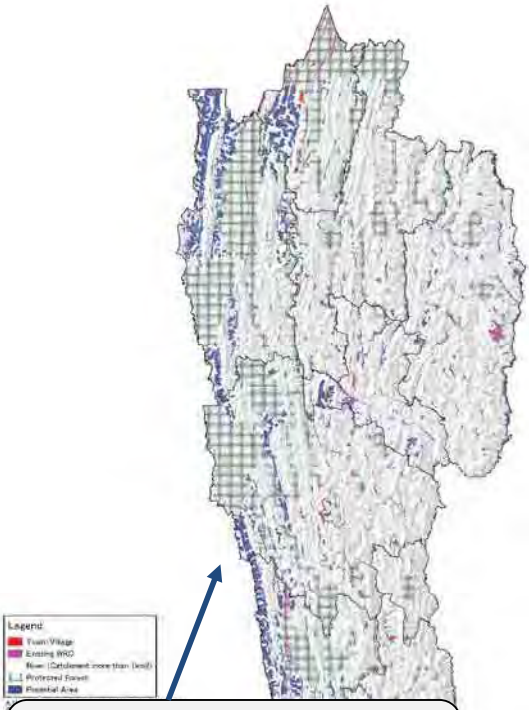
PRINCIPAL DIRECTION OF PRODUCTION AND PRODUCTIVITY IMPROVEMENT

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

1. *Necessary accessibility improvement*
2. *Capacity development of MID staff for new DPR*
3. *Existing scheme rehabilitation works*

Reach to 57,000 (ha) in 2035





1. *Area slope is less than 25%*
2. *Area locates within 500 m away from perennial river*
3. *Area does not locate within an urban area, protected forest and/or riverine reserved forest area*
4. *Area has more than 50 (ha)*

AREA ZONING AND DEVELOPMENT DIRECTION

Zone 1

Agricultural advance region with high productivity and marketability where industrialisation of agriculture is progressed

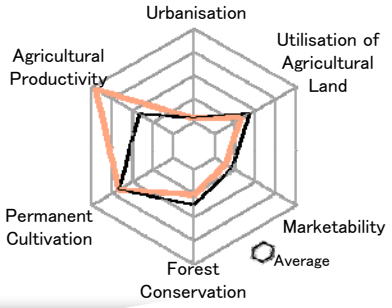
Land
- Low elevation with moderate slope

Water Resources
- Better water resources. There is a dam for electric-generation
- Irrigation facilities are developed relatively well for WRC and upland field

Agriculture
- Productivity of paddy rice is low.
- Vegetables are cultivated during dry season in WRC, but their production is limited.
- Cultivated areas of oil seed crop/oil palm and arecanut are large.

Others
- Strong influences by Assam economic zone: e.g. traders and tenant farmers from Assam

- A cold storage facility and an oil palm mill are constructed.
- There are many fish ponds, and inland fisheries are active.
- Many of cooperatives/associations/SHGs are not functioned.



Development Direction

Progressing of production and processing of industrial crop (oil palm, rubber, areca catechu, areca nut etc) with WRC development through development and effective management of better water resources

AREA ZONING AND DEVELOPMENT DIRECTION

Zone 2

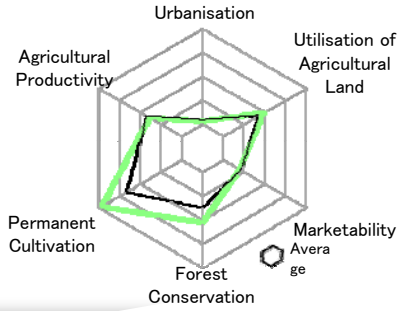
Transition from Jhum to permanent cultivation is progressed.
Semi self-sufficient and market-oriented region

Land
- Middle elevation with middle-level slope and relatively large land of moderate slope along with the river is available

Water
- Development of WRC is limited but relatively many irrigation facilities for upland field

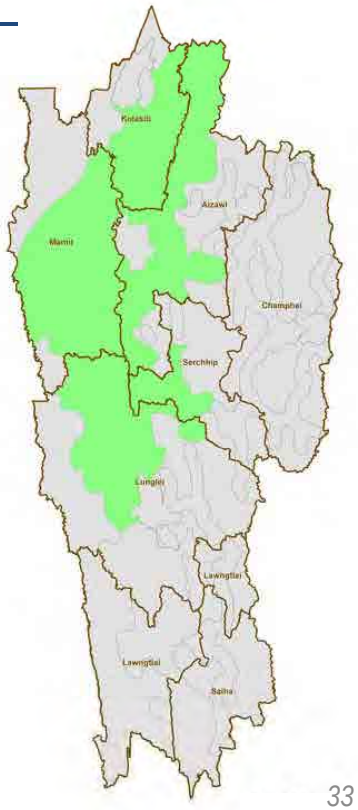
Agriculture
- Mixed cropping of upland rice with vegetables and cereals is practiced in Jhum land and horticultural crops, especially spices, citrus and banana are cultivated in upland converted from Jhum land. Soil erosion and degradation are severe in those upland areas
- Maize and sugarcane coffee cultivation are active, and a processing factory for coffee was constructed.
- Others
- Assam traders are active.

- There are a national road in a north-south direction and a state road in an east-west direction; thus, road network is relatively developed.
- Conversion from WRC to fish ponds is observed.
- Many of cooperatives/associations/SHGs are not functioned.



Development Direction

Production of various products needed for main habitants in the State through enhancement and upgrading of permanent agriculture



AREA ZONING AND DEVELOPMENT DIRECTION

Zone 3

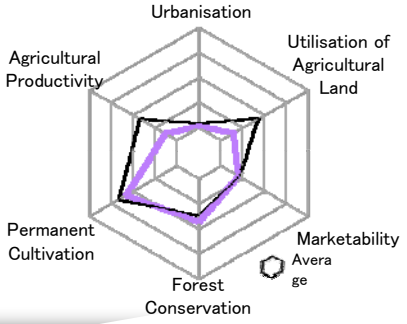
Self-sufficient agriculture region rely on Jhum

Land
- High elevation with steep slope covering Mara Autonomous District.
- Amount of rainfall is relatively small: annual rainfall is less than 2,000mm.

Water
- The water resources development is limited except the Champhai basin

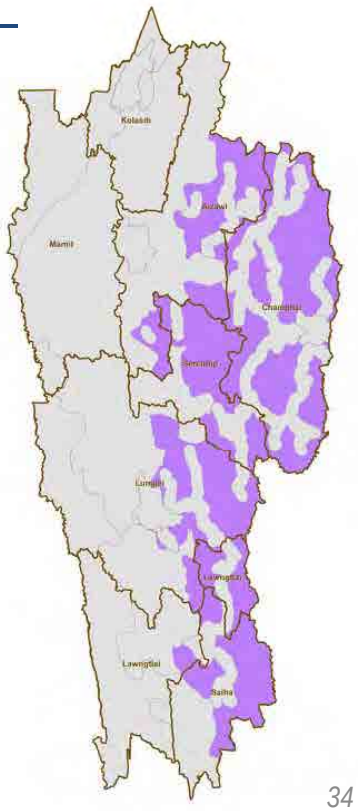
Agriculture
- Jhum is most actively practiced and upland rice with vegetables are produced in the subsistence scale.
- Rice, maize, and tobacco are produced in rainy season and pulse and sugarcane are produced in dry season. Their productivity is low.

Others
- Accessibility to district road and higher level roads is most severe. In rainy season, there are some areas whose accesses are blocked.
- Many of cooperatives/associations/SHGs are not functioned.



Development Direction

Improvement productivity of subsistence agriculture through improved Jhum practice and perennial crop cultivation



AREA ZONING AND DEVELOPMENT DIRECTION

Zone 4

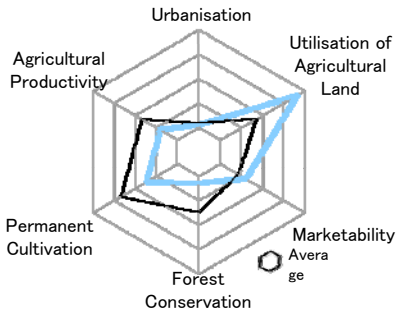
Accessibility is relatively good and plantation crops are cultivated, together with Jhum practice

Land
- High elevation with steep slope.

Water
- Amount of rainfall is relatively small: annual rainfall is less than 2,000mm.
- There are relatively many water storage tanks and pipes to irrigate horticultural crops.
- The water resources development is limited except the Champhai basin

Agriculture
- Mixed cropping of upland rice with vegetables is practiced in Jhum land.
- In upland converted from Jhum land, vegetable, maize, tobacco and sugarcane are cultivated. But cultivation in dry season is limited.

Others
- Accessibility is relatively good.
- Many of cooperatives/associations/SHGs are not functioned.



Development Direction

Production of market oriented differentiated horticulture and fruits production suitable for high altitude

AREA ZONING AND DEVELOPMENT DIRECTION

Zone 5

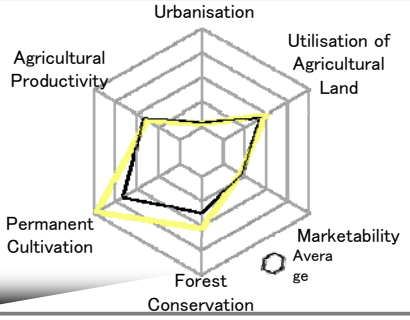
Transition from Jhum to permanent cultivation is progressed. Remain to be Self-sufficient agriculture due to bad accessibility

Land
- Middle elevation with middle-level slope covering Lai Autonomous District.

Water
- Although it belongs to basin of Kolodyne River which is the biggest in Mizoram, the areas where water resources are utilised are limited. The irrigation development is limited

Agriculture
- Mixed cropping of upland rice with vegetables, cereals, pulse, and tobacco is practiced in Jhum land. Sugarcane is partially cultivated in dry season.
- In upland 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 those upland areas.

Others
- Accessibility is bad in general.
- Number of markets is few.
- Many of cooperatives/associations/SHGs are not functioned.



Development Direction

Production of regional required products at first and shifting to export oriented industrial or other crop production

AREA ZONING AND DEVELOPMENT DIRECTION

Zone 6

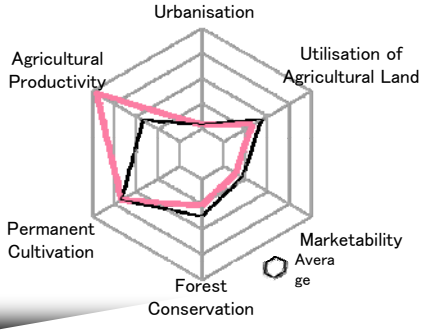
Self-sufficient agriculture with focus on rice paddy

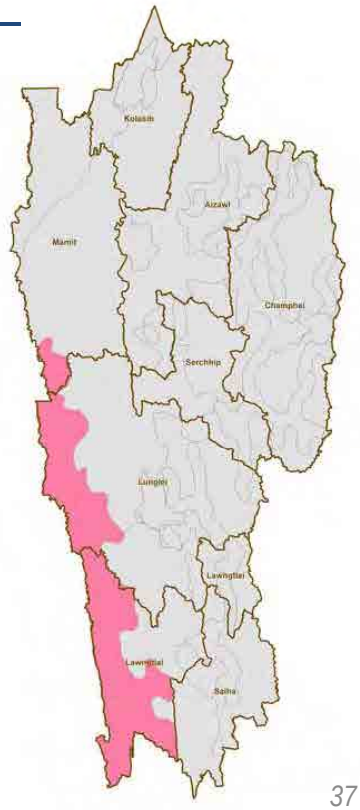
Land
- Low elevation with moderate slope covering Chakma Autonomous District

Water
- Better water resources but irrigation is underdeveloped, rain-fed rice paddy cultivation is predominant.

Agriculture
- There are areas where double cropping is practiced with utilising rainfall of dry season, but its productivity is low
- While production of horticultural crops is low, high-quality mango is produced
- Cultivation of oil seed crop/oil palm and industrial crops such as tobacco has been progressed recently. An oil palm mill is under construction

Others
- Road network is poor and market access is bad
- There is border gate to Bangladesh and the Kaladan Multi Modal Transit Transport Project is going- on
- Many of cooperatives/ associations/ SHGs are not functioned.





Development Direction

Increase in production of Mizoram paddy and export oriented products with utilization of better water resources and land

AREA ZONING AND DEVELOPMENT DIRECTION

Zone 7

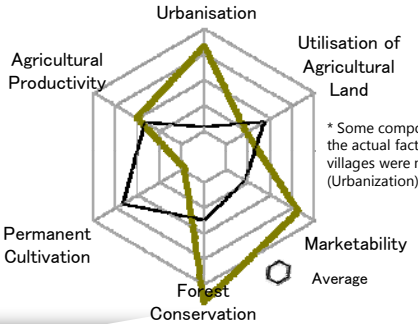
Land-intensive agriculture region in urban neighbourhood

Land
- Middle elevation with middle-level slope

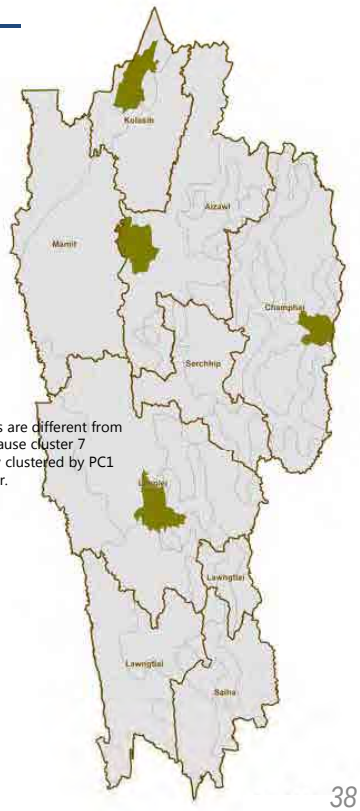
Water
- Development of WRC was completed in general. There are many water storage tanks and pipes to irrigate horticultural crops. Since same water sources are used for urban areas and for irrigation, it is relatively difficult to ensure water resources especially in dry season.

Agriculture
- Vegetable production for Aizawl markets is active, and green houses are built up.
- 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).

Others
- Road accessibility is good.
- 51 markets are built up. There are cold storage facilities, a turmeric processing facility, a livestock processing facility, a fruit juice processing factory, ice plants, a boom processing factory, etc.
- It belongs to urban neighbourhood and has high population density.
- Many of cooperatives/associations/SHGs are not functioned.



* Some components are different from the actual facts because cluster 7 villages were mainly clustered by PC1 (Urbanization) factor.



Development Direction

Supply of safe and traceable qualified agriculture product to urban population

PROPOSED PROJECT AND IMPLEMENTATION PLAN

PROPOSED APPROACHES AND PROJECTS

Approach (1) >> *Institutional Development for Effective Agriculture Development Planning and Implementation*

(Programme 1-1) Stakeholders Capacity Development and Convergence Planning

(Programme 1-2) Enhancement of Basic Agriculture Supporting Services

Approach (2) >> *Enhancement of Sustainable Agriculture Production through Proper Resources Utilization and Management*

(Programme 2-1) Enhancement of Fundamental Infrastructure

(Programme 2-2) Enhancement of Resources Managed Farming System

Approach (3) >> *Enhancement of Good Value Chain for Agriculture Product*

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

(Programme 3-2) Improvement of Present Rigid Supply Chain

(Programme 3-3) Enhancement of Agro-industrialization

PROPOSED PROJECTS

No.	Name of Project	Implementing Organisation		Project Period (Yrs.)	Applicable Zone							Target Group	Objective	Activity
		Main	Sub		1	2	3	4	5	6	7			
Programme 1-1 : Stakeholders' capacity development and convergence planning														
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 of the agriculture-allied dept.	Establishment of "agriculture development committee (ADC)" to prepare vision policy and plans for the state agriculture development and to coordinate the programmes and projects for more effective and efficient implementation	(1) Establish preparatory committee (2) Preparation of roles and regulation of ADC with some trials (3) Capacity development of members of ADC through training and study tour
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 dept.	Establishment of agriculture data collection and management system for better planning and monitoring	(1) Data collection system development such as forms and database (2) Procurement of necessary equipment (3) Capacity development of officers concerned
1-3	Capacity Strengthening of Government Officers for Planning and Good Agriculture Extension	DOA, KVK, DOH, MID, DOF	DSWC, AHVD, DOS, RDD, ATMA	4	-	-	-	-	-	-	-	Officers of agriculture-allied dept. and MID	Strengthening of the government officers' capacity and formulation of improved systems for promoting proper project planning and management and effective agricultural extension	(1) Preparation of TOT manual for agriculture development planning and monitoring, agriculture technologies extension, extension of marketing technologies, water management and infrastructure O&M. (2) Capacity development of officers concerned through classroom training or OJT.
1-4	Preparation of Regional Agriculture Development Plan	DOA, DOH, MID	SWCD, RDD, AHDV, DEF, DOF, DOS, ATMA, MIRSAC	6	○	○	○	○	○	○	○	VC, CBOs	Preparation of integrated plan including land use plan, resource management plan and agriculture action plan in each village to be the base for the agriculture development in Mizoram	(1) Preparation of land use and resources management plan for nearly 700 villages through participatory approach (2) Preparation of village-based agriculture development plan for 700 villages for the base of the agriculture development
1-5	Strengthening of Village-based Self-reliant Organisations for Taking on Key Roles for Agriculture Development	RDD	DOA, DOH, DOF, MID, RDD, AHVD, SD	5	○	○	○	○	○	○	○	Local NGO VC, CBOs,	Enhancement of village-based CBOs for making the agriculture development more effective	(1)Training of local NGOs (2) Identify the present capacity of CBOs and facilitate the formation of the federation of CBOs for agriculture development in each village (3) Awareness of role and responsibility of CBO in the development work and necessary training for self-sufficiency

PROPOSED PROJECTS

No.	Name of Project	Implementing Organisation		Project Period (Yrs.)	Applicable Zone							Target Group	Objective	Activity
		Main	Sub		1	2	3	4	5	6	7			
Programme 1-2 : Enhancement of Basic Agriculture Supporting Services														
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	Establishment of one stop service centre in each block for giving better agriculture support services	(1) Construction of 26 ASCs(2) Procurement or establishment of necessary equipment and facilities attached to ASCs (3) System design for effective utilization of ASC and capacity development of officers concerned
1-7	Production of Appropriate and Quality Paddy Seed	DOA, KVK	-	10	◎	○	○	○	○	○	○	Seed producer group	Selection of appropriate paddy seeds and establishment of practical system to produce and disseminate enough quantity of quality seeds	(1) Rehabilitation and enhancement of existing seed farm in KVK and DOA (2) Selection and verification of recommended seed for extension (3) Formation of seed farmers' group and capacity development (4) Support for distribution of quality paddy seeds to other farmers
1-8	Rehabilitation and Upgrading of Existing Fish Farms for Sustained Fingerling Production	DOF	CIFE, CIFA, CIFRI	5	○	○	-	-	○	○	○	Staff in fish farms	Production of quality fingerlings in the state and dissemination to the farmers	(1) Rehabilitation and upgrading of 11 existing fish seed farms (2) Provision of facility and equipment for fish seed farms (3) Capacity development training for staff on fish seed farm for sustainable production

PROPOSED PROJECTS

No.	Name of Project	Implementing Organisation		Project Period (Yrs.)	Applicable Zone							Target Group	Objective	Activity
		Main	Sub		1	2	3	4	5	6	7			
Programme 2-1 : Enhancement of Resources Managed Farming System														
2-1	Improvement of *Jhum*-based Agriculture	DOA	DOH, AHVD, DSWC, EFD	5	-	-	◎	○	-	-	-	VC, individual farmers	Improvement of productivity of *jhum* cultivation	(1) Awareness to VC for land use for *jhum* cultivation and preparation of regulation (2) Technology transfer for prolonging the *jhum* cycle to the farmers (3) Technology transfer for enhancement of forest production during fallow period
2-2	Enhancement of Environmentally-balanced Slope Area Cultivation	DOA	DOH, AHVD, DSWC, EFD	3	-	◎	◎	○	◎	-	○	Horticultural farmers' organisations and individual farmers	Improvement of productivity of slope area cultivation through enhancement of environmentally-balanced agriculture technologies	(1)Provide necessary technologies and equipment or facilities to the farmers to prevent soil erosion with agronomic, vegetative, and structural ways (2) Collection of necessary records for soil erosion to measure the effect of soil erosion on productivity through establishment of observation point
2-3	Enhancement of WRC and Promotion of Winter Crop	DOA	DOH, AHVD, DSWC, EFD	4	◎	-	-	-	-	○	◎	WUA	Increase of the production and productivity of wet rice cultivation and increase of winter crop production such as vegetables in WRC area	(1) Legislation of tenant farming system of WRC land owning system (2) Provision of appropriate technologies such as cultivation scheduling (including mix cropping), farm mechanisation and soil fertility management
2-4	Integration of Livestock Farming into Crop Cultivation	DOA, DOH, AHVD	-	3	-	○	◎	○	◎	○	-	SHG, individual farmers	Increase the agriculture production and income security through integration of livestock farming into crop cultivation	(1) Provision of the technologies for crop and livestock integration such as compost making, animal feed production and provision of necessary equipment (2) Skills development on farm household economy for diversification of income sources (3) Promotion of small-scale animal rearing and provision of necessary skills and facilities
2-5	Integration of Fish Farming into Crop Cultivation	DOF	DOA	6	◎	○	-	-	◎	◎	◎	WUA, individual farmers	Increase the fish production and income security through promotion of fish culture in the available water bodies	(1)Technology transfer on semi-intensive fish farming including paddy cum fish (2) Enhancement of fishery cooperative or WUA for joint shipping or marketing of the product (3) Provide necessary equipment or cost for small-scale fish pond construction on pilot basis

PROPOSED PROJECTS

No.	Name of Project	Implementing Organisation		Project Period (Yrs.)	Applicable Zone							Target Group	Objective	Activity
		Main	Sub		1	2	3	4	5	6	7			
Programme 2-2 : Enhancement of Fundamental Infrastructure														
2-6	Irrigation and Command Area Development for WRC Potential Area	MID	DOA, DOH, DOF	20	◎	○	○	○	○	◎	○	WUA	Providing the irrigation and drainage facilities and development of irrigation command area in WRC potential area	(1) Construction of irrigation and drainage facilities for WRC potential area of 43,000 ha (2) Command area development of above scheme
2-7	Improvement of Water Resource Utilisation for Existing Irrigation Schemes	MID	DOA, DOH, DOF	10	◎	◎	○	○	○	○	◎	WUA	Increase in cropping intensity of the existing minor irrigation scheme through construction of ponds, rehabilitation of canals, and introduction of water saving irrigation	(1) Upgrading of existing irrigation schemes (300 schemes) through construction of ponds, diversion structures, agro well, lift irrigation facilities, and rehabilitation of canal system (2) Introduction of water saving irrigation system in existing and newly developed area through necessary data collection such as soil moisture and water losses and provision of micro irrigation facilities
2-8	Construction of Soil and Water Conservation Facilities	SWCD	MID, DEF	5	○	○	○	○	○	○	○	VC, CBOs	Construction of soil and water conservation facilities and empowering the community for resources management through employment of the community contract method	(1) Preparation of guidelines for construction of soil and water conservation facilities through community contract system (2) Construction of soil and water conservation structures such as check dams, water harvesting structures, and river or stream protection walls
2-9	Improvement of Farm Accessibility and Transportation	DOA, MID	PWD	20	◎	○	○	○	○	◎	○	WUA, VC	Providing necessary access from main road to farmland for better utilization of the potential land and transportation of the agriculture input and output	(1) Preparation of the guidelines for planning, design and construction of the work to be executed by DOA. (2) Upgrading of existing farm access road through provision of side drains and drainage culverts (3) Construction of new farm access road from main road to potential area
2-10	Capacity Development of O&M of Fundamental Infrastructure	MID, DOA	-	5	○	○	○	○	○	○	○	WUA, VC	Capacity development of WUA and VC for operation and maintenance of irrigation facilities and farm access road. The institutional body to support the stakeholders is also established.	(1) Establishment of O&M unit in MID and providing necessary training or study tour for PIM (2) Introduction of WUA registration system in MID (3) Formation of O&M guidelines for irrigation and drainage facilities and farm access road (4) Providing O&M training to WUA and VC to increase the technical, financial and management skills

PROPOSED PROJECTS

No.	Name of Project	Implementing Organisation		Project Period (Yrs.)	Applicable Zone							Target Group	Objective	Activity
		Main	Sub		1	2	3	4	5	6	7			
Programme 3-1 : Enhancement of Market Oriented Farming Technologies and Supporting System														
3-1	Establishment of Market Information Provision System	TCD	Agriculture allied dept.	2	○	○	○	○	○	○	○	Individual farmers, traders, processors and others private sector	Establishment of systematic market information collection and provision system to promote market-oriented agriculture	(1) Establishment of network system of market data collection (2) Provision of equipment such as computers and accessories (3) Capacity development training for the staff to make the system functional
3-2	Production of Import Substitution Crops Throughout the Year	DOH	DOA, KVK, ICAR	5	○	◎	-	○	○	○	◎	Horticultural farmers' organisations and individual farmers	Production of import substitution crops throughout the year and increase in productivity of those crops	(1) Selection of capable horticultural farmers' organisation to be supported (2) 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) Provision of necessary technologies, tool and facilities for production enhancement
3-3	Establishment of Safe and Traceable Crop Certification System	DOH	DOA, KVK, ICAR	5	-	○	-	○	-	-	◎	400 farmers belonging to horticultural farmers' organisations	Production and supply of safe and traceable horticultural crops and adding to the proper value of the products by introducing the certification systems	(1) Establishment of state certification system for Mizoram products and organic products (2) Provision of awareness and training on GAP and organic farming to the advanced producers' group.

PROPOSED PROJECTS

No.	Name of Project	Implementing Organisation		Project Period (Yrs.)	Applicable Zone							Target Group	Objective	Activity
		Main	Sub		1	2	3	4	5	6	7			
Programme 3-2 : Improvement of Present Rigid Supply Chain														
3-4	Establishment of Direct Marketing System	TCD	ID	3	○	◎	-	◎	○	-	○	Farmers' group or any private enterprise	Establishment of direct marketing system in order for producers and consumers in Mizoram to obtain reasonable benefits	(1) Selection of the horticultural producers' group to be supported (2) Create direct sales model utilisation of the roadside shops and sales outlets in the urban area (3) Provide necessary facility and renovation of the building on pilot basis
3-5	Establishment of Direct Supply Chain for Reimported Products	TCD	ID	3	◎	◎	-	○	-	-	○	Farmers' group and/or any private enterprises	Establishment of direct supply chain of reimported products for obtaining reasonable profit and increasing job opportunities	(1) Selection of farmers' group to be supported (2) Provision of technical training on processing of betel nuts and oranges (3) Provision of necessary equipment and facilities to farmers' group on pilot basis
3-6	Development of State Brand and Establishment of Sales Outlets in Other States	TCD	ID	4	◎	◎	-	○	-	-	○	Producers, processors, traders and others	Development of state brand and establishment of sales outlets in other states for expanding sales of agricultural products	(1)Establishment of state brand strategy management and implementation committee (2) Survey for competitive Mizoram products to be supported by the state (3) Design the brand image and specifications of the product (4) Conduct sales campaign in other states (5) Establishment of sales outlets (attached to Mizoram house) in other states

PROPOSED PROJECTS

No.	Name of Project	Implementing Organisation		Project Period (Yrs.)	Applicable Zone							Target Group	Objective	Activity
		Main	Sub		1	2	3	4	5	6	7			
Programme 3-3 : Enhancement of agro-industrialization														
3-7	Development of Horticulture Agro-industry	DOH	DOA , TCD, DOI, KVKs, ICAR, Mizoram University	5	-	-	-	◎	-	-	◎	All stakeholders involved in the horticultural agro-industry	Development of horticulture agro-industries for enhancing the production and for creating new employment	(1) Establishment of steering committee with ICAR, KVK, state departments, Mizoram University, food processor, distributors, producers' group. (2) Enhance the target product or industry such as grapes and wine and floricultural industry. (3) Developing new products such as high-class/high-quality fruits, essential oils, and food with health-giving benefits
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	Development of horticulture agro-industries for enhancing the production and for creating new employment	(1) Promote tree-borne oil production and processing such as Tung and Jatropha with the collaboration of private sector (2)Assess the present capacity of oil palm processing and enhance oil palm production
3-9	Development of Business-oriented Post-harvest Skills	KVK, DOA	DOH, DOF, DOAV, DCRZ	4	◎	◎	○	◎	○	○	◎	Farmers' group, youth group, or any private enterprises	Initiate agriculture-related business through skills development of unemployed youth group and subsistence farmers	(1) Identify capable youth group and/or any private enterprises to be supported (2) Provide business management training to selected group (3) Provide necessary technical training for their business activities (4) Provision of necessary tools, equipment and facilities to the target group on a pilot basis

STAGE-WISE PROJECT IMPLEMENTATION

Stage 1 (1st to 7th year)

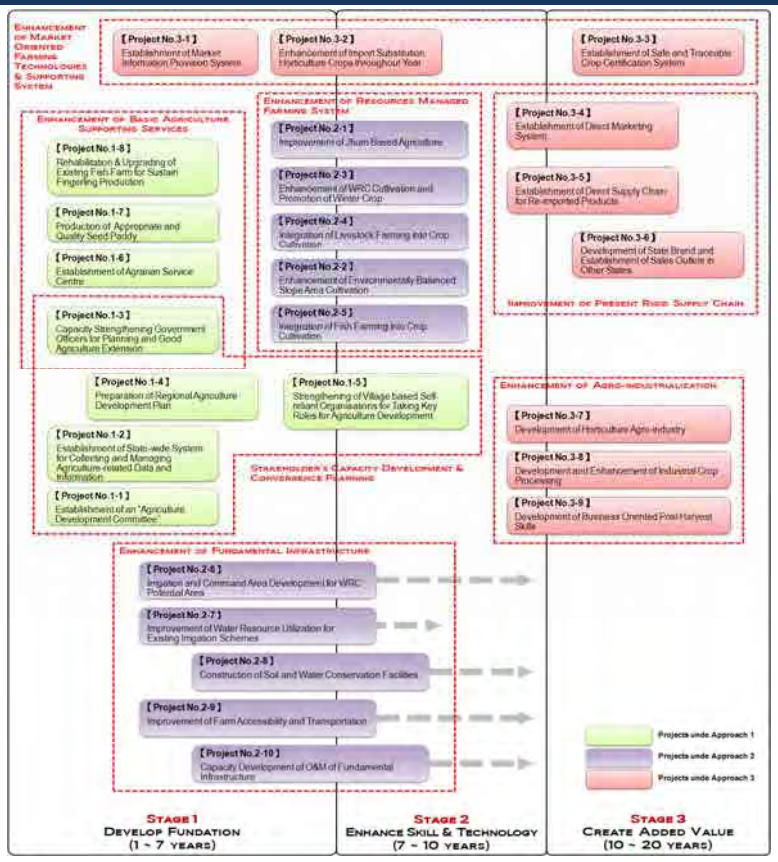
Develop Foundation

Stage 2 (7th to 10th year)

Enhance Skill & Technology

Stage 3 (10th to 20th year)

Create Added Value



NECESSARY BUDGET FOR PROJECT IMPLEMENTATION (1/2)

No.	Project Name	Project Cost (INR. crore)				
		Civil Work	Equipment Machinery	Expert & Training	Others	Total
1-1	Establishment of an "Agriculture Development Committee"	-	-	1.0	0.3	1.3
1-2	Establishment of State-wide System for collecting and managing agriculture-related data and information	-	0.3	7.3	-	7.6
1-3	Capacity Strengthening Government Officers for planning and Good Agriculture Extension	-	-	15.4	-	15.4
1-4	Establishment of agrarian services centre	62.6	17.0	4.4	2.8	86.8
1-5	Production of Appropriate and Quality Seed Paddy	7.0	3.0	22.0	2.0	34.0
1-6	Rehabilitation and upgrading of existing fish farms for sustain fingerlings production	4.9	7.2	1.0	-	12.1
1-7	Preparation of Regional Agriculture Development Plan	-	0.1	32.2	5.5	37.8
1-8	Strengthening of village based self-reliant organisations for taking key roles for agriculture development	-	-	15.6	0.6	16.2
2-1	Improvement of jhum based agriculture	-	-	12.1	1.1	13.2
2-2	Enhancement of environmentally balanced slope area cultivation	-	-	8.9	0.8	9.7
2-3	Enhancement of WRC Cultivation and Promotion of Winter Crop	-	2.0	26.8	0.9	29.7
2-4	Integration of Livestock Farming into Crop Cultivation	-	5.4	9.7	-	15.1
2-5	Integration of fish farming into crop cultivation	-	-	4.1	-	4.1
2-6	Irrigation and Command Area Development for WRC Potential Area	2,1561	-	25.4	-	2,181.5
2-7	Improvement of Water Resource Utilization for Existing Irrigation Schemes	389.7	-	12.3	-	402.0

NECESSARY BUDGET FOR PROJECT IMPLEMENTATION (2/2)

No.	Project Name	Project Cost (INR. crore)				
		Civil Work	Equipment Machinery	Expert & Training	Others	Total
2-8	Construction of Soil and Water Conservation Facilities	9.2	-	6.2	-	15.4
2-9	Improvement of Farm Accessibility and Transportation	387.0	-	39.5	-	426.5
2-10	Capacity Development of O&M of Fundamental Infrastructure	-	-	7.4	-	7.4
3-1	Establishment of Market Information Provision System	-	0.1	1.1	-	1.2
3-2	Production of Import Substitution Crops throughout Year	-	0.1	21.8	16.0	37.8
3-3	Establishment of Safe and Traceable Crop Certification System	-	1.0	15.0	6.1	22.1
3-4	Establishment of Direct Marketing System	-	-	8.2	-	8.2
3-5	Establishment of Direct Supply Chain for Re-imported Products	-	-	10.5	-	10.5
3-6	Development of State Brand and Establishment of Sales Outlets in Other States	-	-	14.3	-	14.3
3-7	Development of Horticulture Agro-industry	-	0.1	17.4	15.2	32.7
3-8	Development and Enhancement of Industrial Crop Production and Processing	0.9	0.7	7.9	2.1	11.6
3-9	Development of Business Oriented Post-harvest Skills	0.4	5.0	3.2	-	8.6
Total		22,422.7	42.0	350.7	53.4	3,462.8

The budget scale of the proposed projects is INR 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

MAJOR DEPARTMENT BASED PROJECT BUDGET

Department	Present Staff (no.) (a)	Proposed Project (Rs., crore)			Capacity of Staff (e)	Ratio (d)/(e)
		Total (b)	Per year (c) = (b)/20	Cost/per year/staff (d) = (c)/(a)		
MID	213	2,600	130	0.61	0.4	152%
DOA	565	632	32	0.06	0.3	20%
DOH	299	110	5.5	0.02	0.1	20%
DOF	101	12	0.6	0.01	0.2	5%
SWCD	298	15	0.8	0.003	0.1	3%
AHVD	131	5	0.4	0.002	0.6	1%
TCD	140	34	1.7	0.012	0.02	60%
KVK	326	21	1.0	0.003	0.03	10%

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.

CSS IN 12TH FIVE-YEAR PLAN AND RELATED PROJECTS

Ministry in charge	Name of CSS	Outlay for Annual Plan 2014/15 (INR crore)	Related Project
Agriculture	National Food Security Mission	7.1	(1-5) 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 (1-5) Production of Appropriate and Quality Paddy Seeds
	RKVY	116.2	(1-5) 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

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

ENVIRONMENTAL AND SOCIAL CONSIDERATION

INSTITUTIONAL ISSUES OF MANAGEMENT OF THE ENVIRONMENT

Environmental Clearance : Environmental clearance is the environmental impact assessment procedure under the provisions of the EIA Notification, 2006 (amended on 1st November, 2009). According to the Indian legislation, small scale irrigation, which is the main 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.

Forestry Clearance : Within the scope of the master plan, development of minor irrigation will cover more than 43,000ha of land by 2035, which is possible only from the loss and conversion of some forest land. The strict application of the forestry clearance will compensate the loss by afforestation and maintain the forest coverage at its initial state. The compensatory afforestation of Jhum forest land for diversion of a forest land that is a government or village forest reserve, in agreement with the Environment and Forest Department, is an alternative to formal forestry clearance that should be considered as much as possible. 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, and compensatory afforestation of a Jhum land is a good alternative both for sustainable agriculture and protection of forest.

Protected Areas and Assets : A protected area is a National Park, a Wildlife Sanctuary, a Conservation Reserve, or a Community Reserve (Wildlife Protection Act 1972). At the exception of the planned extension of the Thorangtlang sanctuary and establishment of the eco-sensitive zones (buffer zones around the protected areas), 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, and the 14 community reserves. These community reserves have not been notified, but they constitute a patchwork of rich biodiversity pockets with a potential of conservation in the future. They individually cover 1.2 km2 to 50 km2, have objectives in the field of conservation of nature or environmental resources, and belong to the jurisdiction of the village authorities.

The location of an infrastructural project like an irrigation scheme should be strictly selected outside the boundaries of the protected areas, and outside the areas having a potential for nature conservation in the future. Similarly, site selection should be done away from the protected monuments or sites notified by the Arts and Culture Department.

INSTITUTIONAL ISSUES OF LAND ACQUISITION, COMPENSATION AND RESETTLEMENT

Background : Given the specific pattern of human occupation of land for housing in Mizoram, with settlements grouped hilltop or hillside and along the crest lines, the infrastructural development projects like minor irrigation schemes in the lowland area should remain away from the housing settlements area, and not affect them, directly or indirectly. A case-by-case analysis of the local conditions is however necessary to identify exceptions and take the appropriate measures for land acquisition, compensation, and resettlement. Encroachment on settlements used for other purposes than housing, like for example the huts often established by the farmers in the cultivation fields, is more likely to occur, as a result of irrigation development.

Land Acquisition and Compensation : The Government of Mizoram is not going to adopt the new Central Government law, the Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act, 2013, which is a comprehensive law intended to integrate compensation, rehabilitation and resettlement measures with land acquisition. In Mizoram, land acquisition and compensation still remain dictated by the provisions of the Land Acquisition Act, 1894, amended in 1984, and the Mizoram Land Acquisition Rules, 2010. While the provisions of the new Central Government law and national policy fit with the requirements of the JICA guidelines for acquisition, compensation, and resettlement, those under the Mizoram legislation show severe gaps for rehabilitation and resettlement.

Rehabilitation and Resettlement : There are very few examples of planned involuntary resettlement in Mizoram. Resettlement has been done in urgency cases after landslide disasters, and by the Environment and Forest Department for management of the Thorangtlang Wildlife Sanctuary. As for the later case, a village has been relocated, and there is a new relocation plan regarding two villages lying in the extension area of the sanctuary. The Environment and Forest Department has its own relocation guidelines, based on the principles of the National Rehabilitation and Resettlement Policy, 2007. The scope of the national policy and its provisions are perfectly consistent with the requirements of the JICA guidelines. In the absence of legal provisions specific to Mizoram, rehabilitation or resettlement of people in a village community should be conducted in accordance with the rules given by the National Rehabilitation and Resettlement Policy, 2007.

ASSESSMENT OF IMPACTS AND MITIGATION MEASURES

Overview of Impact : The assessment of impacts of the master plan is based on the evaluation of the strategic directions and objectives of the programmes. Impacts may be negative or positive. 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 indigeneous people. The negative impacts concern only water quality, water use, and rivers habitats. They are ranked as small to moderate.

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

ASSESSMENT OF IMPACTS AND MITIGATION MEASURES

Mitigation Measures : The mitigation measures at planning and operation stages are summarized below. Their strict application will minimize the negative impacts and maximize the positive impacts

Category of measure	Measures	Issues and main programmes of concern
Engineering design	Proper hydraulic design of each irrigation scheme in order to guarantee that the river flow downstream will be sufficient to cover the needs at all times	WATER USE / Programme 2-2
	Proper hydraulic design for sustainable use of groundwater within the capacity of natural replenishment *The use of groundwater as a supplementary source of irrigation should be restricted to minimal use*	WATER USE / Programme 2-2
Awareness heightening	Promotion of the organic farming system *Action inherent to the implementation of programmes*	WATER QUALITY / Programmes 2-1,3-1
	Awareness heightening campaigns and training for the proper handling and use of fertilizers and pesticides	WATER QUALITY / Programmes 2-1, 3-1
Monitoring	Monitoring the use of agrochemicals and the quality of surface water *In case of use of agrochemicals*	WATER QUALITY / Programmes 2-1, 3-1
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 / Programmes 2-2, 3-1
Implication of stakeholders	Coordination with water users associations *To identify potential conflicts in water use*	WATER USE / Programme 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 preserve the 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 protected areas and on areas with potential for nature conservation*	RIVER HABITATS / Programmes 2-2, 3-1
	Coordination with the village Biodiversity Management Committees *To identify the nature conservation needs and find the most appropriate location of the development projects*	BIOLOGICAL DIVERSITY / Programmes 2-2, 3-1
	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 / Programmes 2-2, 3-1
	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 / Programmes 2-2 BIOLOGICAL DIVERSITY / Programmes 2-2, 3-1

DPR PREPARATION GUIDELINE

Background of Preparation of Guideline

- *However the inventory survey carried out in October 2013 to February 2014 shows that 49% of the created irrigation potential under minor irrigation facilities is not in use and only 7 % of the facilities is properly maintained by established Water Users' Association (WUA).*
- *Analysing the present situation of the minor irrigation scheme, the State government requested JICA Study Team to improve the procedure for preparation of Detailed Project Report (DPR) with field verification*

Procedure	Points to be Improved
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.
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.
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.
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.
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.

Main Points for Improvement

Standardization of Procedure

- *Project application*
- *Selection of candidate project*
- *Way of survey*
- *Design, cost estimation and evaluation*

Incorporate beneficiary (WUA), other departments knowledge and idea (DOA, DOH etc.) into planning

- *Selection of candidate project*
- *Preparation of proposed cropping calendar*

Identify the responsibility and mandate in the planning stage for project management

- *Awareness of WUA roles and responsibility*
- *Preparation of agriculture action plan to materialize the proposed cropping calendar*
- *Preparation of operation and maintenance plan of irrigation facilities*
- *Final consensus building*

Source JICA Study Team

OVERALL PROCEDURE

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 Level	MID, DOA, DOH 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	-

CONCLUSION AND RECOMMENDATION

Recommendation (1/2)

Utilisation and Implementation of Mater 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

Recommendation (2/2)

Utilisation and Implementation of Mater Plan

- *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*

Utilisation 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*

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

Final Report
Summary

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Abbreviations

AAU	Assam Agriculture University
AAY	Antyodaya Anna Yojana
ADB	Asian Development Bank
AHVD	Animal Husbandry and Veterinary Department
AI	Artificial Insemination
AIBP	Accelerated Irrigation Benefits Programme
AMFU	All Mizoram Farmers Union
AMSL	Above Mean Sea Level
AP	Andhra Pradesh
APEDA	Agricultural Processed Food Product Export Development Authority
APMC	Agricultural Produce Marketing Committee
ASEAN	Association of South East Asian Nations
ASHA	Accredited Social Health Activist
ASI	Archeological Survey of India
ATMA	Agriculture Technology Management Agency
BAFFACOS	Bamboo Flowering & Femine Combat Scheme
BCAM	Brooms Cultivators Association of Mizoram
BCTs	Border Trade Centres
BDR	Business Development Resource
BHP	Brake Horse Power
BIMSTEC	Bay of Bengal Initiative for Multi-Sectoral Technical and Economic Cooperation
BMMU	Block Mission Management Unit
BOT	Build Operate Transfer
BPL	Below Poverty Line
BRGF	Backward Regions Grant Fund
BRO	Border Roads Organisation
BSNL	Bharat Samchar Nigam Ltd.
CAD	Command Area Development
CAU	Central Agricultural University
CB	Commercial Bank Development Action Plan
CCA	Cultivated Command Area
CCF	Chief Conservator of Forest
CDAR	Community Development Action & Reflection
CDP	Catalytic Development Programme
CIF	Community Investment Fund
CM	Chief Minister
C-NES	Center for North East Studies & Policy Research
CONCOR	Container Corporation of India
CPI	Consumer Price Index
CRRI	Central Road Research Institute
CSB	Central Silk Board
CSIR	Council of Scientific and Industrial Research
CSO	Central Statistical Organization
CSS	Centre for Susutainable Sysytem
CSS(s)	Centrally Sponsored Scheme(s)
CWC	Central Water Commission
DAP(s)	District Agriculture Plan(s)
DCP	District Credit Plan
DCRR	Department of Cooperative Revival and Reforms
DDP	Desert Development Programme
DEDS	Dairy Entrepreneurship Development Scheme
DEF	Department of Environment & Forest
DES	Department of Economics & Statistics
DGBR	Directorate General of Border Roads
DMI	Directorate of Marketing & Inspection

DMMU	District Mission Management Unit
DMRD	Disaster Management & Rehabilitation Department
DOA	Department of Agriculture
DoES	Department of Economic & Statistics
DOF	Department of Fisheries
DOH	Department of Horticulture
DoLR	Department of Land Resources
DONER	Development of North Eastern Region
DOPT	Department of Personnel and Training
DOS	Department of Sericulture
DPAP	Drought Prone Areas Programme
DPC	District Planning Committee
DPR(s)	Detailed Project Report(s)
DRDA	District Rural Development Agency
DRIP	District Rural Industries Project
DSWC	Department of Soil & Water Conservation
EDC	Eco-Development Committee
EE	Executive Engineer
EIA	Environment Impact Assessment
EL	Elevation
EM	Effective Micro Organism
ERM	Extension, Renovation and Modernization
ES	Epidemiological Section
FAO	Food and Agriculture Organization of the United Nations
FCI	Food Corporation of India
FCR	Feed Conversion Ratio
FDB	Fisheries Development Board
FDI	Foreign Direct Investment
FEO	Fisheries Extension Officer
FFDA	Fish Farmers Development Agency
FMP	Flood Management Programme
FRBM	Fiscal Reform and Budget Mangernent
FSF(s)	Fish Seed Farm(s)
FSSAI	Food Safety and Standards Authority of India
FTP	Foreign Trade Policy
GAP	Good Agricultural Practices
GCA	Gross Command Area
GDP	Gross Domestic Products
GFD	Gross Fiscal Deficit
GIS	Geographic Information System
GLC	Ground Level Credit
GNP	Gross National Product
GoI	Government of India
GOM	Government of Mizoram
GPS	Global Positioning System
GSDP	Gross State Domestic Product
HCP	Hnam Chhantu Pawl
HDI	Human Development Index
HDO	Horticulture District Officer
HMNEH	Horticulture Mission for North East & Himalayan States
HP	Horse Power
HSSLC	Higher Secondary School Leaving Certificate
IBRD	International Bank for Reconstruction and Development
ICAR	Indian Council of Agricultural Research
ICMR	Indian Council of Medical Research
ICP	Integrated Check Point
ICRISAT	International Crops Reserch Istitute for the Semi-Arid Tropics

ICT	Information and Communication Technology
ID	Industry Department
IDA	International Development Association
IDDP	Intensive Dairy Development Project
IEC	Information, education and Communication (activities)
IEE	Initial Environmental Examination
IFAD	International Fund for Agricultural Development
IFFCO	Indian Farmers Fertiliser Cooperative Limited
IFS	Indian Forest Service
IGNOU	Indira Gandhi National Open University
IL&FS	Infrastructure Leasing & Financial Services
IMF	International Monetary Fund
IMR	Infant Mortality Rate
INM	Integrated Nutrient Management
INR	Indian Rupee
IPC	Irrigation Potential created
IPM	Integrated Pest Management
IRs	Indian Rupee
ISIA	Initial Social Impact Assessment
ISO/HACCP	ISO/Hazard Analysis & Critical Control Point
ISOPOM	Integrated Scheme of Oilseeds, Pulses, Oil palm and Maize
ISRO	National Space Reserch Organization
IT	Information Technology
ITTC	Integrated Textiles Training Centres
IUCN	International Union for Conservation of Nature and Natural Resources
IWAI	Inland Waterway Authority of India
IWDP	Integrated Wastelands Development Programme
IWMP	Integrated Watershed Management Project
IWT	Inland Water Transport
JFMCs	Joint Forest Management Committees
JICA	Japan International Cooperation Agency
JLGS	Joint Liability Group
JNNURM	Jawaharlal Nehru National Urban Renewal Mission
KCC(s)	Kisan Credit Card(s)
KVK(s)	Krishi Vigyan Kendra(s)
KW	Kilo Watt
LCS	Land Customs Stations
LFPR	Labour Force Participation Rate
LPG	Liquified Petroleum Gas
LRSD	Land Revenue & Settlement Department
LSCs	Land Settlement Certificates
LWA	Lai Women Association
MAHCO	Mizoram Apex Hand loom and Handicraft Cooperative Society
MAHFED	Mizoram State Agriculture, Horticulture and Marketing Cooperative Federation Ltd.
MAMCO	Mizoram Agriculture Marketing Corporation
MASCOS	Mizoram Sericulture Farming Cooperative Society Ltd
MBA	Master of Business Administration
MCAB	Mizoram Co-operative Apex Bank Ltd.
MGNREGA	Mahatma Gandhi National Rural Emploment Guarantee Act
MHIP	Mizoram Hmeichhe Insuihkhawm Pawl
MI	Minor Irrigation
MICLUN	Mizoram Cultivator and Labour Union
MID	Minor Irrigation Department
MIFCO	Mizoram Food and Allied Industries Corporation
MIFPROY	Mizoram Food Processing Industry

MIGA	Mizoram Iskut (Squash) Growers Association
MIP	Mizoram Indodelhna Project
MIRSAC	Mizoram Remote Sensing Application Centre
MIS	Market Intervention Scheme
MIZOFED	Mizoram State Cooperative Marketing & Consumer Federation Ltd
MMR	Maternal Mortality Rate
MNES	Ministry of Non-Conventional Energy Sources
MNRES	Ministry of New and Renewable Energy Sources
MOEF	Ministry of Environment and Forest
MoFPI	Ministry of Food Processing Industry
MoRD	Ministry of Rural Development
MoU	Memorandum of Understanding
MOWR	Ministry of Water Resources
MPZA	Mizo Panhnah Zuar Association
MRB	Mizoram Rural Bank
MSc	Master of Science
MSCU	Mizoram State Cooperative Union
MSL	Mean Sea Level
MSME(s)	Micro, Small and Medium Enterprise(s)
MSTL	Mobile Soil Testing Laboratory
MTZA	Mahni Thlai Zuar Association
MULCO	Mizoram Multi-Commodity Producers Cooperative Union Ltd.
MUP	Mizoram Upa Pawl
MW	Mega Watt
MZTA	Mahni Thlai Zuar Association
NABARD	National Bank for Agriculture and Rural Development
NCDC	National Cooperative Development Corporation
NDC	National Development Council
NDDB	National Dairy Development Board
NE	North East
NEC	North Eastern Council
NEDFI	North Eastern Development Finance Corporation Ltd.
NEEPCO	North Eastern Electric Power Corporation
NEHU	North Eastern Hill University
NERAMAC	North East Regional Agricultural Marketing Corporation
NFDB	National Fisheries Development Board
NFSM	National Food Securit Mission
NGO(s)	Non Governmenatal Organisation(s)
NH	National Highway
NHAI	National Highway Authority of India
NHDP	National Highway Development Programme
NIEPA	National Institute of Education Planning & Administration
NIMZs	National Investment and Manufacturing Zones
NLCPR	Non Lapsable Central pool of Resources
NLUP	New Land Use Poilcy
NMFP	National Mission on Food Processing
NMMI	National Mission on Micro Irrigation
NMMP	National Mission on Medicinal Plant & Aromatic Plants
NMMU	National Mission Management Unit
NMPS	National Mission for Protein Supplements
NPBBD	National Programme for Bovine Breeding and Dairy
NPCBB	National Project for Cattle and Buffalo Breeding
NPL	Non-performing Loan
NPMSF	National Project on Management of Soil Health & Fertility
NRAA	National Rainfed Area Authority
NRCS	National Sensing Centre
NRHM	National Rural Health Mission

NRLM	National Rural Livelihood Mission
NSDP	National State Domestic Product
NSIC	National Small Industries Corporation
NSS	National Social Service
NSSO	National Sample Survey Organization
NTDC	North Eastern Tourism Development Corporation
NTFR	Non timber Forest Resources
NVIUC	National Vegetable Initiative For Urban Cluster
NW	National Waterway
NWC	National Water Policy
NWDPRA	National Wateshed Development Project for Rainfed Areas
ODA	Official Development Assistance
ONGC	Oil and Natural Gas Corporation
OPAE	Oil Palm Area Expansion Programme
PAC	Potential Area Connectivity
PCCF	Principal Chief Conservator Forest
PDS	Public Distribution System
PED	Power and Electric Department
PGCIL	Power Grid Corporation of India Ltd.
PHC	Primary Health Centres
PHED	Public Health Engineering Department
PIA(s)	Project Implementation Agency(ies)
PIGFED	Mizoram Pig Producers Cooperative Federation Ltd
PIM	Participatory Irrigation Management
PLP(s)	Potential Linked Credit Plans
PLs	Prawn Post-larvaes
PMGSY	Pradhan Mantri Gram Sadak Yojana
PMRY	Prime Minister's Rojgar Yojana
PP	Plant Protection
PPID	Planning and Programming Implementation Departmen
PPP	Public Private Partnership
PRRS	Porcine Reproductive And Respiratory Syndrome
PS	Power Station
PSE(s)	Public Small Enterprise(s)
PU	Physical Units
PURA	Provision of Urban Amenities in Rural Areas
PWD	Public Works Department
RBI	Reserve Bank of India
RCCF	Regional Chief Conservator Forest
RCF	Regional Conservator Forest
RD	Rural Development
RDD	Rural Development Department
REC	Regional Empowered Committee
REDP	Rural Entrepreneurship Development Programme
RES	Rinderpest Eradication Section
RFD	Results-Framework Document
RGGVY	Rajiv Gandhi Grameen Vidyutkaran Yojna
RIDF	Rural Infrastructure Development Fund
RKVY	Rashtrya Krishi Vikas Yagona
RMIS	Rationalization of Minor
RPA	Irrigation Statistics
RPI	Retail Price Index
RRL	Regional Research Laboratory
RSVY	Rashtriya Sam Vikas Yojana
RVP	River Valley Project
SAG	State Advisory Group
SAMIS	Service Area Monitoring and Information System

SAP	State Agriculture Plan
SARDP-NE	Special Accelerated Road Development Programme for North East
SAUs	State Agricultre Universities
SCERT	State council of Education Research & Training
SD	Sericulture Department
SDO	Sub Divisional Officer
SEAC	State Level Expert Appraisal Committee
SEIAA	State Level EIA Authority
SEO	Sericulture Extension Officer
SFP	The State Focused Paper
SGSY	Swarnajayanti Gram Swarojgar Yojana
SHG(s)	Self Help Group(s)
SHP	Strategic Healthcare Programme
SI	Small Imdustries
SIA	Social Impact Assessment
SIDBI	Small Industries Development Bank of India
SJSRY	Swarna Jayanti Sahari Rojgar Yajana
SLNAs	Supporting State Level Nodal Agencies
SME(s)	Small and Medium Enterprise(s)
SMMU	State Mission Management Unit
SNF	Solid Not Fat
SOEs	State Owned Enterprises
SPCB	State Pollution Control Board
SRI	System of Rice Intensification
SSA	Sarva Shiksha Adhiyan
SSI	Small Scale Industry
STI	Sericulture Training Institute
SVFA	Senior Veterinary Field Assistant
SWCD	Soil and Water Conservation Department
SWRTO	Small Water and Road Transport Operator
TCD	Trade and Commerce Department
TCS	Tata Consultancy Services
TEV	Techno Economic Viability
TRA	Tea Research Association
TRIFED	Tribal Cooperative Marketing Development Federation of India Limited
TTAADC	Tripura Tribal area Autonomous District Council
UN	United Nation
UNDP	United Nations Development Programme
UPASI-TRI	UPASI Tea Research Foundation
US	United States
UT(s)	Union Territory(ies)
VA	Voluntary Agency
VC(s)	Village Council(s)
VDBs	Village Development Board
VDC	Village Development Committee
VECs	Village Education Committees
VFA	Veterinary Field Assistant
VIP	Very Important Person
VLMC	Village Level Momtoring Committee
VOs	Voluntary Organisations
VVV	Vikas Volunteer Vahini
WAPCOS	Water and Power Consulting Services (India) Limited
WC(s)	Watershed Committee(s)
WCDC	Watershed Cell cum Data Centre
WDPSCA	Watershed Development Programme in Shifting Cultivation Area
WDT	Watershed Development Team

WFP	World Food Program
WMP	Water Management Programme
WPI	Wholesale Price Index
WRC	Wet Rice Cultivation
WTO	World Trade Organization
WUA	Water Users' Association
YCA	Young Chakma Association
YLA	Young Lai Association
YMA	Young Mizo Association
ZAGS	Zo-Anthurium Growers Society
ZEP	Zopar Export Private Limited
ZIDCO	Zoram Industrial Development Corporation Limited
ZOFISFED	Mizoram Cooperative Fish Farming Marketing and Processing Federation Ltd
ZOHANDCO	Mizoram Handloom and Handicraft Development Co-operation Ltd.

Measurement Units

Area

cm^2 = Square-centimetre(s)
m^2 = Square-metre(s)
km^2 = Square-kilometre(s) (1,000,000 m^2)
ha = Hectare(s) (10,000 m^2)
acre = Acre(s) (4,046.8 m^2 or 0.40468 ha.)

Length

mm = Millimetre(s)
cm = Centimetre(s)
m = Metre(s)
km = Kilometre(s) (1,000 m)

Currency

US$ = United State Dollars
US$1.0 = INR 61.5 = Yen 117
(as of December 2014)
Yen = Japanese Yen
INR = Indian Rupee

Volume

cm^3 = Cubic-centimetre(s)
m^3 = Cubic-metre(s)
L = Litre(s) (1,000 cm^3)
MCM = Million Cubic Metre (s)

Weight

g = Gram(s)
kg = Kilogram(s) (1,000 gr.)
tonne = Metric Tonne(s) (1,000 kg)
t = Metric Tonne(s) (in Table)

Time

sec = Second(s)
min = Minute(s) (60 sec.)
hr = Hour(s) (60 min.)

Indian Numbering

Lakh(s) = Hundred Thousand (100,000)
Crore(s) = Ten Million (10,000,000) or 100 lakhs

Chapter 1 Introduction

1.1 General

This is Final Report prepared in accordance with the record of discussions on the Study on Development and Management of Land and Water Resources for Sustainable Agriculture in Mizoram in the Republic of India (hereinafter called the "Study"), between the Japan International Cooperation Agency (JICA) and the Minor Irrigation Department (MID), State Government of Mizoram (GoM), Republic of India.

1.2 Background and Objectives of the Study

In Mizoram, 60% of the population is engaged in agriculture even though the cultivable land is extremely limited as 70% of the land is located in the hilly area with more than 35° slope. As in many hilly areas in the region, a large portion of the farming population has traditionally been engaged in *jhum* cultivation. However, the rapid increase in the population has led to the shortening of the cultivation cycle, which in turn prevents the fallow land to regain its productivity. The practice also contributes to the deforestation of the area.

While the topography of the state and poor transportation infrastructure prevent the development of other economic sectors, agriculture faces problems as well, due to competition against cheaper food items from other states. Mizoram produces only 30% of its food consumption. The State of Mizoram thus places importance on the improvement of food self-sufficiency through agricultural development.

Rice is widely consumed as a staple food in Mizoram. It is the key to improving food security of the state. Currently, 70% of the state's rice is produced through *jhum*. The state government is fully aware that this practice should gradually shift to settled agriculture through proper land development and introduction of irrigation systems for the improvement of the state's agricultural productivity.

Given this background, the state government initiated a multipurpose development project named as the New Land Use Policy Project (NLUP, 2009-2013) in order to improve household income by reducing *jhum* cultivation for the protection of the forests and promotion of alternative livelihoods. Although it is expected that NLUP is implemented with the cooperation of various departments of the state government, in reality, each department operates independently of its counterpart in the central government. Thus, this project is carried out without a holistic analysis of the current status of agriculture in the state, and overall strategy for the growth of the sector.

Mizoram's annual 2,600 mm rainfall is much higher than in other states of the country. Efficient utilization of water resources thus should lead to agricultural productivity. However, as discussed above, because of the hilly geographical conditions of the state, irrigation rate is recorded as low as 10%, which is the lowest in the country. In addition, the existing irrigation schemes are not in full-scale use without proper agricultural production and marketing plan of the beneficiaries and poor maintenance of the facilities. Due to inadequacy in planning, the state does not have a long-term agricultural development master plan and its detailed project report (DPR) for irrigation only includes technical matters, without a proper plan for farming program and economic benefits, which should cover market access or channelling.

As requested by the central government, JICA has conducted a detailed survey for the formulation of further agricultural projects in Mizoram, from February to March 2013. The major findings of the Study are as follows:

i) In the process of DPR preparation, the design does not necessarily give due consideration to the climate and topography of Mizoram, which is characterized by heavy rainfall that often destroys the infrastructure or causes water stagnation, in turn preventing the efficient utilization of water. Hence, such a design is not suited for minor irrigation in hilly areas, common in Mizoram.
ii) In order to improve the capacity to formulate proper DPR, a holistic approach is required. The report should include clauses for technical upgrade, detailed plans for improving

farming programs with cooperation of concerned departments, cost and benefit estimates, and plans for maintaining the structures by the beneficiaries. The current DPR does not discuss the management and maintenance of the project structures, also the coordination among various departments for agricultural programs.

Based on these findings, the Minor Irrigation Department, Agriculture Department, Horticulture Department, and Soil and Water Conservation Department, have come to understand that there is a need for a concerted cooperation among them in order to improve productivity and promote the development of DPR.

The objectives of the Study are as follows: (a) to rely its basis on the overall analysis of the current status and development potential of the land and water resources and socioeconomic situations of agriculture in Mizoram; (b) to formulate a master plan for the sustainable improvement of the livelihood of farmers that is suitable for the diversity of the state; and (c) to create and assess the validity of the DPR formulation model for the participatory minor irrigation project and model DPR, through lateral participation of various agricultural departments and farmers. These objectives and their expected outcome are summarized below:

1.3 Study Area

The Study covers all districts of the State of Mizoram, which has an area of 21,087 km^2.

1.4 The JICA Study Team and its Counterpart

The JICA Study Team is composed of 12 experts having different expertise in the field of agricultural development. Nine departments in GoM involved in the Study nominated their counterpart personnel, as well as, the nodal officers who will be the focal point of the respective departments and the JICA Study Team. The members of the JICA Study Team and the nominated counterpart personnel and nodal officers are shown in Table 1.4.1 and Table 1.4.2, respectively.

Table 1.4.1 Members of the JICA Study Team

Position	Name
Team Leader/Rural Development Planning 1	Shigeki Yamaoka
Sub-Leader/Rural Development Planning 2	Yutaka Murai
Irrigation/Water Resource Development Planning/Hydrology	Shingo Ueno
Agriculture/Paddy Production	Takuya Saisho
Horticulture/ Farmland Conservation	Katsuyuki Yamamoto
Facility Planning/Cost Estimates/Civil Work Planning	Tatsuhiko Hiraiwa
Land Utilization Planning/ Database/GIS	AW. Al-Hanbali
Agro Economy/Marketing/Post-Harvest Processing	Akeshi Mori
Rural Society/Rural Organizations/Rural Finance/Economic Analysis	Junko Saikawa
Training/Coordination/Land Utilization Planning/GIS	Takahisa Amano
Environmental Social Consideration	C.Rouviere
Inland Fishery	K. Allapichay

Source: JICA Study Team

Table 1.4.2 List of Nodal Officers and Counterpart Personnel

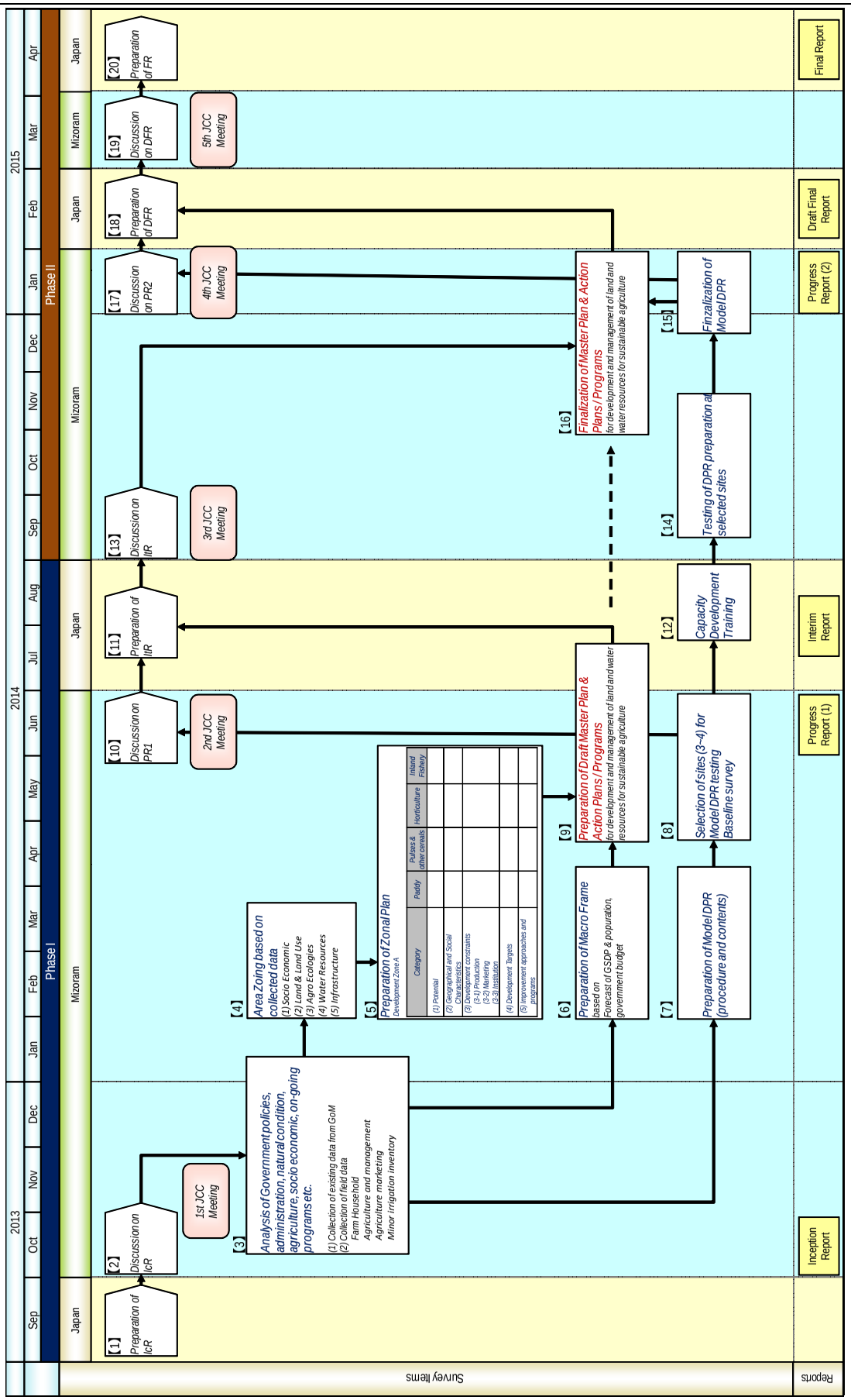
Department	Nodal Officer		Counterpart Personnel	
	Name	Position	Name	Position
Minor Irrigation Department	Er. Laldingliana	Superintending Engineer (SE) (W&D)	Er. K. Hamlet Er. Lalremruata Ngurte	Executive Engineer (EE) (Work) Junior Engineer
Agriculture Department (CH)	Mr. C.Lalthlamuana	Deputy Director, Soil Survey	Mr. P. Vanlalngheta	Subject Matter Specialist (SMS) Agro
Horticulture Department	Mr. Lalliankima	Joint Director	Mr. Vanlaruata Chenkual	Deputy Director
Soil and Water Conservation	Mr. Hualthanga Chhakckhuak	Joint Director	Mr.Vanlalmuanpuia	Assistant Soil Conservation

Department	Nodal Officer		Counterpart Personnel	
	Name	Position	Name	Position
Department				Engineer
Fisheries Department	Mr. S. P. Singh	DFDO, Aizawl	Mr. Lalmalsawma	Fisheries Extension Officer (FEO)
Animal Husbandry and Veterinary Department	Dr. Lalremliana	Deputy Director	Dr. P. C. Lalsangzuala	Vety Officer
Environment and Forest Department	Mr. V. Lalfala, IFS	DFO, Aizawl	-	-
Rural Development Department	Mr. Robert C. Lalhmangaiha	Deputy Director (Gen)	Ms. Lalhmangaihzuali	Junior Project Office
Sericulture Department	Mr. Lalrinmawia	Joint Director	Ms. P. Lalmuansangi	Sericulture Promotion Officer
Ministry of Water Resources, Government of India	Mr. Maddali Ram Jogesh	Deputy Secretary (EA)	-	-

Note: CH:Crop Husbandry
Source: JICA Study Team

1.5 Work Procedure and Outline

The Study was carried out for 20 months from September 2013 to April 2015. The Study was divided into two phases, namely: Phase-1 from September 2013 to August 2014 and Phase-2 from September 2014 to April 2015. The objectives of Phase-1 are mainly the preparation of the master plan for development, and the management of land and water resources for sustainable agriculture while Phase-2 targets the improvement of DPR procedure and content. The workflow is shown in Figure 1.5.1.



Source: JICA Study Team

Figure 1.5.1 Workflow

1.6 Technology Transfer

The technology transfer from the JICA Study Team members to counterpart personnel was carried out according to the technology transfer plan discussed and agreed upon in the inception meeting as shown in Table 1.6.1.

Table 1.6.1 Technology Transfer Plan

Categories		Content	Method	Target
Formulation of a master plan		Data organization and analysis with Geographic Information System (GIS) Water resource/hydrological analysis Development potential evaluation and developmental zoning Macro frame formulation (development goal, strategy, and scenario) Environmental social consideration	Discussion and sharing of knowledge through day-to-day communication	MID and other relevant agencies
DPR formulation process improvement model	Outside Mizoram	Participatory planning Participatory irrigation management and maintenance Water users association and management	Field visits and lectures in Japan or other country	MID and other relevant agencies
	Within Mizoram	Agricultural planning Water demand estimation, water budget analysis, and irrigation planning Construction plan, design, and budget Maintenance planning Cost-benefit analysis and economic evaluation Environmental and social consideration	Discussion and sharing of knowledge through day-to-day communication	MID and other relevant agencies

Source: JICA Study Team

1.7 Joint Coordination Committee (JCC)

The joint coordination committee (JCC) was established to provide coordination among different departments and to give the necessary words of guidance to the JICA Study Team for the smooth and effective implementation of the Study. The JCC was chaired by Ms. L. Tochhong, Chief Secretary, and each related department head was nominated as a member of JCC as shown in Table 1.7.1. Five JCC meetings were scheduled during the study period in the months of October 2013, June and September 2014, and January and March 2015.

Table 1.7.1 Members of the Joint Coordination Committee

Title	Name	Position	Organization
Chairman	Ms. L. Tochhong (1^{st} – 3^{rd} meeting) Mr. Lal Malsawma (4^{th} – 5^{th} meeting)	Chief Secretary	GoM
Vice Chairman	Mr. Lianchungnunga	Secretary to MID	GoM
Project Director	Mr. Lalthanliana	Chief Engineer	MID
Member	Mr.Ngunlal Chinzah	Principal Adviser	Planning and Programme Implementation Department
	Mrs.L.N.Tohchhawng	Commissioner	Finance Department
	Dr. C. Lalzarliana	Director(Crop Husbandry)	Agriculture Department

Title	Name	Position	Organization
	Mr. H.Lalthanpuia	Director (Research and Education)	Agriculture Department
	Mr. R.Zotawna	Director	Horticulture Department
	Er. Laldingliana	S. E.	Minor Irrigation Department
	Dr. Jerome Rokima	Director	Soil and Water Conservation Department
	Mr. M.A.Razi	Director	Fisheries Department
	Dr. L.B. Sailo	Director	Animal Husbandry and Veterinary Department
	Mr. S.S. Garbyal, IFS	Principal Chief Conservator of Forests	Environment and Forest Department
	Mr. Lianhmingi Pachuau	Director	Rural Development Department
	Mr. D. Engzanang	Director	Sericulture Department
	Mr. Maddali Ram Jogesh	Deputy Secretary	Ministry of Water Resources, Government of India
	Ms. Yu SASAKI Mr. Akihiro KIMURA	Lead Administration Officer Representative	JICA

Source: JICA Study Team

Chapter 2 National Background

2.1 Overview of the National Economy

The Indian economy achieved a gross domestic product (GDP) growth rate of above 9% for three consecutive years i.e., 2005/06, 2006/07, and 2007/08. After the global financial crisis in 2008/09, it made a V-shaped recovery. However, the growth rates from 2011/12 to 2012/13 have slowed down due to several factors such as slowed consumption demand caused by strong inflation and powerful monetary response, slowed corporate and infrastructure investment, and a slowing global economy. There are prospects that GDP growth rate would moderately recover in 2013/14 due to monetary easing measures by the Reserve Bank of India (RBI), efforts of the Government of India (GoI) for economic reform, and moderate recovery of global economy. Regarding GDP shares by industries, while the shares of agriculture, forestry, and fishery have been decreasing, the service industries (Information Technology (IT), communication, transportation, financing, real estates, etc.) have been in an upward trend.

Table 2.1.1 GDP Shares (at Constant 2004-05 Prices) by Industry

billion INR

	Industry	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13
1	Agriculture, forestry & fishing	5,654	5,945	6,192	6,551	6,557	6,610	7,135	7,395	7,536
	Growth rate (%)		5.1	4.2	5.8	0.1	0.8	7.9	3.6	1.8
2	Mining & quarrying	850	861	926	960	981	1,038	1,089	1,082	1,076
3	Manufacturing	4,532	4,990	5,705	6,291	6,563	7,304	8,015	8,230	8,316
4	Electricity, gas & water supply	627	671	734	794	831	882	928	988	1,029
5	Construction	2,289	2,581	2,848	3,155	3,323	3,544	3,907	4,124	4,303
6	Trade, hotels & restaurant	4,773	5,354	5,949	6,550	6,922	7,470	8,326	8,844	9,653
7	Transport, storage & communication	2,504	2,800	3,152	3,545	3,929	4,509	5,131	5,559	5,667
8	Financing, insurance, real estate & business services	4,372	4,923	5,611	6,281	7,036	7,719	8,496	9,488	10,307
9	Community, social & personal services	4,114	4,404	4,528	4,839	5,445	6,084	6,344	6,725	7,166
	GDP Total at cost 2004-05 prices	29,715	32,531	35,644	38,966	41,587	45,161	49,370	52,436	55,054
	Growth rate (%)		9.5	9.6	9.3	6.7	8.6	9.3	6.2	5.0

Note: Figures in the GDP for 2010-11, 2011-12, and 2012-13 are 2nd revised estimates, 1st revised estimates, and advanced estimates, respectively.
INR; Indian Rupee
Source: Economic Survey 2012-13, Government of India, and Central Statistics Office.

2.2 Overview of Agriculture Sector in India

Shares of agriculture and allied activities to GDP at constant (2004-05) prices have been shrinking year by year and it accounted for only 13.7% in 2012/13. Moreover, the growth rates are lower than those of the total GDP at constant prices. However, its role in the country's economy is still important in terms of employment and food security. Employment in the agriculture sector still accounted for 51% (2010), while those in the services and industry sectors accounted for 27% and 22%, respectively.

There was an observed significant progress towards increasing production, yield levels, and crop diversification during the last three decades. The 1980-90 period witnessed relatively higher growth in terms of production and yield in major crops compared to the 1990-2000 period except for coarse cereals. Yield levels significantly improved for cotton, pulses, and coarse cereals during 2000-12. As of 2011/12, rice still occupied the largest portion of cultivated areas (44 million ha), followed by wheat (29.9 million ha) and coarse cereals (26.4 million ha). Production of rice, wheat, and coarse cereals achieved 105 million t, 95 million t, and 42 million t, respectively in 2011/12.

The GoI had strongly controlled imports and exports of agricultural products in the 1990s. Quantitative restrictions on their imports were alleviated in the 1990s and completely eliminated in April 2001. Tariff rates for imported products have been periodically adjusted in order to stabilize domestic prices of agricultural products. Quantitative restrictions on exports of agricultural products

were also eliminated in the late 1990s. However, quotas have been imposed to meet the objectives of domestic price policies. Top five imports in 2011/12 are 1) vegetable oils, 2) pulses, 3) cashew nuts, 4) fruits and nuts, 5) sugar, while top five exports are 1) cotton, 2) marine products, 3) guargum meal, 4) rice basmati, 5) meat.

GoI has implemented agricultural policies on pricing, distribution and agricultural inputs. Under the public distribution system (PDS), the government procures agricultural crops such as rice and wheat at the minimum support prices (MSP), and store and distribute them to consumers through state governments at subsidized prices. 40.13 million tonnes of rice (out of 103 million tonnes production) and 38.15 million tonnes of wheat (93.9 million tonnes of production) were procured by the government in 2011/12. The government has subsidized chemical fertilizers, electricity, and irrigation water through several schemes aiming for an increased agricultural production. Policies related to agricultural finance and insurance, technology development and extension have also been implemented.

2.3 Administrative and Financial Mechanisms between the Union and State Government

2.3.1 Distribution of Authorities and Administration

India is a federal republic having 29 states and seven union territories (UTs). Though it adopts relatively centralized system, the states have wide-range legislative powers. Distribution of legislative powers between the union and the states are stipulated in Schedule 7, Article 246 of the Indian Constitution as shown in Table 2.3.1.

Powers, authority, and responsibilities of local governments (municipalities and *panchayats*) were stipulated in the Constitution of India due to its 73rd and 74th Amendments in 1992. However, their practical responsibilities and relations to the state government differ depending on the states.

Table 2.3.1 Distribution of Legislative Powers (Examples)

Union: Defence, naval, military and air forces, arms, atomic energy, mineral resources/Central Bureau of Intelligence and Investigation/Foreign affairs/UN Organization/Treaties and agreements with foreign countries/War and peace/Foreign jurisdiction, extradition/Railways, highways, maritime shipping/Posts and telegraphs/Currency, coinage, legal tender, foreign exchange/Foreign loans/Reserve Bank of India/Trade and commerce with foreign countries/Incorporation and regulation/Bills of exchange, cheques, promissory notes/Insurance/Stock exchange and futures markets/Regulation and development of oilfields and mineral oil resources/Census/Union Public Service/Elections to Parliament, to the Legislatures
Concurrent: Criminal law/Code of criminal procedure/Marriage and divorce/Transfer of property other than agricultural land/Contracts/Bankruptcy and insolvency/Civil procedures/Economic and social planning/Trade unions/Social security and social insurance/Welfare of labour/Price control/Factories/Electricity
State: Public order/Police/High court/Local government/Public health and sanitation/Communication (road, bridges, ferries, etc.)/Agriculture/Water (water supplies, irrigation, canals, drainage, embankments, water storage, water power)/Land/Fisheries/Trade and commerce within the State/Elections to the Legislature of the State/Powers, privileges and immunities of the Legislative Assembly and its members

Source: Schedule 7, Article 246, Constitution of India.

2.3.2 Financial System

Authorities regarding taxation and expenditure are also demarcated between the union and the state governments. At the central level, while the Ministry of Finance manages general financial issues, the Planning Commission is responsible for plan expenditure and the Finance Commission is responsible for non-plan expenditure.

(1) Taxation

Revenues of the state finance come from state's own taxes and non-taxes, and fund transfer from the central to the state. Distribution of powers on taxation between the union and the states are stipulated in Schedule 7, Article 246 of the Indian Constitution as shown in Table 2.3.2.

Table 2.3.2 Distribution of Powers on Taxation

Union: Taxes/duties on income (except agricultural income), customs (including export), excise on tobacco and other goods manufactured or produced in India, corporation, capital value of the assets (except agricultural land of individuals

and companies), capital of companies, estate in respect of property (except agricultural land), succession to property (except agricultural land), terminal on goods or passengers carried by railway/sea/air, railway fares and freights, transactions in stock exchanges and future markets, rates of stamp, sale/purchase of newspapers and on advertisements published, sale/purchase of goods taken place in the course of inter-state trade/commerce.
State: Taxes/duties on land, agricultural income, succession to agricultural land, estate of agricultural land, lands and buildings, mineral rights, excise on the goods manufactured or produced in the State, entry of goods into local area, consumption/sale of electricity, sale/purchase of goods other than newspapers, advertisements other than advertisements published in the newspapers, goods and passengers carried by road/inland waterways, vehicles, animals and boats, tolls, professions/trades/callings/employments, capitation, luxuries (including entertainment/amusement/betting/gambling), rates of stamp (except those imposed by the Union government).

Source: Schedule 7, Article 246, the Constitution of India.

(2) Financial Transfer

Financial transfers from the central to the state governments are done through three types of procedures:

- Share in central taxes and grants by the Finance Commission (account for about 50%): It is for state non-plan expenditures. Criteria such as population and per capita income are considered in the distribution among the states.
- Grants and loans by the Planning Commission (account for about 30%): Grants and loans for state plan expenditures and capital expenditures are provided under the name of Central Assistance (CA) of a) Normal Central Assistance (NCA); b) Additional Central Assistance (ACA) for implementation of externally aided projects (EAPs); and c) Special Central Assistance (SCA) for special projects/programmes for special category states. Their distributions are decided based on Gadgil-Mukherjee Formula (in consideration of the population, per capita income, efforts for tax collection, irrigation/power projects, etc.).
- Grants and loans by the ministries of the Central Government (account for about 20%): Grants and loans are provided with Central and Centrally Sponsored Schemes (CSS).

2.3.3 Budget Transactions of the Centre and States

Revenue and expenditure of the centre and of the states for the last six years are shown in Table 2.3.3 and Table 2.3.4. Both for them, while non-developmental and developmental expenditures have been increased, total revenue increased as well. There is budget transfer from the centre to states under items of "Grants to States and UTs under Developmental Expenditure" and "Statutory Grants to States". Amount of grants from the centre have accounted from 18% to 20% of the total revenue amount.

Table 2.3.3 Revenue and Expenditure of the Center (INR crore)

		2007/08	2008/09	2009/10	2010/11	2011/12 (RE)	2012/13 (BE)
A.	Non-developmental Expenditure	369,942	457,717	562,609	620,199	661,050	784,502
1	Interest payment	169,179	192,204	213,093	234,022	275,618	319,759
2	Defense services	91,681	114,223	141,781	154,117	170,937	193,407
3	Border services	887	881	1,185	2,421	2,173	2,492
4	Organs of State	2,166	2,964	4,193	3,588	4,317	4,575
5	Fiscal services	4,478	7,680	11,243	16,993	10,689	51,764
6	Administrative services	22,185	31,124	38,754	41,469	49,111	54,001
7	Pension and other retirement benefits	24,261	32,941	56,149	57,405	56,190	63,183
8	Technical and economic cooperation	1,601	1,739	1,980	2,570	2,429	3,460
9	Subsidy to FCI	31,328	43,751	58,443	63,844	72,823	75,000
10	Grants to UTs (NP)	611	895	814	496	563	514
11	Social security and welfare	11,011	16,672	16,790	18,588	1,647	1,539
12	Others	10,555	12,643	18,185	24,687	14,553	14,806
B.	Developmental Expenditure	304,293	383,108	413,852	525,019	586,268	664,600
1	Social and community services	67,757	90,386	105,314	128,906	132,741	162,520
2	General economic services	46,798	7,583	5,734	28,967	42,231	66,197
3	Agriculture and allied services	44,157	65,828	62,330	78,869	72,818	82,221
4	Industry and minerals	9,534	17,995	28,643	56,125	85,855	65,070
5	Fertilizer subsidy	32,490	76,602	61,264	62,301	67,978	60,974

		2007/08	2008/09	2009/10	2010/11	2011/12 (RE)	2012/13 (BE)
6	Power, irrigation, and flood control	6,711	9,034	10,586	9,993	12,018	13,925
7	Transport and communication	37,898	42,542	60,443	76,035	72,592	91,080
8	Public works	1,421	1,752	2,083	3,855	2,645	3,342
9	Grants to states and UTs	57,527	71,385	77,452	80,868	97,390	119,271
C.	Statutory Grants to States	26,365	27,259	29,697	31,514	47,572	58,357
D.	Loan and Advances	1,386	6,748	7,034	11,166	6,355	8,429
	TOTAL EXPENDITURE	701,985	874,831	1,013,193	1,187,898	1,301,245	1,515,889
A.	Tax Revenue	439,547	443,319	456,536	569,869	642,251	771,071
B.	Non-tax Revenue	101,543	93,735	109,939	213,941	120,210	159,104
	TOTAL REVENUE	541,090	537,054	566,475	783,810	762,462	930,175

Note: RE;Revised Estimates, BE;Budget Estimates, FCI; Food Corporation of India.
Source: Indian Public Finance Statistics 2012-2013, Ministry of Economic Affairs, Ministry of Finance, Government of India.

Table 2.3.4 Revenue and Expenditure of the States (INR crore)

		2007/08	2008/09	2009/10	2010/11	2011/12 (RE)	2012/13 (BE)
A.	Non-developmental Expenditure	260,026	292,121	362,897	414,035	487,132	561,165
1	Interest payment	94,919	97,637	115,637	127,619	142,637	159,153
2	Appropriation for reduction/avoidance of debt	6,165	6,253	4,155	3,874	3,341	5,554
3	Organs of state	5,026	6,480	9,180	10,574	14,552	14,418
4	Fiscal services	8,497	9,894	12,356	14,036	17,334	19,607
5	Administrative services	42,741	49,940	65,818	72,831	90,883	110,018
6	Relief on account of natural calamities (NP)	5,938	7,275	7,881	7,431	12,054	7,156
7	Pension and other retirement benefits	53,373	61,727	83,403	108,553	122,042	140,895
8	Compensation/assignment to local bodies	16,721	18,701	20,709	25,688	3,462	40,076
9	Food subsidy	1,380	2,543	3,678	3,783	4,270	4,629
10	Social security and welfare (NP)	13,699	17,871	23,263	23,314	27,258	33,277
11	Compensation to landholders	0	0	0	0	0	0
12	Others	11,567	13,801	17,818	16,333	18,399	26,382
B.	Developmental Expenditure	390,256	474,359	570,048	646,592	821,964	942,719
1	Social and community services	199,013	249,721	315,658	376,223	478,463	551,787
2	General economic services	6,338	6,639	5,749	4,932	6,249	5,933
3	Agriculture and allied services	48,346	62,567	74,666	81,777	104,876	123,150
4	Industry and minerals	7,425	7,066	8,430	10,037	13,457	14,667
5	Power, irrigation, and flood control	76,714	87,830	91,133	95,494	120,007	134,160
6	Transport and communication	39,987	46,870	56,951	59,538	72,219	81,994
7	Public works	7,787	8,040	10,741	11,558	14,903	17,171
C.	Loan and Advances by States and UTs	9,254	7,832	14,434	19,256	21,265	24,702
D.	Transfer to Funds	5,565	4,918	7,950	10,783	12,864	14,169
	TOTAL EXPENDITURE	**665,101**	**779,239**	**956,329**	**1,090,665**	**1,343,224**	**1,542,754**
A.	Tax Revenue	423,583	464,683	543,673	697,741	833,081	975,701
B.	Non-tax Revenue	54,267	55,441	64,678	63,481	68,382	77,107
C.	Grants from the Center	107,235	126,944	150,382	169,398	226,992	267,936
D.	Transfer from Funds	4,327	4,841	2,633	1,671	2,754	2,726
	TOTAL REVENUE	**589,411**	**651,910**	**761,367**	**932,291**	**1,131,209**	**1,323,470**

Note: RE=Revised Estimates, BE=Budget Estimates.
Source: Indian Public Finance Statistics 2012-2013, Ministry of Economic Affairs, Ministry of Finance, Government of India.

2.4 Development Plan of India

2.4.1 Indian Vision 2020

"Indian Vision 2020", which India should accomplish by 2020, indicates the vision that has been prepared with the initiative of the Planning Commission and published in December 2002. This vision states that with population growth slowing to about 1.6% per annum, the growth rate of GDP of around 9% per annum would be sufficient to quadruple the per capita income and make India from a

low income country to an upper middle income country (UMI) by 2020. Average performances of UMI countries are referred as benchmark for India's development challenges and achievable goals by 2020. In order to strive to achieve and surpass these reference levels, significant challenges were determined: i) A targeted approach to bring millions of families above the poverty line; ii) Generation of nearly ten million new employment opportunities per annum, especially for those in the lower income group; iii) Eradication of illiteracy; iv) Raise the primary and secondary enrolment rates and minimize dropouts; v) Improved public health to reduce infant mortality and child malnutrition; vi) Massive investment in power generation, telecommunications, and other physical and social infrastructure; vii) Accelerated acquisition of technological capabilities to increase productivity in agriculture, industry, and services; and viii) Become more important player in the world economy in terms of trade and investments.

2.4.2 North Eastern Region Vision 2020

The Ministry of Development of North Eastern Region is responsible for the matters relating to planning, execution, and monitoring of development schemes and projects in the North Eastern Region consisting of Arunachal Pradesh, Assam, Manipur, Meghlaya, Mizoram, Nagaland, Tripura, and Sikkim. Its vision is to accelerate the pace of socioeconomic development of the region so that it may enjoy growth parity with the rest of the country. The ministry together with the North Eastern Council (NEC) prepared the "North Eastern Region Vision 2020", which was adopted at the NEC's 56th Plenary Session in May 2008. The vision explains that the region has remained one of the most backward regions of the country. It is remote, its access for movement of goods and people is constrained, and its governance is poor. In the vision, the following components of the strategy were raised for bridging the gap between the region and the rest of the country in terms of productivities, capacities of people and institutions for making the region peaceful, strong, confident, and ready to engage with the global economy: i) Empowerment of the people by maximizing self-governance and participatory development through grassroots planning; ii) Rural development focused on improving agricultural productivity and creation of non-farm avocations and employment; iii) Development of comparative advantage agro-processing industries and sericulture, investment in manufacturing units, utilizing the large hydroelectric power generation potential and focus on developing services such as tourism; iv) Augmentation of capacity of the people and institutions both in government and private sector; v) Augmentation of infrastructure to facilitate movement of the people and goods, communication networks, utilizing vast power generation potentials, which will open up markets for produce from the region, attract private investment, and create greater employment opportunities; vi) Ensuring adequate flow of resources for public investments in infrastructure, a framework for private participation, and an enabling environment for the flow of investment.

2.4.3 Twelfth Five-Year Plan (2012-2017)

The Twelfth Five-Year Plan with themes of faster, sustainable, and more inclusive growth was approved by GoI in October 2012. Highlights of the plan are: i)Average GDP growth of 8.0%; ii) Agriculture sector growth of 4.0%; iii) Manufacturing sector growth of 10.0%; iv) Reduce poverty ratio by 10.0%; v) Generate 50 million work opportunities; vi) Health and education are main thrust areas. Increase outlays on these areas; and vii) Enhance infrastructure investment to 9.0% of GDP.

Table 2.4.1 shows the allocation for public sector's resources by major sectors of 12th Plan projections. Total outlays from "center" and "center, states, and UTs" of the 12th Plan projections were increased from those of the 11th Plan realization by 14% and 9%, respectively. Regarding the total outlay from "center, states, and UTs", the "social services" sector accounted for the largest portion, followed by the "energy" and "transport" sectors.

Table 2.4.1 Sectoral Allocation for 12th Plan (2012-17) Projections (billion INR)

#	Heads of Development	Center			States and UTs	Center, States, and UTs
		Budgetary Support	IEBR	Total Outlay	Budgetary Resources	Total Outlay
1	Agriculture and Allied Activities	1,339.65	6.71	1,346.36	2,286.37	3,632.73
2	Rural Development	2,670.47	0.00	2,670.47	1,904.17	4,574.64
3	Special Area Programmes	0.00	0.00	0.00	803.70	803.70

#	Heads of Development	Center			States and UTs	Center, States, and UTs
		Budgetary Support	IEBR	Total Outlay	Budgetary Resources	Total Outlay
4	Irrigation and Flood Control	172.12	0.00	172.12	4,048.00	4,220.12
5	Energy	985.41	9,874.56	10,859.97	3,524.68	14,384.65
6	Industry and Minerals	1,203.72	1,717.18	2,920.90	852.12	3,773.02
7	Transport	4,917.13	3,277.69	8,194.82	3,846.90	12,041.72
8	Communications	296.99	512.85	809.84	0.00	809.84
9	Science, Technology, and Environment	1,300.54	0.00	1,300.54	372.96	1,673.50
10	Economic Services	1,813.21	1.55	1,814.76	1,241.36	3,056.12
11	Social Services	11,904.16	838.45	12,742.61	13,905.82	26,648.43
12	General Services	505.00	0.00	505.00	574.59	1,079.59
	Total	27,108.40	16,228.99	43,337.39	33,360.68	76,698.07

Note: IEBR (Internal and Extra Budgetary Resources) = Resources of PSEs (Public Sector Enterprises) including borrowed resources.
Source: Twelfth Five Year Plan (2012-2017) – Faster, More Inclusive and Sustainable Growth, Planning Commission (Government of India), 2013.

2.4.4 Agriculture Sector in Twelfth Five-Year Plan (2012-2017)

While the average of annual growth rate of GDP in the agriculture and allied sectors during the 11th Plan was 3.7%, the growth target during the 12th Plan is set at 4.0%. The 12th Plan is needed to face challenges such as a shrinking land base, dwindling water resources, adverse impact of climate change, shortage of farm labour, and volatility in the international markets. The following are regarded as key drivers of growth: i) viability of farm enterprise and returns to investment; ii) availability and dissemination of appropriate technologies; iii) plan expenditure on agriculture and infrastructure; and iv) governance and institutions enabling better delivery of services.

(1) Farm Viability

Farm viability is central to achieve rapid and inclusive agricultural growth. In order to ensure this, the 12th Plan focuses on: i) Centrality of smallholdings; ii) Expanding agricultural marketing and processing; iii) Reform credit and cooperatives; and iv) Modify agriculture insurance system.

(2) Agricultural Research and Education

A number of new initiatives have been proposed, namely: i) research consortia platforms; ii) National Agricultural Education Project for Systemic Improvement in Higher Agricultural Education and Institution Development as an externally-funded project; iii) nurture entrepreneurship development with external funds; iv) enhance farmers-scientist contact; v) a one-year composite programme for developing professional skills for entrepreneurship; and vi) a youth-centric approach for attracting and retaining youth in agriculture. It is planned to allow spending 1% of agricultural GDP on the National Agriculture Research System (NARS), which should address the following issues: i) strengthen organic carbon research, ii) develop model and technology interventions on rational use of inputs; iii) expert group on pulses; iv) develop heat resistant varieties of wheat; v) post-harvest and commercialization; and vi) protect intellectual property rights of public research system.

(3) Extension and Technology Management

It is proposed to give a coordinated thrust on seeds, farm mechanisation, and extension. Regarding seeds, it requires to raise the ratio of quality seeds used for increasing productivity, to expand linkage between the private seed industry and public research institutions, to establish seed testing and certification centers, to strengthen infrastructure, and to improve local-seed system. In addition, farm mechanization penetration, participation of commercial agricultural machinery manufacturers, and identification of critical mechanization gaps and specific local requirements are proposed. As for extension, collaboration between public extension and private agencies, conduct a country-wide extension census, gender consideration, attention payments to fields other than cropping (livestock, fishery, fodder, machinery, etc.) are proposed.

(4) Specific Plans and Objectives for Major Subsectors

An annual growth rate of 5-6% for livestock sector, 6% growth rate during 12th Plan period for fisheries sector, 5% during the same for horticulture sector, 2-2.5% increase of foodgrain production during the same are targeted.

(5) Natural Resources

Water: INR 109,552 crore budgetary support is planned during 12th Plan for water resources development (creating and utilisation of irrigation facilities including micro-irrigation).

Watershed development: Emphasis has been shifted from soil and water conservation towards livelihood security and income generation.

Land and soil: Preparation of clear policies and guideline to protect productive agricultural lands and taking necessary measures to rejuvenate deteriorated soils are proposed during 12th Plan.

Fertilizer and pesticides: It is proposed to prioritize fertilizer use efficiency and soil health, enhance soil testing capacity, make efforts for production and use of organic and biological inputs, and to enhance availability of safe and efficacious pesticides and their judicious use.

Chapter 3 Socioeconomic Conditions of Mizoram State and Development Plans

3.1 Overview of Mizoram State

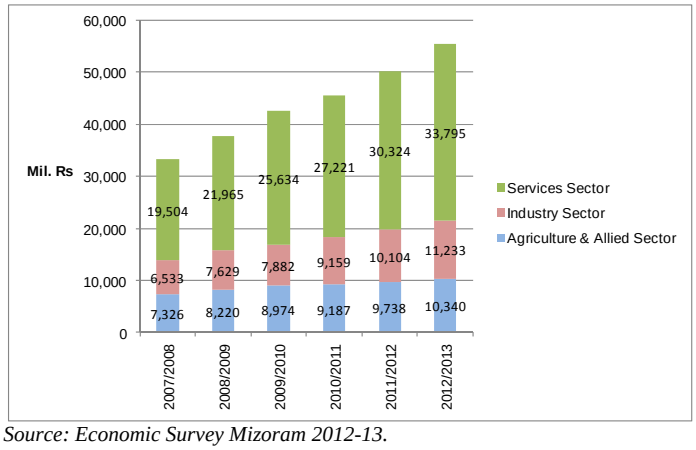
Mizoram is located in the east end of Indian territory, lying between Latitude 21° 58' and 24° 35' North and Longitude 92° 15' and 93° 29' East, and sandwiched between Myanmar in the east and south and Bangladesh in the west with about 722 km long borders. Mizoram is a land-locked state having an area of 21,087 km^2, topographically characterised as the steep hill ranging from 100 m to 2,210 m above mean sea level, and separated by 15 major rivers which flow either northward, southward, or westward creating deep gorges. Climate is relatively mild with temperature not exceeding 30°C on an average. It rains heavily from May to September with more than 2,700 mm of annual rainfall.

Mizoram was incorporated in the Union Territory in 1972, and became the full fledged state as the 23rd independent State of the Union in February 1987. Agriculture is the mainstay of Mizoram. Around 48 % of the families are engaged in agriculture and most of them rely on the traditional Jhum (slash and burn) cultivation on steep slope lands. Mizoram is characterised as the 3rd highest literacy rate in India as high as 91.6% (2011). This may be attributed to the contribution of the Christian missionaries since the end of 19th century.

3.2 Socioeconomic Overview

The gross state domestic product (GSDP) of Mizoram has been continuously increasing over the years. During the period from 2007/2008 to 2012/2013, GSDP at constant (2004/2005) prices showed average annual growth rates of 10.7%, higher than India of 7.5%. GSDP at current prices and at constant prices are expected to attain INR 8,091.9 crore and INR 5,536.9 crore (projected estimates), respectively, for 2012/2013. Per capita income of Mizoram is also continuously increasing over the years. It is projected at INR 61,732 for 2012/2013, while that of the national level is INR 66,747 (both are current).

Figure 3.2.1 shows the trend of real GSDP by the sectors of agriculture and allied (primary), industry (secondary), and services (tertiary). GSDP of the respective sectors has been increasing steadily. While around 60% of GSDP is derived from the services sector, around 20% each came from the agriculture and allied sector, and the industry sector. The share of the agriculture and allied sector has been slightly decreasing for the last six years, from 22% to 19%.



Source: Economic Survey Mizoram 2012-13.

Figure 3.2.1 Real GSDP by Sector

With the latest Census 2011, the population of Mizoram was reported to be 1,091,014 with density of 52 persons per km^2 as shown in Table 3.2.1. Its growth rate from 2001 to 2011 was 22.78%, equivalent to 2.07% per annum. Aizwal District has the largest population and highest density. Nearly all (94.4%) were categorized as Scheduled Tribes and the majority (87.0%) of the population is Christian. The literacy rates of males and females are 93.72% and 89.4%, respectively. Among all the districts,

Serchhip District recorded the highest literacy rate at 98.8% (male 99.2%, female 98.3%), while Lawngtlai District, where the Christian population was less than half unlike in other districts, recorded the lowest at 66.4% (male 74.7%, female 57.6%).

Table 3.2.1 Population of Mizoram (2011)

District	Rural			Urban			Total			Growth Rate (2001-2011)	Density per km2
	Male	Female	Total	Male	Female	Total	Male	Female	Total		
Mizoram	**271,319**	**257,718**	**529,037**	**281,020**	**280,957**	**561,977**	**552,339**	**538,675**	**1,091,014**	**22.78%**	**52**

Source: Statistical Abstract of Mizoram: 2011, Census 2011.

3.2.1 Poverty and Gender

With result of the latest survey on household consumer expenditure by National Sample Survey Office (NSSO) conducted in 2011-12, the poverty ratio of Mizoram was 20.4%, which is lower than India's average of 21.92% and is ranked 23rd of the lowest. Its result revealed that the poverty situation in Mizoram has worsened since 15.4% in 2004/05 and 21.1% in 2009/10. The poverty ratios by district estimated by Mizoram University in 2009/10 shows that three districts of Aizawl, Lunglei, and Lawngtlai has higher rural poverty, while higher urban poverty in Serchhip.

The condition of women in Mizoram is comparatively better than in other states of India, as proven by the relatively higher female literacy rate, lower maternal mortality rate, higher female work participation rate, etc. Nevertheless, Mizo women are discriminated against in various aspects of life and society. Many cases have been observed wherein women's earnings are controlled by their husbands. Women are excluded in various decision-making bodies in both social organizations and church life. Female participation in local administration and politics is limited. For instance, only 36 women were selected as village council members from 556 villages in the elections in February 2006. There is no woman Minister of State in the Legislative Assembly. Female state government employees were still one-third of male ones as of 2009. On the other hand, the number of women working in agriculture and related activities are quite high, and increasing while men have been moving to urban areas in search of job opportunities.

3.2.2 Agriculture and Food Security

Agriculture is the mainstay of Mizoram people. Around 48% of families are engaged in agriculture. Rice as the staple food occupies 67% of the total cultivated area, and 75% of the total food grain production in the state. Other crops than rice are maize, tapioca, potato, oilseeds, pulses, sugarcane, and spices. There are two types of agriculture in Mizoram, one is farming on the sloping land represented as *Jhum* (shifting cultivation) and the other wet rice cultivation on terraces. The major challenge that Mizoram continue to face is how to adapt its land use pattern and production system to increasing population and to change people's lifestyle that is biologically and economically sustainable. Livestock, pig and poultry in particular, provide farmers with additional income and employment. The state also has a large scope and potential in other allied activities such as sericulture and fisheries.

Although Mizoram is an agrarian state, it still imports a large quantity of food products, fruits, vegetables, fish, and livestock required for the overall food supply of the people. Large quantities of such items are imported from other states particularly neighbouring states of Assam, Tripura, and Manipur.

Regarding rice, Mizoram requires an estimated amount of 180,000 tonnes of rice annually. However, the state could produce only 46,000 tonnes per year, which could meet only 20% of its requirement. The remaining 80% is imported from outside the state mainly through the public distribution system (PDS). Those quantities were 144,745 tonnes in 2010/11, 155,457 tonnes in 2011/12, and 157,841 tonnes in 2012/13, respectively.

PDS is a major instrument of the government for ensuring food grains to the public at affordable prices as well as for enhancing food security for the poor. Essential commodities such as rice, wheat, sugar, and kerosene oil, are distributed through a network of fair price shops (FPSs). The central government (the Government of India: GoI) is responsible for procurement, storage, transportation, and bulk

allocation of food grains. The Government of Mizoram (GoM) is responsible for identifying the target households, issuing ration cards, and supervising and monitoring the functions of FPSs.

Table 3.2.2 shows the targets and amounts distributed under PDS. The ceiling numbers of BPL (below poverty line) and AAY (*Antyodaya Anna Yojana*, the poorest of poor) households are fixed by GoI, and GoM deals only with their allocations based on identification by the concerned village and local councils. GoI decides sales prices for BPL and AAY at FPSs, while that for APL (Above Poverty Line) is decided by GoM.

The coverage of PDS for APL is decided by the state governments. In case of Mizoram, GoM decided that all APL should be provided with a certain amount of rice under PDS. Currently, 2,841 MT of rice per month are allocated to APL households, and therefore GoM could procure such rice from FCI at a subsidised price of INR 830/quintal. GoM procures additional 8,000 MT per month from FCI under the open market sales scheme (OMSS), but at a price of INR 1,987/quintal in order to cover the required amount for APL households, which increases the fiscal burden of the state.[1]

Table 3.2.2 Targets and Amounts Distributed under PDS (2013/14)

Targets		No. of Target Households	Ceiling Amount Distributed to Targets (month)	Price at Procurement from FCI	Sale Price at FPS	Allocation/ Distribution (month)
Rice (Normal Operation)	APL	191,153	8 kg per adult	INR 830/quintal	INR 9.50/kg	2,841 MT
	BPL	41,900	35 kg per household	INR 565/quintal	INR 6.15/kg	1,470 MT
	AAY	26,100	35 kg per household	INR 300/quintal	INR 3.00/kg	910 MT
Rice (OMSS)	APL	191,153	8 kg per adult	INR 1987/quintal	INR 9.50/kg	8,000 MT
Sugar	APL/BPL/AAY	259,153	400 g per head	-	INR 14.00/kg	666 MT
Wheat	APL/BPL/AAY	259,153	3 kg per household	-	INR 9.48/kg	624 MT
K.Oil	APL/BPL/AAY	259,153	3 L per household	-	INR 16.00/L	648 KL

Note: (i) OMSS = Open Market Sales Scheme. 1 quintal =100 kg. (ii) APL : above poverty line (iii) BPL : below poverty line (iv) AAY: Antyodaya Anna Yojana (the poorest of the poor)
Source: Food, Civil Supplies and Consumer Affairs Department.

3.2.3 Landholding System

All lands in Mizoram that are not classified as reserved forestland is owned by GoI. Reformed old land and revenue laws and rules (1963 and 1971), GoM established afresh the Mizoram (Land and Revenue) Rules, and enacted in July 2013. As per this rules, allotment of land for agricultural purposes is made either by periodic *patta* (*p. patta*) or by land lease for specific tenure and for specific purpose, e.g. commercial plantation, horticultural farming, and agricultural farming. While both shall pay for land revenue, major differences between them are that:

- *p. patta* holders may transfer or sublet during validity period, but the same cannot be done by land leaseholders;
- if development damages the land, *p. patta* land should be compensated according to its assessed market value, but not in the case of land lease;
- *p. patta* validity is five years subject to renewable while land lease validity is from 15 to 99 years; and
- *p. patta* is for agricultural land while land lease is for any purpose other than residential.

A *p. patta* can be converted to an Agricultural Land Settlement Certificate (ALSC) with consideration of situation of quality of land use, annual land revenue payment, and validity of *p. patta*. An ALSC holder shall pay for land revenue. While the *p. patta* holder needs to renew the validity, the ALSC holder has absolute ownership, i.e., has right to transfer ownership of the land in part or in whole. If

[1] Data on fiscal revenue and expenditure relating to PDS are not available. Difference between cost of procuring rice from FCI and sales of rice at FPS is estimated to be INR 945,789,600 in 2013/14. It could be thought that this amount plus other operation costs of PDS are covered by State finance.

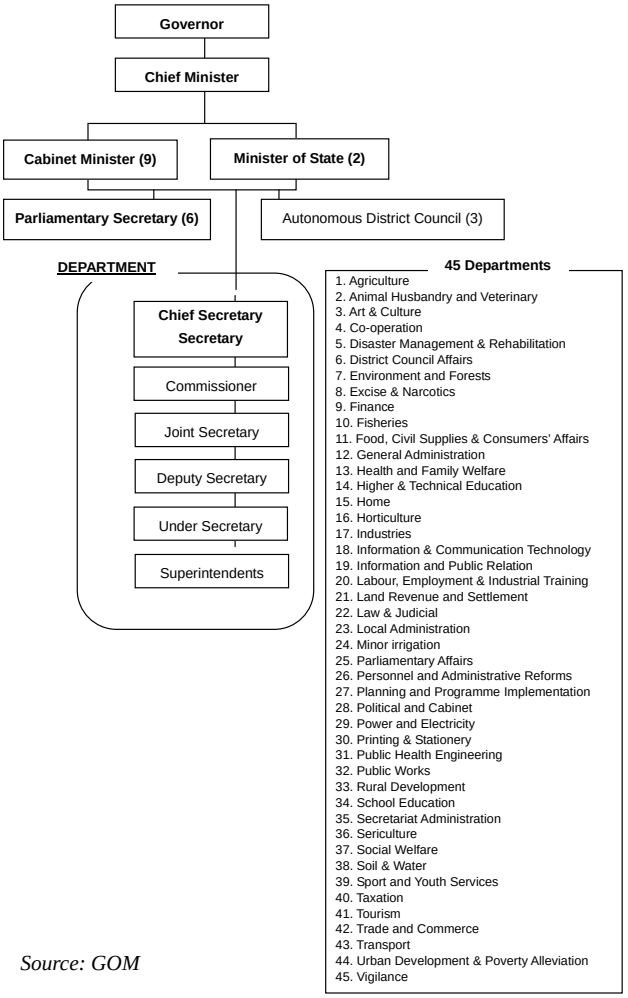
holders of *p. patta* or ALSC make fish ponds in their land, they should apply for diversion of use of the land holding.

State lands falling within the jurisdiction of a village and being controlled by the village council (VC) has been regarded as so-called community land. VCs have never been legally entrusted to allocate such community land to villagers except house-side plots. However, VCs have done allotment of community land as per the customary practice of *jhuming* and other farming activities by issuing VC passes[2]. Under the Mizoram (Land and Revenue) Rules, 2013, VCs have to apply for the Land Revenue and Settlement Department to demarcate the land reserved for VCs. The department shall make survey, fix boundaries pillars, and accordingly, declare that land as community land by issuing notifications.

3.3 State and Local Administration

3.3.1 State Administration

Mizoram is the 23rd state of India and is one of the "Seven Sisters" of Northeast India. It was one of the districts of Assam until 1972 when it became a union territory. After the agreement of settlement between GoI and the Mizo National Front in 1986, Mizoram was granted statehood on 20 February 1987. A governor as appointed by the President of India heads the state government and the administration continue to run in the name of the governor. The chief minister (CM) is an advisor of the governor, and has real executive authority. Under CM, there are cabinet ministers and ministers of state who have portfolios in departments. Parliamentary secretaries are also selected to assist the ministers. Each department is headed by a secretary with supports from functionaries down the line. Currently, there are 45 departments. These organisational structure in the state level is shown in Figure 3.3.1.



Source: GOM

Figure 3.3.1 State Administrative Structure

3.3.2 Local Administration

The state is divided into eight administrative districts. Each district is headed by a deputy commissioner / district collector / district majesty that has the authority of district-level administration and judiciary, as well as the function of coordinating different government departments at the district level. Under the head of district, there are sub-divisional officers/sub-collectors/sub-divisional majesties. The district is also divided into a number of rural development blocks (RDBs). An RDB is under a block development officer.

Parallel to these administrative districts, there are three Autonomous District Councils (ADCs), viz. Mara, Lai, and Chakma, under the Sixth Schedule to the Constitution of India. MADC (Mara), is

[2] According to the results of rural household survey (total number of respondent households is 360) conducted by the JICA Study Team, VC passes are predominant as land holding status for all types of land use. The number of VC passes/number of lands held are 195/281 (69%) for shifting cultivation land, 199/219 (91%) for fallow land, 55/64 (86%) for irrigated land, 87/101 (86%) for rainfed land, and 217/325 (67%) for residential land.

located in the entire of Saiha District, while LADC (Lai) and CADC (Chakma) are in Lawngtlai District. The principles and sprits as envisaged by the Sixth Schedule are purely to enable tribal communities to run their own local government in the style of their own socio-political practices, customs, and traditions without interference and without imposition of the general administration. The ADC is composed of elected executive members, and is headed by the chief executive member. These ADCs are positioned under the CM, and the District Council Affairs Department deals with issues relating to the ADCs. Some functions of the state government departments are entrusted to these ADCs.

Unlike other states of India which usually have a three-tier local government system, there are no councils for both administrative districts and sub-divisions of Mizoram. There are VCs for all villages and towns for both administrative districts and ADCs[3].

Table 3.3.2 shows number of VCs and their members. VCs are the grassroots level democratic setups and administrative units consisting of the elected village members. They carry out all village and internal administration within the powers provided to them by the Village Council Act. They have functions such as acting as a village court, allotting land for house sites and annual *Jhum*, enforcing social works for the common benefit of the community, and managing burial grounds. Their services are utilized in developmental works. VCs receive grants from the Finance Commission for the schemes. Schemes under rural development programmes are mostly implemented through VCs.

Table 3.3.1 District-Wise Administrative Setup

No.	Name of District	No. of Sub-Divisions	No. of RDBs
1.	Mamit	3	3
2.	Kolasib	3	2
3.	Aizawl	3	5
4.	Champhai	3	4
5.	Serchhip	3	2
6.	Lunglei	3	4
7.	Lawngtlai	3	4
8.	Saiha	2	2
	Total	23	26

Source: General Administration Department, Government of Mizoram, Administrative Atlas Mizoram ,Census of India 2011.

Table 3.3.2 District-Wise No. of Village Councils and Members

No.	District	No. of Village Councils		No. of VC Members	
		2010-11	2011-12	2010-11	2011-12
1.	Mamit	71	85	240	332
2.	Kolasib	45	45	179	219
3.	Aizawl	91	91	322	379
4.	Champhai	101	105	360	445
5.	Serchhip	42	44	152	192
6.	Lunglei	135	138	464	548
7.	LADC	86	87	415	398
8.	MADC	85	93	267	436
9.	CADC	69	69	390	390
Total		725	757	**2,789**	**3,339**

Source: Statistical Handbook Mizoram 2012, Directorate of Economics & Statistics, Mizoram: Aizawl.

3.3.3 State Finance

Table 3.3.3 shows the overall fiscal position of Mizoram in the last five years. The fiscal soundness of the state has been gradually improving, owing to both improvement of tax awareness and better grants-in-aid from the central government. Grants-in-aid from the central government have accounted for around 75% of the total revenue received, while tax revenue has accounted for around 20% only. Tax-GSDP ratio of Mizoram has remained as low as 1.5, being far lower level than the average of all states[4] at 8.0.

Table 3.3.3 Overall Fiscal Position of Mizoram (INR crores)

		2008/09	2009/10	2010/11	2011/12	2012/13*
I	**Opening Balance**	-76.59	-85.10	-130.87	533.05	1,094.12
II	**Revenue Account**					
1	**Receipt**	2,653.13	2,963.50	3,374.71	4,011.81	5,259.69
1)	Tax Revenue	478.01	502.11	720.86	1,006.45	994.72
2)	Non-Tax Revenue	158.67	126.50	146.71	168.04	206.75

[3] There is only a municipal council for Aizawl in Mizoram. Under the Aizawl Municipal Council, there are 19 local (ward) councils.

[4] According to the working group on State's Financial Resources' Report, the average tax-GSDP ratio of Mizoram during the 11th Plan period was 1.5, whereas the average of all states was 8.0. It also projected that average tax-GSDP ratio of Mizoram for the period of 2012-17 would be 2.2 against the average of all states, which is 7.4.

		2008/09	2009/10	2010/11	2011/12	2012/13*
3)	Grants-in-aid from GoI and Contribution	2,016.45	2,334.89	2,507.15	2,837.33	4,058.22
2	**Expenditure**	2,313.80	2,702.70	3,255.03	3,723.86	4,673.03
1)	General Services	803.75	947.76	1,010.82	1,220.05	1,410.68
2)	Social Services	898.18	1,105.68	1,237.35	1,345.92	1,717.61
3)	Economic Services	611.86	649.35	1,007.68	1,157.89	1,555.75
3	**Surplus or Deficit**	339.33	260.80	119.68	287.96	586.65
III	**Capital Account**					
1	**Receipt**	130.63	251.21	539.50	493.55	426.89
1)	Internal Debt of State Govt.	99.58	193.72	510.28	443.47	390.70
2)	Loans and Advances from GoI	6.19	32.17	3.25	22.28	9.44
3)	Loans and Advances (Recoveries)	24.86	25.32	25.97	27.80	26.55
2	**Expenditure**	554.74	963.07	902.41	814.60	1,432.82
3	**Surplus or Deficit**	-424.11	-711.87	-362.92	-321.05	-1,005.93
IV	**Public Account (Net)**	76.27	405.30	907.15	594.17	178.84
V	**Overall Surplus or Deficit**	-8.51	-45.76	663.91	561.07	-240.43
VI	**Closing Balance**	-85.10	-130.87	533.05	1,094.12	853.69

Note: Figures of 2012-13 are revised estimates. Regarding revenue account, the totals of 1) General Services, 2) Social Services; and 3) Economic Services are not matched to the figures of expenditure in 2010-11 and 2012-13 since there are deductions of stock recoveries for those years.
Source: Figures of 2008-09 and 2009-10 are from Statistical Abstract of Mizoram: 2011, and those of 2010-11, 2011-12 and 2012-13 are from Annual Financial Statements, website of Finance Department, Government of Mizoram.

The state's own tax revenue has shown improvement in the last few years as seen in Table 3.3.4. Taxes on sales and trade, taxes on vehicles, and income have been the prominent contributors to the state's own tax revenue. However, the overall contribution of the state's own tax revenue is still limited compared with resources devolved from central taxes and duties.

Table 3.3.4 Taxes by Type (INR crores)

		2008/09	2009/10	2010/11	2011/12	2012/13*
A.	**STATE TAXES**	**94.6**	**107.6**	**130.1**	**178.7**	**202.1**
1	Taxes on Income and Expenditure	5.9	7.9	8.4	11.9	11.5
2	Land Revenue	1.6	2.8	4.3	2.5	1.4
3	Stamps and Registration	0.5	0.4	0.3	0.7	0.6
4	State Excise	1.9	2.1	2.4	2.3	2.6
5	Sales Tax	77.5	85.9	104.7	142.2	158.2
6	Tax on Vehicle	5.5	6.7	7.7	16.7	23.2
7	Taxes on Goods and Passengers	1.4	1.4	1.7	2.1	4.1
8	Other Taxes on Commodities and Services	0.3	0.4	0.5	0.4	0.6
B.	**CENTRAL TAXES AND DUTIES (Devolution)**	**383.4**	**394.5**	**590.8**	**827.8**	**792.6**
1	Corporation Tax	125.7	162.4	230.9	318.7	286.6
2	Taxes on Income (other than corporation tax)	78.9	90.5	122.0	172.1	169.8
3	Taxes on Wealth	0.1	0.4	0.5	1.1	0.7
4	Customs	73.3	55.2	103.3	147.1	132.9
5	Union Excise Duties	64.0	44.5	75.2	93.8	90.1
6	Service Tax	11.4	41.6	58.9	95.0	112.5
	TOTAL TAX REVENUE	**478.0**	**502.1**	**720.9**	**1,006.5**	**994.7**

Note: Figures of 2012-13 are Revised Estimates.
Source: Figures of 2008-09 and 2009-10 are from Statistical Abstract of Mizoram: 2011, and those of 2010-11, 2011-12, and 2012-13 are from Annual Financial Statements, website of Finance Department, Government of Mizoram.

3.4 Development Plan for Mizoram

3.4.1 12th Five-Year Plan of Mizoram

The state governments have to prepare own five-year plans synchronising with the national five-year plan. The current one is 12th plan spanning five fiscal years from 2012/13 to 2017/18. The Mizoram's

vision and strategy of 12th plan is to achieve growth with equity based on enhanced livelihood options through agricultural and rural development, better resource management, and development of human resources including relevant skills upgrading. The components of the development strategy are: (i) empowerment of people; (ii) creation of development opportunities; (iii) development of sectors with comparative advantages; (iv) strengthening infrastructure and connectivity; and (v) capacity development.

Table 3.4.1 shows sector-wise proposed outlay for the 12th Five-Year Plan. Against the initially proposed outlay of INR 15,326.8 crore, a total amount of INR 12,160 crore was approved by the Planning Commission of India. However, its sector-wise allocations have not yet been finalized. As compared with the actual allocation for the previous 11th Plan, this approved amount for the 12th Plan is larger by INR 5,860 crore, or by 93%. The largest outlay is given in agriculture and allied activities including irrigation (20.8%), followed by general economic services (13.6%), transport (13.4%) and education (12.7%) reflecting the above development strategy.

Regarding procedures for plan budgets, respective state departments start preparing proposals in December or January of the previous fiscal year. The Planning and Programme Implementation Department compiles these proposals as an annual plan, and submits it to the Planning Commission of GoI. The Planning Commission approves the annual plan in May or June, by when any disbursement could not be done.

Table 3.4.1 Sector-Wise Proposed Outlay for the Twelfth Five-Year Plan

Sector		Actual Allocation for the 11th Plan		Initially Proposed Outlay for the 12th Plan		Revised Proposed Outlay for the 12th Plan*		Approved Outlay for the 2012/13 Annual Plan	
		INR crore	%	INR crore	%	INR crore	%	INR crore	%
I	Agriculture and Allied Activities	954.0	15.1	1,823.6	11.9	1,447.0	11.9	504.9	22.0
II	Rural Development	229.8	3.6	610.3	4.0	483.0	4.0	49.3	2.1
III	Special Area Programme	325.0	5.2	488.4	3.2	387.9	3.2	94.2	4.1
IV	Irrigation and Flood Control	261.8	4.2	750.1	4.9	594.6	4.9	115.4	5.0
V	Energy	382.7	6.1	1,066.7	7.0	846.3	7.0	97.1	4.2
VI	Industry and Minerals	130.7	2.1	230.0	1.5	183.6	1.5	93.9	4.1
VII	Transport	536.3	8.5	2,119.8	13.8	1,630.7	13.4	338.8	14.7
VIII	Science, Technology and Environment	36.5	0.6	24.4	0.2	70.5	0.6	1.3	0.1
IX	General Economic Services	495.2	7.9	2,077.1	13.6	1,647.7	13.6	181.5	7.9
X	Social Services	2,318.9	36.8	5,642.0	36.8	4,476.1	36.8	715.8	31.1
1	Education	685.7	10.9	1,946.0	12.7	1,543.1	12.7	325.2	14.1
2	Medical and Public Health	495.2	7.9	854.0	5.6	677.3	5.6	85.4	3.7
3	Water Supply and Sanitation	318.6	5.1	1,311.2	8.6	1,039.7	8.6	84.3	3.7
4	Housing	118.4	1.9	292.5	1.9	232.3	1.9	43.1	1.9
5	Urban Development	459.1	7.3	656.0	4.3	521.7	4.3	148.4	6.5
6	Other Social Services	242.0	3.8	582.3	3.8	462.1	3.8	29.5	1.3
XI	General Services	629.1	10.0	494.5	3.2	391.6	3.2	107.9	4.7
	TOTAL	6,300.0	100.0	15,326.8	100.0	12,160.0	100.0	2,300.0	100.0

Note: These figures were provided by the Planning and Programme Implementation Department.
Source: Draft Twelfth Five-Year Plan (2012-17) and Annual Plan, Planning and Programme Implementation Department, Government of Mizoram.

3.4.2 New Land Use Policy (NLUP)

(1) Background and Objectives

The New Land Use Policy (NLUP) has a history of nearly three decades during which its implementation was on and off. During 1985-1992, about 30,000 families were covered, and few cases

of success stories were observed which showed the potential of the NLUP programmes to provide sustainable livelihood options. The first NLUP was replaced by the Mizoram Intodelhna Programme (MIP) in 2002. Beneficiaries were given financial assistance of INR 7,500/beneficiary in the first phase, and INR 4,000/beneficiary in the second phase. A total of INR 30.38 crore has been released under the MIP, which was too small to make any headway. Combined with administrative problems, however, all the programmes finally went away. In February 2009, an NLUP project proposal was submitted to the Planning Commission covering a five-year project, and its first year was approved under State Plan in August 2009.

The major objectives of the NLUP are to: (i) improve surface and water management with introduction of new forest and land management system; (ii) wean away farmers from destructive *Jhum* practices by adoption of sustainable on-farm and off-farm economic activities; (iii) improve income for both urban and rural poor through sustainable farming and micro-enterprises including promotion and modernization of small-scale and cottage industries; and (iv) initiate allied policies which are vital for the state's reform programme.

(2) Implementation Setup and Procedure

The NLUP includes three components, i.e., A) Management, B) Development, and C) Infrastructure. The financial and physical targets initially planned are shown in Table 3.4.2. Around 120,000 families are planned to benefit over the project period. The NLUP is implemented and monitored under a four-tier management system, hierarchically consisting of (i) NLUP Apex Board headed by the CM; (ii) NLUP Implementing Board (NIB) chaired by the vice chairman of the NLUP Apex Board; (iii) District Level Committees headed by the concerned deputy commissioner; and (iv) Village Level Committees as a community-based institutions.

Firstly, beneficiaries are identified and selected by a village level committee. The list then goes to the district level committee for further action. Secondly, activities and trades selection is done by the village committee, subject matter specialists from respective departments, and the beneficiaries themselves. The final list of the beneficiaries and the trades are sent to the NIB. Once these beneficiaries and trades are finalized by the NIB, the respective implementing departments assess the trade-based input requirements for the year. Based on these assessments, the funds are allotted by the departments.

Once the funds are received from the NIB, whether the assistance shall be provided in cash or in kind is taken care by the concerned departments. The beneficiaries who have difficulty in arranging materials are assisted under in kind terms and these inputs are provided by departments.

Table 3.4.2 NLUP Targets

	NLUP Planned Targets (2009/10-2013/14)	
	Phy. (No. of beneficiaries)	**Fin. (INR crore)**
A Management	**-**	**70.12**
B Development		
Agriculture	31,600	376.00
Horticulture	28,800	268.50
Sericulture	8,500	85.00
Fishery	3,000	63.52
Soil & Water Conservation	9,000	84.05
AH & Veterinary	18,860	152.82
Industries	9,500	76.00
Environment & Forest	10,740	163.93
Total	**120,000**	**1,269.82**
C Infrastructure	-	1,187.05
Grand Total (A+B+C)	**120,000**	**2,526.99**

Source: NLUP Project, Detailed Action Plan (Short and Long Term)

(3) Progress and Achievement

Though the NLUP had been approved in 2009, its actual start was delayed to January 2011. Thus, the whole project period was changed from 2009/10-2013/14 to 2010/11-2014/15. Table 3.4.3 shows the targets for the first three years, and the actual achievements by the end of March 2013 with financial terms as well cumulative number of beneficiaries by the end of June 2013.

Against the fiscal targets of INR 1,463.57 crore, INR 1,061.15 crore (72.5%) had been disbursed by the end of March 2013. Regarding physical achievements, 63,497 families had benefited by the end of June 2013 against a target of 120,000 families for the whole project period (five years). The progress and achievements in respective sectors are described in the latter chapter.

Table 3.4.3 Target and Cumulative Achievement (2010/11-2012/13)

	Targets for 2010/11-2012/13 (Financial) INR crore			Cumulative Achievements of 2010/11-2012/13 (31 March 2013) (Financial), INR crore			Cumulative Achievements up to 30 June 2013 (Beneficiaries)
	CSS	ACA	Total	CSS	ACA	Total	
A Management	**-**	**35.62**	**35.62**	**-**	**35.62**	**35.62**	
B Development							
Agriculture	11.30	138.08	149.38	2.54	89.13	91.67	13,603
Horticulture	31.77	152.41	184.18	29.08	86.86	115.94	19,427
Sericulture	2. 00	14.76	16.76	3.57	8.39	11.96	1,096
Fishery	15.00	21.70	36.70	1.68	21.70	23.38	2,578
Soil and Water Conservation	4.51	74.07	78.58	0.75	62.04	62.79	3,551
AH and Veterinary	-	168.36	168.36	-	101.56	101.56	9,919
Industries	-	159.75	159.75	-	101.20	101.20	10,736
Environment and Forest	2.14	23.56	25.70	3.51	22.48	25.99	2,587
Total	**66.72**	**752.69**	**819.41**	**41.12**	**493.37**	**534.49**	**63,497**
C Infrastructure	**558.92**	**50.52**	**608.54**	**445.78**	**45.25**	**491.03**	
Grand Total (A+B+C)	**624.740**	**838.83**	**1,463.57**	**486.91**	**574.24**	**1,061.15 (72.5%)**	

Note: CSS = Centrally Sponsored Scheme, ACA = Additional Central Assistance.
Source: Status on the Progress of the Implementation of NLUP Project Cumulatively as of 30 June 2013, NLUP Implementing Board.

In order to review the progress of the NLUP and identify scopes for performance improvements and strengthening service delivery mechanism, a midterm assessment was conducted from December 2012. The study was conducted by synthesizing existing data/information, and conducting household-level surveys and focus group discussions. The major findings of the assessment are as follows:

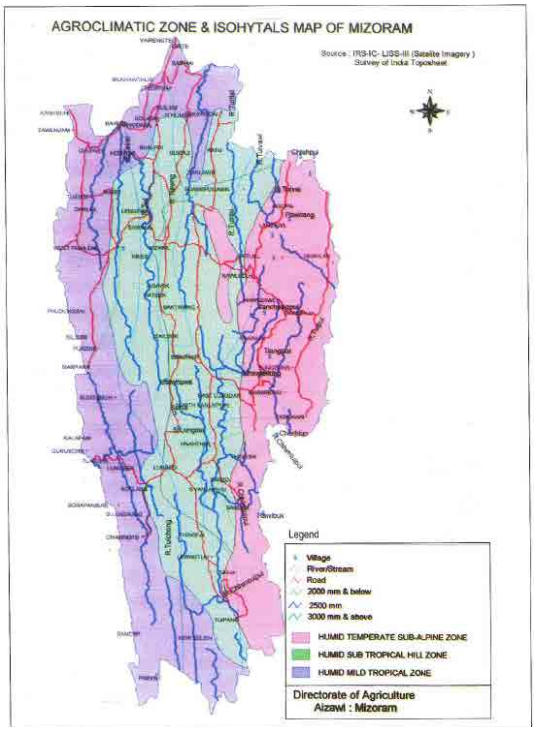
- Awareness among stakeholders and villagers on the NLUP was very high.
- Some of the beneficiaries' livelihood means had been advanced, and their income enhanced because of the project. Also, people's exposure to project management and integration with the market were enhanced.
- The stakeholders' capacity to arrange input supply under in kind terms had been enhanced. Assistance-related cash transactions were done through banking systems, which facilitated financial inclusion of people.
- Physical structures, which would be useful for the communities even after project withdrawal, were created.
- It seemed that there were disappearing boundaries between the village level committees and VCs.

Chapter 4 Agriculture and Rural Setting in Mizoram

4.1 Natural and Social Conditions

4.1.1 Agro-ecology

Of 15 broad agro-climatic zones in India, Mizoram belongs to "Eastern Himalayan Region" together with six other north eastern states, characterised by high rainfall, high forest cover, heavy soil erosion and floods. Mizoram is further divided into three sub-agro-climatic zones, namely: Humid Mild Tropical Hill Zone situated in the western side of the state; Humid Subtropical Hill Zone in the central part of the state; and Humid Temperate Subalpine Zone in the eastern side. Figure 4.1.1 shows the demarcation of the three agro-climatic zones.



Source: Source: Agriculture Department (CH), JICA Study Team

Figure 4.1.1 Agroclimatic Zones of Mizoram

4.1.2 Topography

The state's topography is mountainous with steep slopes forming deep gorges culminating into several streams and rivers. Almost all the hill ranges traverse in the north-south direction. The eastern part of Mizoram is at a higher elevation compared with the western part. The highest peak is 2,165 m above mean sea level (AMSL) at the top of Blue Mountain, and the average height of hill ranges is about 920 m AMSL. There are 15 major rivers in the state, of which seven rivers flow northward towards Assam Valley. The five other rivers flow southwards. The remaining three rivers flow to the west. Table 4.1.1 and Table 4.1.2 show the numerical characteristics of Mizoram's topography.

Table 4.1.1 Slope Range-wise Area Distribution

Slope Range		Mizoram Slope-wise Area Distribution		
in %	in degree	Km^2	%	Acm
Less 15%	Less 10°	2,412	11%	11%
15% -40%	10°- 20°	9,154	43%	55%
40% -65%	20°- 30°	6,899	33%	88%
65%-90%	30°- 40°	2,109	10%	98%
90% more	40°more	512	2%	100%
Total		21,087	100%	

Source: Mizoram Remote Sensing Application Centre (MIRSAC) and JICA Study Team

Table 4.1.2 Altitude Range-wise Area Distribution

Altitude Range (AMSL in meter)	Altitude Range-wise Area Distribution		
	km^2	%	Acm
Less 100 m	1,110	5.3%	5.3%
100 - 500 m	8,193	38.8%	44.1%
500 - 1,000 m	8,125	38.6%	82.7%
1,000 - 1,600 m	3,434	16.3%	99.0%
1,600 - 2,000 m	225	1.1%	100.0%
2,000 m more	2	0.0%	100.0%
(Max. 2,165 m)	21,087	100%	

Source: Mizoram Remote Sensing Application Centre (MIRSAC) and JICA Study Team

The average land slope of Mizoram is estimated to be about 35% or 20°, and the majority of its land (80%) are on steep slopes ranging between 15% and 65% or between 10° and 30°. The higher altitude with steep slope topography is prevailing in the central to eastern parts along the border of Myanmar, covering the four districts of Aizawl, Champhai, Serchhip and Saiha, while four other districts have rather gentle topographies.

4.1.3 Soil and Soil Erosion

The soils prevailing in both hills and valleys are of homogeneous nature, and they are mainly derived from sandstones, shales and siltstones. The hill slopes and valleys have soil orders of Ultisols and Entisols, respectively. They are further classified into Udults and Orthents at sub-order level, while Inceptisols are commonly found in the hills and valleys. The surface soils of the hilly terrain are dark, highly leached and poor in bases, rich in iron and highly acidic with pH values from 4.5 to 5.5. These are well drained, deep to very deep, rich in organic carbon, low in available phosphate content and high in available potash. The textures of surface soils are loam to clay loam with clay content increasing with depth. These soils are capable of providing substantial oxygen supply for plant growth and have the capability to retain moisture and maintain its supply throughout the growing seasons of most crops.

Soils of the flat valley bottoms are brown to dark brown, poor in bases, moderately acidic with pH ranging from 5.5 to 6.0, medium to high in organic carbon content, low in available phosphate and medium to high in available potash. They are deep to very deep but moderate to poorly drained. The texture of the soils is mostly sandy loam to sandy clay loam. The ratio of clay, silt and sand in the upper 50 cm ranges from 15-35%, 5-34% and 40-75%, respectively. Clay content does not increase with depth. The soils below the plough layers in some places are so poorly drained that water logging in the depression is common. They are alluvial and colluvial, the most fertile and most productive soils irrespective of their elevation. Groundwater table is high, within one meter of the surface, during Kharif. They are utilised for cultivation of wet rice paddies. The soils of narrow valleys have light and coarse texture. They are very well drained, well-aerated and skeletal, receiving new deposits of alluvium at frequent intervals. They are acidic, moderately rich in organic carbon, low in available phosphate and medium in available potash content. They are less fertile and mainly utilised for cultivation of paddies and vegetables.

The Department of Agriculture (DOA) has been conducting experiments in soil erosion since 1994 at different places in the state under various land covers. The cultivations of Jhum paddy and ginger on steep slopes show higher soil erosion at about 30 tonnes/ha/year. The DOA evaluates the average rate of soil erosion to be 16.84 Mt/ha/year in Mizoram.

4.1.4 Land Use

Mizoram is still a non-land record state. The Department of Land Revenue and Settlement (DLRS) is carrying out land use survey over the state land aiming for completion in the year 2020 except three Autonomous District Councils (ADCs). The survey for the Lunglei District as a first target has been finished, and the Serchhip District is the next target. Therefore, it is difficult to estimate an accurate classification of present land use in Mizoram. Table 4.1.3 shows the figures estimated by the JICA Study Team as the most probable land use data through interpretation of the three data sets, i.e. : (i) land use statistics of given in Statistical Handbook of Mizoram, (ii) forest classification given in India State of Forest (IFS) Report, and (iii) GIS data prepared by the Mizoram Remote Sensing Application Centre (MIRSAC). The forested area is more or less the same figure as that of the IFS report. The *Jhum* land, irrespective of whether it is abandoned or being cultivated, occupies about 19% of state land, and would be categorised as open forest in the IFS report or as barren and uncultivated land, fallow land and net sown area given in the land use statistics.

Table 4.1.3 Estimated Land Use in Mizoram

Classification	Area (km^2)	Ratio (%)
City, urban, village and infrastructure	143	0.6
Forest	16,586	78.7
Agriculture - Wet Rice Cultivation (WRC) - Upland crops - Agroforest and plantation	252 (122) (43) (87)	1.2
Jhum	3,960	18.8
Water body, etc.	146	0.7
Total	21,087	100.0

Source : JICA Study Team

4.1.5 Shifting Cultivation (*Jhum*)

(1) *Jhum* Practices[1]

The practice of Jhum farming is slashing, burning and cropping without tilling the soil, and the cropped land is subsequently fallowed to attain pre-slashed forest status through natural succession. Cropping on Jhum lands in Mizoram is predominantly practiced for one year. Farmers have a general apprehension that the yields obtained from the second year of cropping are far less than those cropped in the new areas; hence, the second year cropping is scarce. Rice is the main crop in Jhum farming. Mostly, rice is grown in monoculture; however, several crops such as maize, chillies, sesame, brinjal, ginger, cotton, and tapioca are also mixed with rice in some areas, depending upon the requirements of the family. A shifting cultivator is allotted for a Jhum field through a lottery system by the village council. The area to be cultivated is decided by the cultivator on the basis of size and working capacity of his family. The forested fallow is slashed and cleared from December to January. The burning is done in March to April. Rice is sown mostly from the middle of April to the middle of May. Weeding is done twice or thrice from July to September, and rice is harvested from the end of October until the beginning of November. After the harvest, the land is left fallow and vegetative regeneration is allowed on it until the land becomes reusable. In the past, Jhum cycle was longer (15-25 years), but it was reduced to 5-6 years, resulting in problems of land degradation and threats to the ecology.

(2) Distribution of Jhum Land

The Jhum land in Mizoram, both abandoned and current, is estimated at 3,960 km^2, corresponding to about 19% of the state as mentioned above in the land use estimate. The district-wise distribution of Jhum land is shown in Table 4.1.4, and those on land slope and altitude basis are shown in Table 4.1.5. These data suggest that: (i) about 20% land is occupied by Jhum land except Saiha District; (ii) the majority is on the slope less than 40% or 21 degree, and about one third on steep slope from 40% to 60%; and (iii) Jhum is practiced on the land lower than 1,000 m above AMSL.

Table 4.1.4 District-wise Jhum Land Distribution

District	Area (km^2)	Area (km^2)	Area (%)	Distr. (%)	Area (km^2)	Area (%)	Distr. (%)	Area (km^2)	Area (%)	Distr. (%)
Mamit	3,054	172	6%	16%	438	14%	15%	609	20%	15%
Kolasib	1,586	88	6%	8%	226	14%	8%	313	20%	8%
Aizawl	3,118	161	5%	15%	307	10%	11%	468	15%	12%
Champhai	3,396	162	5%	15%	565	17%	20%	726	21%	18%
Serchhip	1,441	68	5%	6%	235	16%	8%	303	21%	8%
Lunglei	4,518	254	6%	23%	619	14%	22%	873	19%	22%
Lawngtlai	2,458	139	6%	13%	329	13%	11%	468	19%	12%
Saiha	1,516	48	3%	4%	151	10%	5%	199	13%	5%
Total	21,087	1,091	5%	100%	2,869	14%	100%	3,960	19%	100%

Source : Mizoram Remote Sensing Application Centre (MIRSAC), and JICA Study Team

Table 4.1.5 Land Slope-wise and Altitude-wise Jhum Distribution

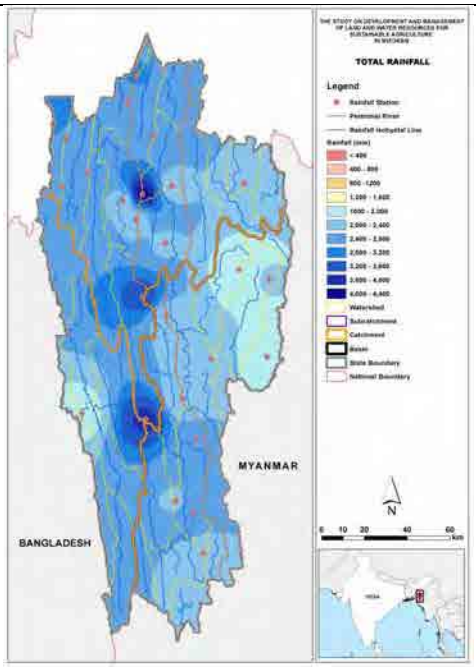
(1) Land Slope-wise Jhum Distribution

Slope (Degree)	Abandoned Jhum		Current Jhum		Jhum Land Total	
	Area (km^2)	Distr. (%)	Area (km^2)	Distr. (%)	Area (km^2)	Distr. (%)
< 30% (< 17°)	423	39%	1,042	36%	1,465	37%
30% - 40% (17°-21°)	215	20%	533	19%	748	19%
40% - 50% (21°-26°)	178	16%	468	16%	646	16%
50% - 60% (26°-30°)	123	11%	346	12%	468	12%
> 60% (>30°)	153	14%	480	17%	633	16%
Total	1,091	100%	2,869	100%	3,961	100%

[1] Referring to a research paper by Tawnega, et. al. titled "Evaluating Second Year Cropping on Jhum Fallows in Mizoram, Northeastern India - Phytomass Dynamics and Primary Productivity", June 1996.

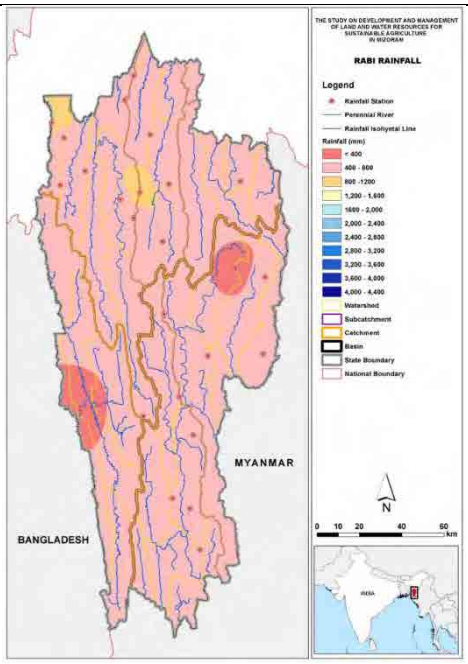
(2) Altitude-wise Jhum Distribution						
< 500 m amsl.	525	48%	1,041	36%	1,566	40%
500 – 1,000 m	440	40%	1,169	41%	1,609	41%
1,000 – 1,500 m	120	11%	593	21%	713	18%
> 1,500 m	7	1%	66	2%	73	2%
Total	1,091	100%	2,869	100%	3,960	100%

Source : Mizoram Remote Sensing Application Centre (MIRSAC), and JICA Study Team



Source : JICA Study Team

Figure 4.1.2 Isohyetal Maps of Annual Average Rainfall



Source : JICA Study Team

Figure 4.1.3 Kharif Average Rainfall

4.1.6 Rainfall and Climate

There are 46 rain gauge stations in Mizoram being operated and maintained by three agencies; (i) 36 the DOA for 27 years from 1986; (ii) three by the Department of Economics and Statistics (DES) from 2007; and (iii) seven by the Rural Development Department (RDD) from 2007. The DOA's 26 stations data recorded since 1999, covering the entire state area and daily records available, are employed for further meteo-hydrological analysis in this study. The historical maximum and minimum annual rainfall were 4,700 mm, recorded in 2000 at Lunglei, and 1,367 mm in 2011 at Vaphai in Champhai District, respectively. The average annual rainfall in Mizoram State is about 2,550 mm for the last 14-year period, and in Aizawl, it is 2,343 mm. The period from November to March is the dry season called 'Rabi' and the rest is the rainy season called 'Kharif'. The Kharif's rain concentration is distinct, having 95% rain in a year. Figure 4.1.2 and Figure 4.1.3 show the isohyetal maps of annual average and Rabi average rainfalls, respectively.

Meteorological data other than rainfall are available only in Aizawl. The average maximum and minimum temperature recorded during 2007 to 2012 are 29°C in April and 12°C in January. The humidity ranges from 91% to 99% in the rainy season and 80% to 87% in the dry season. The wind is generally mild, being observed at Aizawl Airport ranging from 1.0 m/sec in the rainy season to 0.4 m/sec in the dry season.

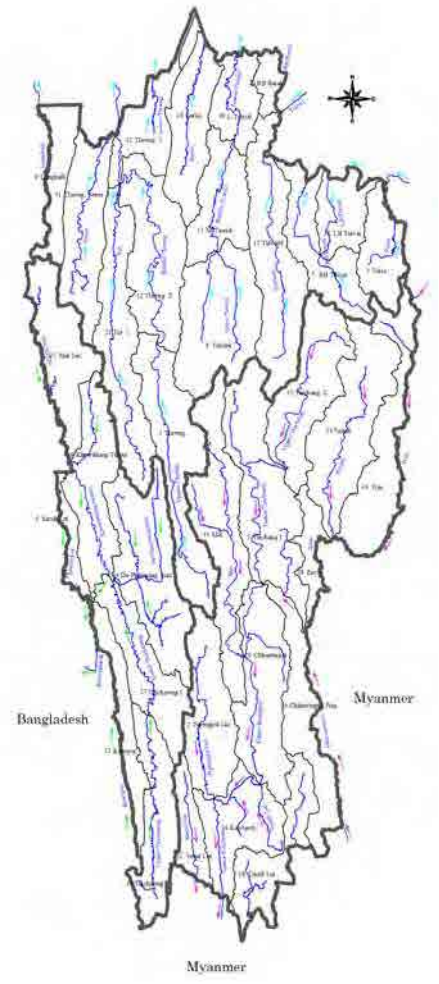
4.1.7 Rivers and River Basins

Mizoram, with an area of 21,087 km^2, is largely divided into three major river basins: one is the Barak basin (8,935 km^2) in the central to northern part of the state, the second is Kolodyne basin(8,144 km^2) in the southeastern part, and the third is Karnaphuli basin(3,999 km^2) in the southwestern part, as shown in Figure 4.1.4. The major tributaries of Barak basin, flowing northwards, are the Tlawng,

Tuirial and Tuivawl, which joins the Barak River in Assam. The rivers Barak, Tlawng, Tuivawl and Tuirial are navigable for considerable stretches, and are used for transporting floated timber and bamboo from Mizoram to Assam, and various commodities between the two states. The Kolodyne River, with four main tributaries, Mat, Tuichang, Tiau and Tuipui, flows into Mizoram from Myanmar and turn west and then southward within Mizoram and returns to Myanmar. Some of its stretches in Mizoram are navigable although interrupted by rapids. The Karnaphuli and its tributaries, Tuichawng, De-Phairuang, Kau, and Khawthlang Tuipui, form the western drainage system. The Karnaphuli enters Bangladesh at Demagiri, and at its mouth sits the port city of Chittagong.

Runoff measurement is undertaken by two agencies, the Central Water Commission (CWC) and Power and Electrification Department (PED) at 18 points mainly for hydropower development purposes. Access to the CWC data is hardly possible for security reasons, hence, runoff records of the Tuivawl River in the northern part of Mizoram were made available to the JICA Study Team, and those at the 11 other points are still pending. Meanwhile, the quality of PED's data is considered to be insufficient for the study.

Mizoram is expected to have hydroelectric power potential of about 4,500 MW, of which only 0.6% (29.35 MW) is developed so far. There are 11 existing hydropower stations and one hydropower station is under construction.



Source: MIRSAC

Figure 4.1.4 Map of Rivers and River Basins of Mizoram

4.1.8 Disaster

Mizoram is vulnerable to natural calamities like landslides, earthquakes, cyclones, flash floods and soil erosions. In 1992, massive landslides occurred in Mizoram, taking the lives of 166 people as well as damaging 14 houses. Earlier in 1983, 250 houses were damaged in Aizawl City alone. Landslide is, therefore, one of the major disasters in the state.

Every year, a number of landslides has usually been reported from various localities. Landslide incidents are more prominent during the rainy/monsoon season, especially with the steeper slope. As per the government's, incidents of landslides from 2008 to 2011 are prominent in all districts of the state where it affects not only physical infrastructure but also human life, domestic animals and agricultural production.

The state, having hilly terrain, does not have a major flood problem. Under the action of heavy rains, flash floods may cause bank erosion and some local damage. Compared with other hazards like landslides and cyclones, the damage caused by floods within the state is the least.

4.2 Agricultural Production

4.2.1 Policy and Development Plan

(1) National Level

The Ministry of Agriculture (MOA) of the Government of India (GoI) is implementing a flagship programme for the Special Additional Central Assistance Scheme called Rashtriya Krishi Vikas Yojana (RKVY), which was launched during the 11th Five-Year Plan (2007/8-11/12). The purpose behind this programme was to encourage states to draw up district and state agricultural plans and also increase their own spending on the sector so as to reorient agricultural development. RKVY aimed to achieve 4% annual growth in the agriculture and allied sector during the 11th Five-Year Plan period. The actual

expenditure was reported to be Rs.212 billion. RKVY is followed by the 12th Five-Year Plan (2012/13-2016/17), with an allocated budget of Rs.632 billion.

(2) Agricultural Policy of Mizoram

A clearly defined agricultural policy is not found in the statements of the Government of Mizoram. Instead, the Department of Agriculture (Research and Education) prepared a long-term vision, namely, Vision 2020 Krishi Vigyan Kendras (KVKs), in July 2011. Vision 2020 KVKs aims to back up North East Vision 2020 launched in May 2008, which presents a comprehensive sectoral development plan for the seven states in the North Eastern Region of India including Mizoram State.

KVKs are institutions where grassroots technology transfer and vocational training are practised for bridging the gap between available technology at one end and their application for increased production on the other. There are eight KVKs centres in Mizoram, one in each of the eight districts. Vision 2020 KVKs was compiled by collecting the district KVKs centres taking into account local agricultural conditions. Vision 2020 KVKs shows the projected requirements and projected production of major agricultural products in quantities; i.e., cereals, pulses, vegetables, fruits, oilseeds, fish, meat, milk, egg and oil palm in 2012, 2017, and 2020. For achieving these targets, necessary actions for increased productivity, capacity building, human resources development, and technical inputs are stated in the Vision 2020 KVKs; however, specific approaches and measures are completely lacking. The establishment of state agricultural policies is an urgent issue for preparing adequate short- and long-term development plans for the agriculture sector.

4.2.2 Overview of Organisation and Issues of Agro-allied Departments

There are eight agro-allied departments in Mizoram, namely: (i) Department of Agriculture (Crop Husbandry), (ii) Department of Horticulture, (iii) Department of Soil and Water Conservation, (iv) Department of Agriculture (Research and Education), (v) Department of Fishery, (vi) Department of Animal Husbandry and Veterinary, (vii) Department of Irrigation, and (viii) Department of Sericulture. Of the eight agro-allied departments, the former three departments are responsible for crop production. There is a distinct demarcation of crops to be treated by the respective three departments. The Department of Agriculture (Crop Husbandry) (DOA (CH)) is responsible for major food crops including cereals (rice, maize, and wheat), pulses and oilseeds, and some industrial crops such as sugarcane and oil palm. The Department of Horticulture (DOH) handles almost all horticulture crops including fruits, vegetables, and flowers. The Department of Soil and Water Conservation is in charge of several crops for forest and soil conservation such as rubber, coffee, and blooming grass.

DOA (CH) and the DOH demarcate their respective field territories as ‘circles’ at their own consideration, i.e., 57 circles for DOA (CH) and 38 circles for DOH The circles do not coincide with each other, and basic agricultural information and data are collected on circle basis. As such, this may hamper to make adequate agro-statistics and holistic development programme for agricultural production across the state. Both departments now intend to integrate the circles into 26 rural development blocks (RD blocks), which are administratively demarcated.

4.2.3 Department of Agriculture (Crop Husbandry, and Research and Education)

(1) Roles and Organisation

DOA consists of two directorates, namely, Crop Husbandry (CH) and Research & Education (R&E). DOA (CH) takes a lead role among the agro-allied departments in Mizoram, and is responsible for all activities for production of staple and food crops in particular. Meanwhile, DOA (R&E) is responsible for transferring improved agricultural technologies to farmers through different schemes. The mandate of DOA is to ensure food security in Mizoram’s society by enhancing the production of rice, maize, pulses, oilseeds, etc.

DOA (CH) has six organisational cells, namely: Administration, Account, Planning, Agronomy, Extension, Soil Survey, and Plant Protection. The organisation at the field level is hierarchically divided into 8 agriculture districts, 13 agriculture subdivisions, and 57 agriculture circles across the state. DOA (R&E) is organised by different institutions and agencies including (i) Integrated Training Centre (ITC), (ii) KVKs, and iii) Farm and Quality Seeds Farms.

(2) Staffing of DOA

DOA is one of the largest departments in Mizoram State, having 725 service personnel in total. There are 564 persons in DOA (CH) and 161 persons in DOA (R&E). The staff of DOA is further divided into two cells, namely, the DOA headquarters in Aizawl, and DOA district offices. DOA (CH) has 564 service personnel in total, consisting of 192 persons at the Aizawl headquarters and 372 persons at the district offices. The actual servicing personnel for administrative and engineering services are 230 in DOA (CH) with vacancy of 30 posts, and 106 persons in DOA (R&E).

(3) Development Plans for Agricultural Production

(a) Comprehensive District Agriculture Plan (C-DAP) and State Agriculture Plan (SAP)

From the 11th Five-Year Plan, the department has prepared the Comprehensive District Agriculture Plan (C-DAP) under RKVY. The objective of district planning is to design an integrated and participatory action plan for the development of local areas in general and the agriculture and allied sectors in particular. The State Agriculture Plan (SAP) is prepared by integrating each C-DAP, and both plans are going to be prepared once every five years along with the five-year plan. Funding from RKVY to the states was linked to formulation of C-DAPs. Mizoram State submitted the C-DAP for eight districts and the SAP to GoI, and the state was allocated with the RKVY fund from 2010-11 until the end of the 11th Five-Year Plan, at an amount of Rs.4,687.5 lakh, utilising oil palm area extension, vegetable initiative in urban cluster, national mission on protein supplements, etc. The state continues to implement RKVY in the 12th Five-Year Plan, amounting to Rs.1,661 lakh.

(b) 12th Five-Year Development Plan

DOA proposed the 12th Five-Year Development Plan with respective budgets for DOA (CH) and DOA (R&E) amounting to Rs.22,337 lakh and Rs.2,500 lakh, respectively. The major thrusts in the five-year plan are as follows: (i) to create additional area of 18,000 ha for cultivation of wet rice cultivation (WRC) and hillslope terraces; and (ii) to increase productivities through provision of certified seeds, maintaining soil health, introducing high-yielding varieties, promotion of farm mechanisation, etc.

(4) Ongoing Development Programmes

DOA is undertaking various development programmes. The major programmes except the New Land Use Policy (NLUP) are the following:

- Integrated Nutrient Management (INM);
- Organic Farming Programme;
- Watershed Development Programme in Shifting Cultivation Area (WDPSCA);
- National Watershed Development Project in Rainfed Areas (NWDPRA);
- Oil Palm Development Programme Under Integrated Scheme of Oilseeds, Pulses, Oil Palm and Maize (ISOPOM); and
- Promotion of Power Tiller and Mechanisation Subsidy.

4.2.4 Department of Horticulture (DOH)

(1) Roles and Organisation

The mandate of DOH is to promote the production of different horticulture crops including fruits, vegetables, spices, plantation crops, and medicinal and aromatic plants of high economic value, taking advantage of vertically-variable climate. DOH has five sub-directorates according to the different types of horticulture crops such as fruits, flower, beekeeping, spices, and vegetables, and one planning sub-directorate. DOH has eight division offices in the respective districts, and further 38 circles across the state.

(2) Staffing of DOA

DOH staffs 433 service personnel in total at present. There are 81 vacant posts against the required 509 number. In particular, staff shortage takes place in core posts for extension works, i.e., 11 horticulture extension officers (HEOs) and 34 horticulture demonstrators.

(3) 12th Five-Year Plan

DOH proposed the 12th Five-Year Development Plan with an amount of Rs.6,000; however, the breakdown of the budget for the respective scheme is not disclosed.

(4) National Project/Programme

DOH is undertaking various Centrally Sponsored Schemes (CSS) such as RKVY schemes, National Mission on Medicinal Plants and Aromatic Plants (NMMP) scheme, Horticulture Mission for North East and Himalayan States (HMNEH), Mission for Integrated Development of Horticulture Natural Calamities, and National Mission on Micro Irrigation (NMMI).

4.2.5 Soil and Water Conservation Department (SWCD)

(1) Roles and Organisation

The mandate of SWCD is to take care of soil and water conservation through efficient use of natural resources and protective afforestation/agroforestry programmes. In addition, SWCD is responsible for production of industrial crops, such as rubber, coffee, and blooming grass, which are deeply related to its main mandate. SWCD has three sub-directorates at its headquarters and four field offices in charge of eight districts. The SWCD staffs 347 service personnel in total.

(2) 12th Five-Year Plan

The SWCD proposed 12th Five-Year Development Plan with an amount of Rs.5,000; however, its budget breakdown for the respective scheme is not disclosed.

(3) Ongoing Projects and Programmes

SWCD is undertaking various state schemes and CSS such as rubber plantation, rubber nursery, RKVY and River Valley Projects and Flood Prone Rivers (RVP/FPR) (construction of water harvesting system, check dam, stream bank erosion control, and planting of cash crops).

4.2.6 Production of Food Crops (Under DOA)

(1) Overview of Rice Security in Mizoram

Prior to discussing paddy cultivation and rice production, the historical and present facts on the provision of rice, the principal food grain in Mizoram, are clarified referring to Table 4.2.1 below, which shows an overview of rice demand and supply in terms of personal consumption in Mizoram.

Table 4.2.1 Supply of Rice and Rice Self-sufficiency in Mizoram (2001/02–2011/12)

Detail	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12
Paddy Production (t)	105,715	109,205	114,630	107,661	107,740	42,091	15,688	68,917	66,132	67,428	75,566
(%)	100	103	108	102	102	40	15	65	63	64	71
PDS: Rice (t)	81,720	36,828	42,444	81,720	81,720	91,862	142,457	112,903	142,860	145,745	153,000
(%)	100	45	52	100	100	112	174	138	175	178	187
Self Sufficiency (%)	45.6	45.4	47.4	43.7	42.8	11.6	6	25.7	24.2	24.2	26.5
(%)	100	100	104	96	94	25	13	56	53	53	58
Population (no.)	888,573	921,013	925,703	944,865	964,438	984,430	1,004,851	1,025,710	1,047,017	1,068,781	1,091,014
(%)	100	104	104	106	109	111	113	115	118	120	123

PDS: Public Distribution System providing rice by the Government of India to supplement the lack in Mizoram
Source: Statistical Abstract of Mizoram 2011 and DOA

A tragedy in Mizoram agriculture was the wide outbreak of rodents caused by bamboo flowering, which is so-called *Mautam,* having a 40 to 50-year cycle phenomenon in Mizoram, that took place in 2006/07 to 2007/08. Agricultural production, of rice in particular, suffered catastrophic damage, and

production drastically decreased by 60% to 80%. To recover from this serious distress close to famine in Mizoram, GoI supplied rice through the Public Distribution System (PDS) to supplement the food shortage. Rice production sharply increased by more than 50% since 2007/08, and it has gradually recovered after the *Mautam* incident, although it has remained at around 60% before the incident. Nevertheless, the PDS rice is still at the same supply level to date as in 2007/08. Therefore, self-sufficiency in rice production has been low at about 27%, which is about half before the *Mautam* incident of about 45%.

From these facts, the JICA Study Team envisages that the framework of the rice production system in Mizoram has unfavourably deviated from the self-sufficiency policy that the Mizoram government aims at. Due to the cheaper market price of PDS rice than those cropped in Mizoram, motivation for growing more rice, by WRC in particular, may have been low. In terms of rice demand and supply, the present situation may be acceptable; however, it would have to be changed for maintaining adequate food security without relying much on external support, and accordingly for realising sound financial management of the state government by saving funds without PDS.

(2) Rice

Rice is the principal food grain in Mizoram, followed by maize. Wheat is rarely cultivated because little is consumed in Mizoram. Paddy farming is practised in two types, i.e., *Jhum* cultivation in sloping lands and WRC in terraces. The total paddy production from both types of farming was around 77,000 t in 2011/12. During the three-year period from 2003-04 to 2005-06, the total annual production of paddy remained above 100,000 t. However, in 2006-07 and 2007-08, paddy production suddenly dropped due to the *Mautam* incident. In addition, other widespread insects such as *Thangnang* (tree bug) also caused extensive damage to crops. Even five years after the *Mautam* incident, the recovery of paddy production remains low at only 68% in 2012-13. Records of paddy production for the last ten years are shown in Table 4.2.2.

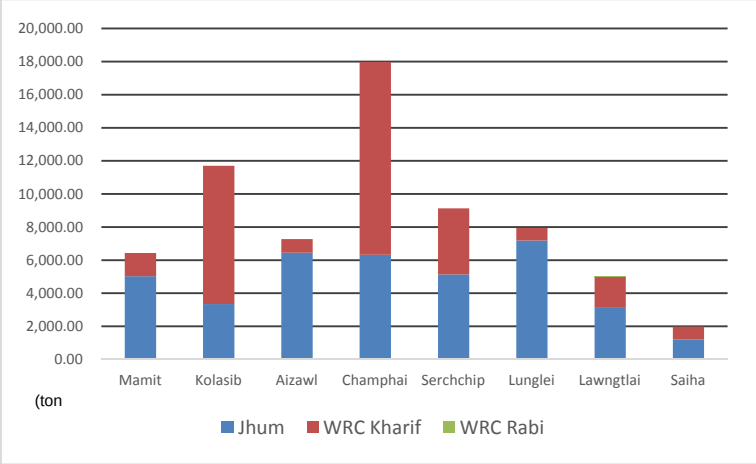
Table 4.2.2 Cultivation Area, Production, and Productivity of Paddy (2003/04–2012/13)

Detail	2003/04	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13
Paddy Jhum (ha)	43,447	40,969	40,100	41,459	44,947	40,792	36,841	28,562	25,826	25,437
(%)	**100**	94	92	95	103	94	85	66	59	**59**
Paddy Jhum (t)	72,181	64,420	63,100	13,935	11,355	44,489	43,985	37,854	38,064	35,032
(%)	**100**	89	87	19	16	62	61	52	53	**49**
Productivity (t/ha)	1.7	1.6	1.6	0.3	0.3	1.1	1.2	1.3	1.5	1.4
(%)	**100**	94	94	18	18	65	71	76	88	**82**
Paddy WRC (ha)	15,749	16,116	16,360	11,386	9,594	11,198	10,363	12,130	13,150	14,637
(%)	**100**	102	104	72	61	71	66	77	83	**93**
Paddy WRC (t)	42,449	43,240	44,640	15,806	4,333	24,428	22,147	29,575	37,502	42,438
(%)	**100**	102	105	37	10	58	52	70	88	**100**
Productivity (t/ha)	2.7	2.7	2.7	1.4	0.5	2.2	2.1	2.4	2.9	2.9
(%)	**100**	100	100	52	19	81	78	89	107	**107**
Total (ha)	59,196	57,085	56,460	52,845	54,541	51,990	47,204	40,692	38,976	40,074
(%)	**100**	96	95	89	92	88	80	69	66	**68**
Total (t)	114,630	107,660	107,740	29,741	15,688	68,917	66,132	67,429	75,566	77,470
(%)	**100**	94	94	26	14	60	58	59	66	**68**
Productivity (t/ha)	1.9	1.9	1.9	0.6	0.3	1.3	1.4	1.7	1.9	1.9
(%)	**100**	100	100	32	16	68	74	89	100	**100**

Source: Statistics Section of DOA

The above records reveal that the *jhum* cultivation area drastically decreased since 2009/10 for reasons such as partly due to the effect of NLUP but mainly due to the Mahatma Gandhi National Rural Employment Scheme (MGNREGS), which provided jobs to the rural poor for 100 days a year. As for WRC, productivity has almost recovered to the level before the *Mautam* incident; however, the recovery of cultivation area is still at its previous level.

Figure 4.2.1 shows district-wise paddy production in 2011-12. Champhai District has the highest production, which produced 17,970 t of paddy, followed by Korasib District, which produced 11,708 t. Lunglei District has the highest paddy production using *jhum* cultivation at 7,183 t. *Rabi* cultivation in WRC areas is rarely practised in Lawngtlai and other districts.



Source: Statistics Section of the Department of Agriculture, Government of Mizoram

Figure 4.2.1 District-wise Paddy Production in 2011-12

(3) Maize

The production of maize in 2012-13 has decreased to around 40%, comparing to the figure in 2003/04, as shown in Table 4.2.3. This is due to the decrease of cultivation area and productivity to 59% and 68%, respectively, from the 2003/04 levels in spite of introduction of improved seeds by the department during the recent years. Maize was also damaged by the *Mautam* incident, and its production has not fully recovered to the same levels as paddy.

Table 4.2.3 Cultivation Area, Production, and Productivity of Maize

Maize	2003/04	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13
Cultivation area (ha)	10,481	10,505	11,742	10,775	7,328	9,558	8,551	9,005	6,905	6,175
(%)	**100**	100	112	103	70	91	82	86	66	**59**
Production (ton)	20,282	19,788	22,703	20,969	729	9,318	11,510	13,499	8,397	8,063
(%)	**100**	98	112	103	4	46	57	67	41	**40**
Productivity (ton/ha)	1.9	1.9	1.9	1.9	0.1	1	1.3	1.5	1.2	1.3
(%)	**100**	100	100	100	5	53	68	79	63	**68**

Source: Statistics Section of the Department of Agriculture, Government of Mizoram

Maize is cultivated mainly in the *Kharif* (rainy) season. Lunglei District has the highest production at about 3,000 t in 2011/12, followed by Champhai District, producing about 2,300 t. Farmers who cultivate maize in the *Rabi* season cultivate maize in their paddy land as a secondary crop.

(4) Pulse and Oilseed

Pulse, together with rice, is the most important food crop, as well as a staple food crop, in Mizoram. The total production of pulses has been increasing since 2003/04. However, pulse crops also could not avoid the *Mautam* damage, and both cultivation area and production recovered only once and have been decreasing during the recent four years, as shown in Table 4.2.4. Instead, its productivity is being increased and stabilised. Aizawl District is the highest producer of pulse, followed by Champhai District. In case of pulse, 57% of pulse crops, such as French bean, cowpea and field pea, were produced in the *Rabi* season in Aizawl.

Table 4.2.4 Cultivation Area, Production, and Productivity of Pulses

Pulses	2003/04	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13
Cultivation Area (ha)	4,892	6,741	6,861	5,055	5,048	3,931	3,920	3,957	3,836	3,100
(%)	**100**	138	140	103	103	80	80	81	78	**63**
Production (ton)	4,313	7,971	8,663	5,833	2,632	3,646	6,479	6,065	5,331	3,288
(%)	**100**	185	201	135	61	85	150	141	124	**76**
Productivity (ton/ha)	0.9	1.2	1.3	1.2	0.5	0.9	1.7	1.5	1.4	1.1
(%)	**100**	133	144	133	56	100	189	167	156	**122**

Source: Statistics Section of the Department of Agriculture, Government of Mizoram

The total production of oilseeds in 2012-13 was 2,224 t, which was less than half of each annual amount from 2003-04 to 2005-06, before the *Mautam* incident, as shown in Table 4.2.5. Oilseeds show

a declining trend in production during the recent years as compared with the situation before the rodent outbreak years, although productivity has been increasing. Cultivation areas of oilseeds have been decreasing year by year, and they are only 27% as compared to that of the level in 2003/04. Although productivity has increased after the rodent outbreak, the quantity of production has been decreasing. Aizawl District is the highest producing area, followed by Mamit District. Almost all oilseeds grow in the *Kharif* season.

Table 4.2.5 Cultivation Area, Production, and Productivity of Oilseed

Oil Seeds	2003/04	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13
Cultivation Area (ha)	7,532	5,817	5,870	4,077	3,485	3,275	2,741	3,140	2,474	2,063
(%)	**100**	77	78	54	46	43	36	42	33	**27**
Production (ton)	5,478	5,321	5,560	3,757	748	2,514	2,988	3,727	2,382	2,224
(%)	**100**	97	101	69	14	46	55	68	43	**41**
Productivity (ton/ha)	0.7	0.9	0.9	0.9	0.2	0.8	1.1	1.2	1.0	1.1
(%)	**100**	129	129	129	29	114	157	171	143	**157**

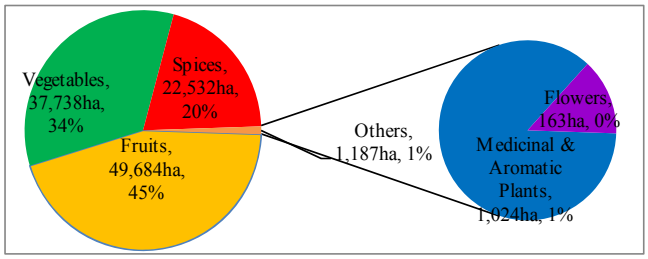
Source: Statistics Section of the Department of Agriculture, Government of Mizoram

4.2.7 Production of Horticulture Crops (under DOH)

(1) Production Data of Available Horticulture Crops

The JICA Study Team acquired production data on horticulture crops for the last five-year period from related government agencies. However, such data show large fluctuation year by year, as shown in Table 4.2.6.

It also shows that several production quantities were calculated by the multiplication of cultivation area with the same yield per unit (such as beans, brinjal, and tomato), meaning that an adequate yield survey might not have been carried out. Therefore, only the data on the latest cultivation area were used as production data of horticulture crops in this report.



Source: Department of Horticulture

Figure 4.2.2 Cultivation Area of Horticulture Crops in Mizoram 2012-2013

(2) Overview of Horticulture Crops Production

Of the cultivation area of horticulture crops in 2012-2013 in Mizoram, fruits occupy the largest area at 49,684 ha (45% of the total), followed by 37,738 ha for vegetables (34%), and 22,532 ha for spices (20%), whilst medicinal/aromatic plants and flowers occupy a mere 1,024 ha and 163 ha, respectively, as shown in Figure 4.2.2.

As for district-wise cultivation area of overall horticulture crops, the northern part of the state–Aizawl, Serchhip, Kolasib, and Champhai districts–has a relatively large cultivation area. Whilst the southern part, which include Lunglei, Lawngtlai, and Saiha districts, has a relatively small area. In terms of the percentage of cultivation area by crop type, fruits take the lead in all districts, and vegetables take second place in Aizawl, Serchhip, and Lunglei districts, whilst spices in the other districts. However in any case, there is no distinct variation, as shown in Figure 4.2.2. The area surrounding Aizawl City and Serchhip Town has a large production area, whilst rural areas of Lunglei District, the northern part of Mamit District, and the northeastern part of Aizawl District have a relatively small production area.

(3) Fruits

Of the cultivation area of fruits in the state, banana occupies the largest area, 21%, followed by local fruits such as mandarin orange, lime/lemon, pineapple, grape, *hatkora*, sweet orange, papaya and mango. The sum of cultivation area of mandarin orange, lime/lemon, *hatkora*, and sweet orange occupies about 40% of the total; therefore, it can be said that Mizoram is rich in citrus products. As for the district-wise cultivation area of fruits (Figure 4.2.3), the northern part of Serchhip District has the largest area for tropical fruits, and southeastern part of Serchhip District and central-eastern part of Champhai District have a large area for temperate fruits. Major cultivation area of banana is northern part of Serchhip District. Large cultivation areas of other major fruits are as follows: southeastern part of Serchhip District and entire area of Kolasib District for Mandarin orange; eastern part of Kolasib District and northern part of Saiha District for Assam lemon; western part of Kolasib District and entire area of Saiha District for pineapple; and central-eastern part of Champhai District for grape.

(4) Vegetables

Of the cultivation area of vegetables in the state, local vegetables occupy the largest area at 30% of the total, followed by 12% for chayote (squash or chow chow), 10% for bitter gourd, 8% for okra, 8% for cabbage, 7% for cowpea, 6% for beans, 6% for brinjal, 2% for tomato, and 2% for broccoli.

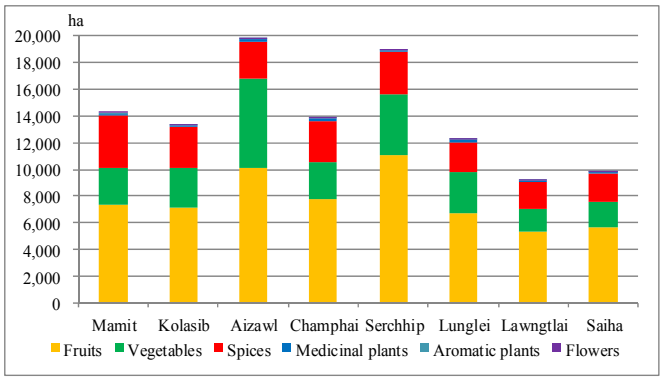
Amongst the districts, Aizawl District has a large area because of big demand in Aizawl City, followed by surrounding Serchhip Town. The northeastern part of Aizawl District, southern part of Kolasib District, and northern part of Saiha District also have a large cultivation area of vegetables.

The surrounding Aizawl City, which is the primary chayote cultivation area in the state, has the largest area for squash production, followed by the southern part of Kolasib, which also has a major cultivation area in Lungdai. Bitter gourd is produced in the whole state. Especially the entire area of Kolasib District, circles surrounding Aizawl City and Serchhip

Table 4.2.6 Cultivation Area, Production, and Productivity of Major Horticulture Crops in Mizoram

Crops		2008-2009	2009-2010	2010-2011	2011-2012	2012-2013
Banana	Area (ha)	7,220	8,660	10,040	10,090	10,540
	Production (ton)	66,424	84,810	118,600	119,060	127,530
	Productivity (ton/ha)	9.2	9.8	11.8	11.8	12.1
Local fruits	Area (ha)	-	-	-	8,840	9,040
	Production (ton)	-	-	-	19,310	19,890
	Productivity (ton/ha)	-	-	-	2.2	2.2
Mandarin Orange	Area (ha)	4,087	5,348	6,515	8,360	8,960
	Production (ton)	10,757	13,265	19,701	22,238	24,100
	Productivity (ton/ha)	2.6	2.5	3.0	2.7	2.7
Lime/ Lemon	Area (ha)	4,176	4,650	4,823	4,850	7,930
	Production (ton)	5,898	14,940	24,150	24,710	25,140
	Productivity (ton/ha)	1.4	3.2	5.0	5.1	3.2
Pineapple	Area (ha)	432	430	1,532	2,720	3,000
	Production (ton)	2,390	2,808	13,590	19,650	21,960
	Productivity (ton/ha)	5.5	6.5	8.9	7.2	7.3
Grape	Area (ha)	1,172	1,232	1,575	1,880	2,380
	Production (ton)	9,962	13,736	20,400	24,300	20,800
	Productivity (ton/ha)	8.5	11.1	13.0	12.9	8.7
Papaya	Area (ha)	817	770	800	850	1,000
	Production (ton)	4,493	4,985	6,750	18,190	23,100
	Productivity (ton/ha)	5.5	6.5	8.4	21.4	23.1
Chayote	Area (ha)	2,000	2,250	3,500	4,000	4,500
	Production (ton)	28,200	34,873	56,849	66,500	75,020
	Productivity (ton/ha)	14.1	15.5	16.2	16.6	16.7
Local vegetables	Area (ha)	-	-	-	10,220	11,460
	Production (ton)	-	-	-	8,380	9,620
	Productivity (ton/ha)	-	-	-	0.8	0.8
Bittergourd	Area (ha)	3,474	3,580	3,715	3,800	3,900
	Production (ton)	17,370	18,258	19,110	19,570	20,400
	Productivity (ton/ha)	5.0	5.1	5.1	5.2	5.2
Okra	Area (ha)	2,749	2,500	2,800	2,950	3,050
	Production (ton)	11,270	10,500	18,710	19,790	20,742
	Productivity (ton/ha)	4.1	4.2	6.7	6.7	6.8
Cabbage	Area (ha)	2,985	2,400	2,600	2,800	3,020
	Production (ton)	23,880	21,600	33,569	37,100	40,080
	Productivity (ton/ha)	8.0	9.0	12.9	13.3	13.3
Beans	Area (ha)	2,250	2,245	2,290	2,310	2,420
	Production (ton)	4,725	4,850	4,956	5,040	5,320
	Productivity (ton/ha)	2.1	2.2	2.2	2.2	2.2
Brinjal	Area (ha)	1,884	1,890	2,010	2,100	2,200
	Production (ton)	12,246	12,096	12,903	13,500	15,620
	Productivity (ton/ha)	6.5	6.4	6.4	6.4	7.1
Tomato	Area (ha)	620	635	675	700	800
	Production (ton)	4,960	5,715	6,180	6,420	7,390
	Productivity (ton/ha)	8.0	9.0	9.2	9.2	9.2
Chilli (fresh)	Area (ha)	7,185	8,700	8,700	-	-
	Production (ton)	24,429	47,850	47,850	-	-
	Productivity (ton/ha)	3.4	5.5	5.5	-	-
Chilli (dried)	Area (ha)	-	-	-	8,900	9,020
	Production (ton)	-	-	-	9,790	8,208
	Productivity (ton/ha)	-	-	-	1.1	0.9
Ginger	Area (ha)	9,391	6,200	6,500	7,010	7,280
	Production (ton)	34,290	31,000	31,950	34,460	28,390
	Productivity (ton/ha)	3.7	5.0	4.9	4.9	3.9
Turmeric	Area (ha)	9,625	4,500	4,780	5,580	6,050
	Production (ton)	39,862	22,500	23,970	29,240	22,990
	Productivity (ton/ha)	4.1	5.0	5.0	5.2	3.8

Source : Horticulture, Government of Mizoram



Source: Department of Horticulture

Figure 4.2.3 District-wise Cultivation Area of Horticulture Crops in Mizoram 2012-2013

Town, and the northern part of Saiha District have a large production area. Large cultivation areas of other major vegetables are as follows: western part of Kolasib District, circle surrounding Aizawl City, northwestern part of Aizawl District, circle surrounding Serchhip Town, and entire area of Saiha District for okra; the circle surrounding Serchhip Town and northwestern part of Aizawl District for cabbage; the northwestern part of Kolasib District, circles surrounding Aizawl City and Serchhip Town, and central-eastern part of Champhai District for brinjal; the circle surrounding Aizawl City for tomato; and the circle surrounding Aizawl City and northern part of Saiha District for broccoli.

(5) Spices

Of the cultivation area for spices in the state, chilli occupies the largest area at 40% of the total, followed by 32% for ginger, and 27% for turmeric, and those three crops occupy most of the cultivation area for spices. As for district-wise cultivation area for spices, Mamit District has a relatively large area; however, overall difference between the districts is small.

(6) Areca Nut

Areca nut is cultivated in low-altitude areas, especially in the western part of Kolasib District where it is primarily cultivated. The western part of Mamit District also has a large area for areca nut production.

4.2.8 Production of Industrial and Other Crops

The major industrial and other crops cultivated in Mizoram are sugarcane, oil palm (both of them under DOA), rubber, coffee, and broom grass (under SWCD). For the latter three crops, no production data are available from the government agencies. SWCD is involved only in the distribution of these seeds and nurseries under the NLUP. In addition, the local agencies of both the national rubber and national coffee boards do not keep any data and records on their production. Therefore, the two crops of sugarcane and oil palm are discussed in this subsection.

(1) Sugarcane

The production of sugarcane has been fluctuating. The highest production was recorded in 2005-06 and quantity of the production was 45,953 t. Whilst in 2012-13, the amount of products decreased to 6,795 t, as shown in Table 4.2.7. The cultivation area has not decreased much during the past decade except in the period of the *Mautam* damage. The productivity is extremely low, and the processed sugar is either self-consumed by farmers or sold to street vendors. There is no improvement observed in recent years in spite of implementation of the sugarcane development programme by the NLUP. Aizawl District has the largest production area at 446 t, followed by Serchhip District producing 306 t. Production in the southern area is minimal.

Table 4.2.7 Cultivation Area, Production, and Productivity of Sugarcane

Sugarcane	2003/04	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13
Cultivation Area (ha)	1,393	1,357	1,383	1,340	883	1,342	1,434	1,418	1,463	1,322
(%)	**100**	97	99	96	63	96	103	102	105	**95**
Production (ton)	36,174	13,565	45,953	12,187	828	13,696	12,368	7,901	7,456	6,795
(%)	**100**	37	127	34	2	38	34	22	21	**19**
Productivity (ton/ha)	26.0	10.0	33.2	9.1	0.9	10.2	8.6	5.6	5.1	5.1
(%)	**100**	38	128	35	3	39	33	22	20	**20**

Source: Statistics Section of the Department of Agriculture, Government of Mizoram

(2) Oil Palm

The Oil Palm Development Programme was initiated from 2004-2005 in Mizoram under the ISOPOM scheme. However, some newly-planted oil palm trees were cut down by farmers because of absence of marketing facilities at the initial stage. The Government of Mizoram made contracts with reliable national companies for oil palm development and processing. Since 2008, companies have bought oil palm at Rs.4.75/kg, and 1,828 t of oil palm have been purchased by companies. Table 4.2.8 shows that the cumulative cultivation area of oil palm from 2005-06 to 2012-13 was 13,056 ha, with 5,623 famers for six districts, excluding Champhai and Saiha districts. Another 5,000 ha are expected to be developed.

Table 4.2.8 Cultivation Area of Oil Palm

Year	Kolasib	Mamit	Lunglei	Lawngtlai	Serchhip	Aizawl	Total
2005-06	82	-	28	-	-	-	110
2006-07	24	-	-	-	-	-	24
2007-08	543	267	15	-	-	-	825
2008-09	964	476	218	-	42	-	1,700
2009-10	997	697	806	-	342	-	2,842
2010-11	489	474	500	105	310	-	1,878
2011-12	478	350	562	300	250	26	1,966
2012-13	1,039	928	750	617	327	50	3,711
Total	**4,616**	**3,192**	**2,879**	**1,022**	**1,271**	**76**	**13,056**

Source: Statistics Section of the Department of Agriculture

4.2.9 Farming System and Cropping Method

(1) Cultivation Seasons for Paddy and Other Food Crops

Most of the farmers in Mizoram are practising traditionally integrated farming systems such as mixed cropping as well as piggery and poultry farming in villages in order to increase or continue their income from different sources, and above all, they are risk-averse farming and cropping systems. Though, a good scientific and appropriate knowledge and technology for smooth running of integrated farms are indispensable to increase farmers' income and production of the state.

The relations between rainfall (monsoon) and cropping patterns of paddy and other food crops of maize, pulse, oilseeds, and sugarcane are shown in Figure 4.2.4. There are two cropping seasons in India as well as in Mizoram, *Kharif* (rainy season / Mizoram: 'Fur') and *Rabi* (dry season / Mizoram 'Thai'). Mizoram's *Kharif* season starts in the end of March or April, earlier than in other places in India. In addition, farming is broadly divided into three cultivation types in Mizoram, as follows:

(a) Jhum Cultivation

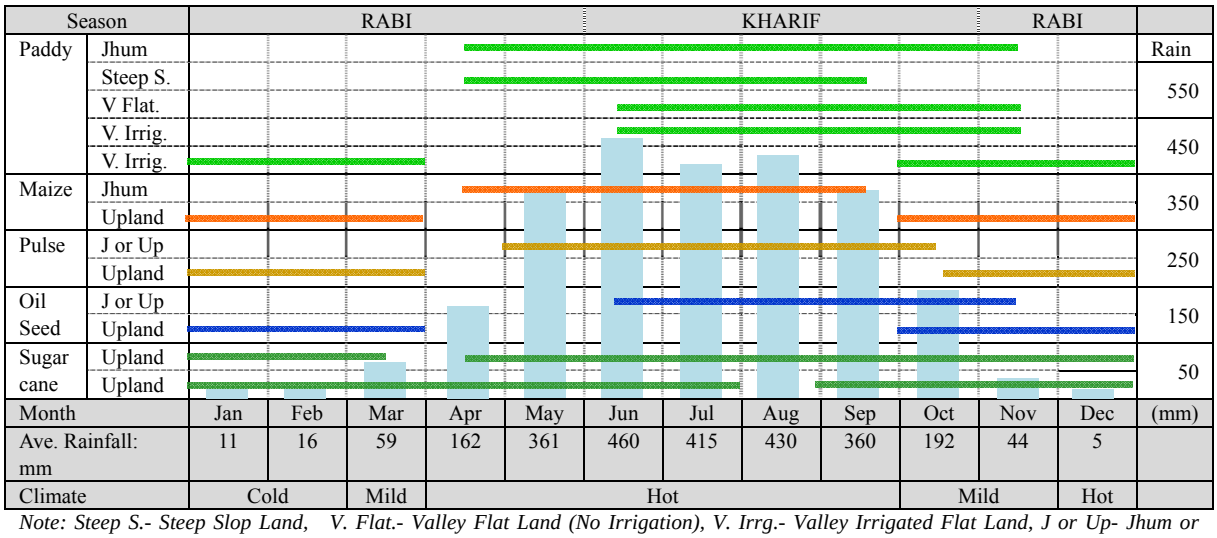
Forested fallow is slashed and cleared from December to January. The burning of slash is done in March. Rice is sown mostly from April to the middle of May, after the first rain. Both early and late matured varieties are adopted in the same land. Accordingly, there are two times for harvesting from July to August, and from October to November. Traditional terrace/slope cultivation applies almost the same cropping pattern as for *jhum* cultivation. Maize and other crops are also sown from April to May as mixed crops with paddy or without paddy. After harvesting once, the land is abandoned and remains fallow for a few years until the next cultivation.

(b) Wet Rice Cultivation (WRC) / Low (Valley) Land Rice Cultivation

The irrigated and non-irrigated cultivation methods are almost the same as WRC. Paddy is planted from June to July, and harvested from October to November. Mixed cropping is not practised in WRC. Double cropping is possible if irrigation water is fully available, but minimal.

(c) Rabi Cultivation

The sowing time for *Rabi* cultivation is from September to October, and harvesting time is from February to March. The area under *Rabi* cultivation of paddy is only 1% to 5% of *Kharif*. The sowing time of maize, pulse, oilseeds, etc. are from September to November, and the harvesting time is from January to March.



Note: Steep S.- Steep Slop Land, V. Flat.- Valley Flat Land (No Irrigation), V. Irrg.- Valley Irrigated Flat Land, J or Up- Jhum or Upland
Source: JICA Study Team

Figure 4.2.4 Cropping Pattern of Food Crops in Mizoram

(2) Cereals (Rice, Maize, Wheat) (Under DOA)

(a) Rice

The rice farming system in Mizoram is generally categorised into four types, as shown in Table 4.2.9.

Table 4.2.9 Types of Paddy Cultivation

Type of Paddy Cultivation	Land Location	Type of Paddy	Cropping Method
i) Direct seeded, rain fed in upland (jhum)	Steep slope / Slope	Upland-rice / Sticky	Mixed cropping
ii) Direct seeded rain fed on level bench terraces	Medium slope	Upland-rice / Sticky	Mixed cropping
iii) Transplanted on wet terraces (WRC)	Gentle slope / Flat	Wet-rice / Sticky	Monocropping
iv) Transplanted in valley lands (WRC /Rabi)	Flat	Wet-rice / Both	Monocropping

Source: JICA Study Team

Paddy and maize are cultivated as the main food crops, and mixed with variable crops such as other cereals, vegetables, and pulses, except for transplanted paddy in wet terraces or flatlands (WRC). WRC entirely depends on the monsoon rain except in a few cases. In *jhum* farming, tilling on the hills is entirely done by hand or there is no tilling; hence, no mechanical tools are used in *jhum* and sloping upland cultivation. Tractors and power tillers have been used in recent years in flatlands in valleys, mainly in Kolasib, Mamit, and Champhai districts. There is traditional gender role in agricultural works, for example, weeding and seed storage are done by women, land protection and marketing are done by men, and clearing of forests, burning, sowing, and harvesting are by women and/or men.

The landrace of paddy preferable to Mizoram farmers is of Japonica sticky type, mainly grown by *jhum* and upland paddy cultivation. Meanwhile, WRC is practised on flatter lands in valleys or terraces, and some famers use improved or hybrid Indica varieties recommended by DOA. Many farmers obtain traditional paddy seeds from farmers of the adjoining state of Manipur or Myanmar as palatable and staple food for their consumption. Apparently, there is a gap between farmers' choice

Transplanted Valley Land - WRC

Paddy mixed with other crops
Source: JICA Study Team

Photo 4.2.1 Paddy Cultivation

and DOA's recommended varieties.

(b) Maize

Many local landrace varieties are utilised by farmers. Several varieties are proved to be high yielding; however, farmers are hardly given enough quantities of improved seeds at proper times by DOA.

(3) Pulses

The major pulses growing in Mizoram are cowpeas, French beans, mung beans, field peas, rice beans, and pigeon peas. Local landrace varieties are prevailing, and seed replacing practices are minimal because of poor distribution of improved seeds. DOA is engaged in seed distribution; however, the quantity of seeds is not enough to cater for the demand. There are no private seed companies except for small dealers in Aizawl. Therefore, generally, farmers save seeds from their harvest for the next season or purchase poor-quality seeds which are usually sold at the local markets.

Pulses are cultivated in both the *Kharif* and *Rabi* seasons as mixed crops in *jhum* and upland fields, along with major crops, without application of chemical fertilisers and pesticides. In settled cultivation, mixed and inter cropping are usually practised for vegetables or major cereals. Most of the pulses are sown by line sowing or broadcasting, and cropping methods and cultivation extent are usually decided depending on marketing conditions. Very few farmers cultivate pulses as secondary crop in their paddy fields in the winter season in Kolasib and Mamit districts.

(4) Oilseeds

Among oilseed crops, mustard, rapeseed, and sesame are the predominant ones and are widely cultivated in *jhum* and upland fields. Several varieties of sesame are mixed and grown with other crops in *jhum* land by traditional method. Mustard and rapeseed are generally mixed with *Rabi* crops such as barley and gram. These crops are mainly cultivated for commercial purposes. Extracted oil is used for their self-consumption or for sale at the local market. Mustard is sometimes taken as an intercrop with autumn-planted sugarcane in which no additional land is required. It also offers to augment mustard production without adversely affecting the yield of companion sugarcane crops. Soya bean is also grown as an intercrop with maize, fruits, or vegetables. It needs proper amount of rainfall that is provided by the monsoon during the sowing seasons of the crop. In addition, rapeseed and mustard crops act as very good cover of soil in winter.

(5) Sugarcane

Traditional varieties are prevailing and their growing period is 10 to 12 months (9 to 10 months for improved varieties). DOA is taking up organic cultivation system recently. Almost all harvested sugarcane are used for making *jaggery* / *gur* (brown sugar lump) in the villages because sugar mills are not available in Mizoram. Some yields in Kolasib are sold to traders from Assam. The planting time of sugarcane is from March to April and from September to October.

(6) Fruits

With the exception of local fruits, fruit trees such as banana, pineapple, citruses, and grapes are generally monocropped in the orchards. These fruit trees are often planted with vegetables in irrigated areas and river terraces where vegetables can be grown even during the dry season. Bananas and pineapples are also planted in *jhum* fields (no longer *jhuming*). In those fields, soil losses are very severe and countermeasures for soil conservation must be taken immediately. Terracing and pit planting are

Table 4.2.10Major Varieties of Fruits in Mizoram

Crops	Varieties
Mandarin Orange	Zo- Mandarin, Michal, Tangerine seedless, Washington, honey orange
Sweet Orange	Valencia
Banana	Tall Cavendish, Grand Naine
Papaya	Red Lady, Red Royal, local
Passion fruit	Yellow, Purple
Pineapple	Giant Kew, queen Mauritius
Mango	Amrapali, Local
Dragon Fruit	Red, White

Source: Department of Horticulture, Government of Mizoram

introduced in the orchards where small-scale irrigation systems are constructed with assistance from DOH; however, those orchards are very few in number.

Fruit trees and orchards are usually managed poorly. Appropriate training and pruning, fruit thinning, and regeneration of fruit trees are not practised. On the other hand, orchards where weeding is frequently practised are often observed; however, weeds pulled up are not utilised for organic manure, and cover crops are not cultivated. Varieties of major fruits cultivated in Mizoram are listed in Table 4.2.10. Fruit trees are planted at the time when the soil moisture condition becomes good during the early part of the rainy season. The crop calendar of major fruit trees is presented in Figure 4.2.5.

Crop	Work	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
		Rainy Season											
Banana	Land preparation												
	Sowing/ Planting												
	Harvest												
M Orange	Land preparation												
	Sowing/ Planting												
	Harvest												
Lime/ Lemon	Land preparation												
	Sowing/ Planting												
	Harvest												
Pineapple	Land preparation												
	Sowing/ Planting												
	Harvest												
Grape	Land preparation												
	Sowing/ Planting												
	Harvest												
Mango	Land preparation												
	Sowing/ Planting												
	Harvest												
Passion fruit	Land preparation												
	Sowing/ Planting												
	Harvest												
Avocado	Land preparation												
	Sowing/ Planting												
	Harvest												
Papaya	Land preparation												
	Sowing/ Planting												
	Harvest												

Source: Department of Horticulture, Government of Mizoram

Figure 4.2.5 Crop Calendar of Major Fruits

Banana cultivation in jhum field

Orange orchard in Lunglei

Vineyard in Champhai

Source : JICA Study Team

Photo 4.2.2 Cultivation of Fruits in Mizoram

(7) Vegetables and Spices

In jhum fields, various vegetables and spices such as pumpkin, brinjal, African eggplant, wax gourd, leaf mustard, chilli and ginger are mixed with paddy. Fertilisers are not applied, and direct seeding is practised. Most of the seeds are saved by farmers; however, ginger seeds are occasionally distributed by DOH. Most of the vegetables are consumed at home. Meanwhile, chilli and ginger are cultivated for selling because they are highly profitable crops in Mizoram. Especially, ginger is monocropped in some *jhum* fields from the first year and beyond; however, appropriate measures for land conservation are not practised, and soil losses at the harvesting time have become a major issue.

In suburban areas in Aizawl and other large towns, irrigated fields for vegetable production are expanding. Water from streams is collected using subsidised water pipes and storage tanks. However, discharge of stream is extremely low, and dripping water among rocks is used for irrigation when some streams are dried up during the driest period. In these areas, terraces for vegetable cultivation are constructed by farmers, and stone retaining walls are also set at steep sloping fields. In general, leguminous crops, pumpkin, maize, and squash (perennial crops) are grown during the rainy season, and peas and cruciferous vegetables such as leaf mustard, cabbage, and broccoli are cultivated during the dry season.

Greenhouses are also being promoted by DOH, mainly in these areas. Vegetables which are difficult to cultivate during the rainy season, such as tomato and broccoli, can be produced even during the rainy season, and vegetable seedlings for the dry season can be grown during the late period of the rainy season. In addition, dairy cows are being introduced with assistance from the state government, and farmers who keep cows apply cow dung to the fields. Farmers with no animal purchases apply cow or chicken dung and neem compost for soil improvement. Only a few farmers have procured subsidised mini-power tillers for land preparation in terraced fields.

Vegetables are also cultivated in fields on river terraces in Sairang in Aizawl District, Hortoki in Kolasib District, Ngengpui in Lawngtlai District, and so on. However, vegetables cannot be cultivated during the flood period, which is three to five months from May to September. Vegetables can be grown without irrigation even during the dry season because of rich soil. Fertilisers are not applied because soil fertility is maintained due to flooding. In WRC areas, vegetables such as peas and leaf mustard are cultivated during the dry season if irrigation water is available.

Open-pollinated vegetables are cultivated under *jhum* farming, while hybrid vegetables are mainly cultivated in greenhouses or under irrigation systems. Major varieties of vegetables cultivated in Mizoram are summarised in Table 4.2.11.

Most vegetables and spices are cultivated mainly in *jhum* fields during the rainy season. Meanwhile, soft green vegetables, such as cabbage and broccoli, are mainly cultivated during the dry season with irrigation, because it is difficult to cultivate such during the rainy season due to diseases caused by fungi and bacteria. The crop calendar of major vegetables and spices is presented in Figure 4.2.6.

Table 4.2.11 Major Varieties of Vegetables in Mizoram

Crops	Varieties
Open-pollinated varieties	
French Bean	Vaishnavi, Local
Cowpea	Bali, Local
Pumpkin	Lalkumra, Local,
Hybrid varieties	
Broccoli	Fantayasy F1, Premiere
Cabbage	Ryozeki, Indam 1299, scarlet Red, Fieldman, KK689 F1
Tomato	Samrudhi F1
Okra (Bhindi)	Money maker, BSS-593, Shehzadi
Brinjal	Abhinav, BSS-633
Bitter gourd	Sheena, BSS-618
Carrot	Chilka, Pusa Kesar, Improved Kuroda
Coriander	Woggiano, Caribe, X-47 Improved
Onion	Red Gold, Preana
Pakchoy	Kanti F1
Chillies	Shimran, Evergreen, Clause HP 158, BSS-367 Arjun, BSS-776
Capsicum	Angel F1, Asha F1, Surekha/ BSS-555
Lettuce	Baltimoral, Garishma
Knol-Khol	Winner F1 Hybrid
Pumpkin	Arjun F1

Source: Department of Horticulture, Government of Mizoram


Vegetable cultivation in suburban area


Vegetable cultivation in river terraces


Tomato cultivation in greenhouse

Source: JICA Study Team

Photo 4.2.3 Cultivation of Vegetables in Mizoram

Crop	Work	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
		Rainy Season											
Chayote (perennial crop)	Land preparation												
	Sowing/ Planting												
	Harvest												
Bittergourds	Land preparation												
	Sowing/ Planting												
	Harvest												
Okra	Land preparation												
	Sowing/ Planting												
	Harvest												
Cowpea	Land preparation												
	Sowing/ Planting												
	Harvest												
Beans	Land preparation												
	Sowing/ Planting												
	Harvest												
Brinjal	Land preparation												
	Sowing/ Planting												
	Harvest												
Tomato	Land preparation												
	Sowing/ Planting												
	Harvest												
Onion	Land preparation												
	Sowing/ Planting												
	Harvest												
Mustard leaf	Land preparation												
	Sowing/ Planting												
	Harvest												
Cabbage	Land preparation												
	Sowing/ Planting												
	Harvest												
Broccoli	Land preparation												
	Sowing/ Planting												
	Harvest												
Cauliflower	Land preparation												
	Sowing/ Planting												
	Harvest												
Knol-khol	Land preparation												
	Sowing/ Planting												
	Harvest												
Lettuce	Land preparation												
	Sowing/ Planting												
	Harvest												
Peas	Land preparation												
	Sowing/ Planting												
	Harvest												
Potato	Land preparation												
	Sowing/ Planting												
	Harvest												
Chilli	Land preparation												
	Sowing/ Planting												
	Harvest												
Ginger	Land preparation												
	Sowing/ Planting												
	Harvest												
Turmeric	Land preparation												
	Sowing/ Planting												
	Harvest												
Garlic	Land preparation												
	Sowing/ Planting												
	Harvest												

: Cultivation during rainy season : Cultivation under irrigation during dry season

Source: Department of Horticulture, Government of Mizoram

Figure 4.2.6 Crop Calendar of Major Vegetables and Spices

(8) Flowers

Several exotic flowers not common in the state before 2000, such as anthurium, birds of paradise, leather leaf fern, rose (Dutch varieties), dendrobium orchids, lilium, chrysanthemun, carnation, and gerbera, have been imported and introduced by DOH. Then, commercial production of flowers started. Especially, anthurium and roses are being exported in the form of cut flowers to other states in India. This positively led ZOPAR Exports Private Ltd., which is based in Bangalore, to expand their business in Mizoram. ZOPAR has been producing cut flowers from their own greenhouses, and has contracted flower growers to increase production of cut flowers. Anthurium growers have formed a society named Zo Anthurium Growers' Society (ZAGS), which operates smoothly to take care of marketing of all cut flowers they produce. Members of ZAGS have initially contracted with ZOPAR to sell all their products; however, they have now developed their own market channels. ZAGS is composed of about 200 farmer members, of which 90% are women. Flowers are produced mainly in the surrounding area of Aizawl City, Kolasib City, and part of Lunglei. The production area is still as small as about 160 ha in total, of which 46 ha is in Aizawl, 35 ha is in Kolasib, and 21 ha is in Lunglei.

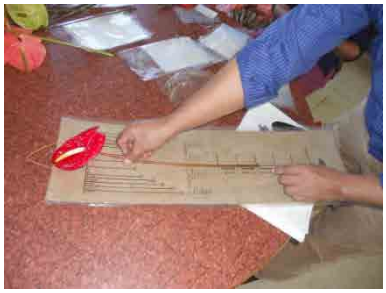
Anthurium and roses are cultivated year-round in shade houses and greenhouses, respectively, which were constructed on terraces with assistance from DOH. Seedlings have also been provided by DOH; however, new varieties have now been introduced by some growers themselves. Cut flowers are shipped after grading and packing. Varieties of major commercial flowers cultivated in Mizoram are described in Table 4.2.12.

Table 4.2.12 Major Varieties of Flowers in Mizoram

Crops	Varieties
Anthurium	Tropical, Fire, Yang
Rose	Gold Strike, Peach, Avalanche, Corvette, Bonear, Taj Mahal, Avalanche, Bordeaux
Mokara Orchid	Nora Blue 'Pink', Dinah Shore, Om Yai, Thailand Sunspot, Nora Blue 'Purple'
Gerbera	Stanza, Brilliance, Pre-Intenzz, Jaffana, Walhalla, Balance, Paradisco

Source: Department of Horticulture, Government of Mizoram

Flower cultivation in shade house



Grading of anthurium

Packaging of cut flowers

Source : JICA Study Team

Photo 4.2.4 Cultivation and Shipping of Flowers

(9) Industrial and Other Crops

(a) Oil Palm

Oil palm is still a new crop for farmers in Mizoram. A variety of tenera is the ruling hybrid and it is a cross between thick-shelled dura and shell-less pisifera. The best season for planting is June-December, i.e., during the monsoon. In case of planting during summer, adequate irrigation, mulching, and growing cover crops such as sun hemp are preferred in practice. Oil palm is a wide-spaced perennial crop with a long juvenile period of three years. Inter and intra row space can be used to generate income during the juvenile phase of the crop. At present, Mizoram farmers are planting paddy, banana, pineapple, ginger, chilli, cucurbit, cowpea, beans, mustard, maize, and soya bean with palm oil.

(b) Rubber

The clones recommended by the Rubber Board of India for the northeast areas are RRIM 600 and RRII 105. These clones have been introduced to Mizoram under the NLUP. This is also a

monocropping system except in the first two to three years after planting during which period certain crops such as paddy, pineapple, banana, vegetables, and pulses can be planted along with rubber. From the fourth year onward, canopy of rubber trees will close and other crops cannot be grown economically. It grows well at elevation below 450 m above sea level, in such low-lying areas mostly in Kolasib, Mamit, Lunglei and Lawngtlai districts.

(c) Coffee

Since robusta coffee production is comparatively high in countries of low elevation and a large portion of Mizoram State is at high elevation, the Coffee Board of India recommended Arabica coffee for Mizoram. Arabica coffee of Sln 12 (Cauvery) variety is being produced since the past few years until today. The practice is monocropping under trees with good shade at elevation ranging from 1,000 m to 1,500 m above sea level.

(d) Broom

This belongs to the grass family and grows anywhere in the state as natural vegetation. Literature on broom cultivation is extremely few and no set principles on packaging and practices for its cultivation are found until today. Due to its tuff root system, broom plants have good soil binding property and act as good soil conservation measure for topsoil, and the green leaves serve as a good source of fodder, whilst the stems after harvest can be used as fossil fuel/firewood.

(10) Diversification of Crops

Table 4.2.13 shows the percentage of gross cropped areas in 1990-91 and 2008-09. The cropped area is categorised into three crop groups, namely: food crop, commercial crop, and horticulture and plantation. In addition, data on the four states of the North Eastern Region are also presented in the table for comparison with Mizoram's status. In 1990-91, food crops was the highest in all states, and significant change was observed with diversification from traditional food crops to commercial crops or horticulture and plantation crops except in Assam. From this perspective, the diversification pattern of Mizoram is horticulture and plantation crop based agricultural diversification, and it means that diversification of other crops is limited. Crop diversification is supposed to bring more remuneration and certain benefits to farmers.

Table 4.2.13 Percentage Change in Area Under Crop Categories

State	1990–91: Gross Cropped Area			2008–09: Gross Cropped Area		
	Food Crops (%)	Commercial Crops (%)	Horticulture and Plantation (%)	Food Crops (%)	Commercial Crops (%)	Horticulture and Plantation (%)
Assam	69.87	10.78	8.33	66.65	7.11	9.11
Manipur	91.53	3.44	16.72	78.64	0.64	25.00
Nagaland	80.63	6.81	7.02	67.66	16.64	7.34
Tripura	71.08	3.19	19.90	85.19	1.93	23.02
Mizoram	77.46	5.63	21.55	68.33	4.69	50.52

Source: Statistical Abstract, India

4.2.10 Shifting Cultivation and Mitigation Plan

Shifting cultivation is still important in rice production for Mizoram. Nevertheless, various attempts including the ongoing NLUP have been undertaken by related government agencies to transfer *jhum* farmers to settled farming. *Jhum* areas have drastically decreased from 2008/09 at the 40,000 ha level to 25,000 ha to date. Such drastic reduction was caused partly by the effect of the NLUP, but mainly due to MGNREGS, which provided jobs to the rural poor for 100 days a year. However, the vulnerability of *jhum* lands remain substantially unchanged because uncultivated *jhum* areas have been converted to oil palm plantations in the north and for ginger production extensively, inducing serious soil erosion; otherwise, it would become fallow lands.

The Central Assistance to State Plan Programme of Watershed Development Project in Shifting Cultivation Areas (WDPSCA) for the benefit of *jhum* cultivation families who live below the poverty line was implemented in 61 micro watershed projects with a target area of 30,000 ha during the 11th Five-Year Plan period. Financing of the scheme includes treatment of arable and non-arable lands, drainage line, creation of water bodies, development of agriculture, forestry and land-based/ household production system as package of rehabilitation components. The target area of treatment has been saturated as per the plan and guidelines, and from which, quite a good number of *jhum* cultivation families within the watershed project have adopted settled cultivation, resulting in significant reduction of *jhum* areas. In addition to this, the practice of *jhum* cultivation could not be stopped at once; therefore, DOA assists *jhum* farmers to develop *jhum* land for productive use and improve cultivation methods and suitable package of practices, including judicious use of fertilisers by placement application in order to enhance the productivity from the current level of 0.9 t/ha to 1.5 t/ha of rice.

On the other hand, SWCD currently has two broad approaches, namely, (i) cash crop plantation such as for rubber, coffee, and brooms for permanent occupation; and (ii) enhancement of production and productivity of existing orchards, farmlands by providing water harvesting ponds/tanks, terracing for land development and river training works/drainage line treatments for prevention of river bank erosion, retention of silt and debris at regular intervals across the stream and impounding stream water for more time for agricultural purposes. Major works for soil and water conservations are shown in Table 4.2.14.

Table 4.2.14 Main Works for Soil and Water Conservation Implemented by SWCD

Work	Unit	2009/10	2010/11	2011/12	2012/13
1. Hillside Terracing/Bench Terracing	ha	185	1,441	183	207
2. Contour Trenching/Staggered Trenching	ha	0	0	190	33
3. Rainwater Harvesting/Farm Ponds	nos.	0	0	244	336
4. Stream Banks Erosion Control	nos.	0	110	650	900
5. Check Dams	nos.	0	200	270	830
6. Logwood Bunding	ha	0	0	50	0
7. Agro Forestry	ha	0	0	25	0

Source : SWCD

4.2.11 Implementation and Progress of the NLUP

(1) Department of Agriculture (DOA)

The following are four different types of development components that the beneficiaries can select:

- Wet Rice Cultivation on Flatlands (0 - 10% slope), i.e., WRC-I
- Wet Rice Cultivation on Flatlands (10 - 25% slope), i.e., WRC-II
- Oil Palm Cultivation
- Sugarcane Cultivation

The total assistance amount is released to the beneficiaries on an instalment basis through their individual bank account. The number of instalments is four times for all agricultural components, and each instalment amount per hectare and beneficiary's contribution are as shown in Table 4.2.15.

Table 4.2.15 Installment Rate for Each Component and Beneficiary's Contribution Rate

Component	Rate of Installment (Rs./ha)					Beneficiary's Contribution (Rs./ha)	(%)
	1st	2nd	3rd	4th	Total		
WRC-I	20,000	45,000	39,000	16,000	120,000	30,000	25
WRC-II	20,000	44,000	28,000	44,000	136,000	34,000	25
Oil Palm	20,000	40,000	28,000	12,000	100,000	30,000	30
Sugarcane	20,000	32,000	20,000	28,000	100,000	45,000	45

Source: Brief Report on Implementation of NLUP / Agriculture Sector 2013

The physical achievement of each development component is shown in Table 4.2.16 below. However, achievement in an area along with the number of beneficiaries could not be summarised because of lack of data.

Table 4.2.16 Achievement Under the Development Component as of October 2013

Component	WRC-I	(%)	WRC-II	(%)	Oil Palm	(%)	Sugarcane	(%)	Total	(%)
No. of Beneficiaries (No.)	8,777	44	7,970	40	2,290	11	1,055	5	20,092	100

Source: Brief Report on Implementation of NLUP / Agriculture Sector 2013

According to the results of the household survey carried out by the JICA Study Team, 96% of farm households replied that they received assistance from the NLUP, as shown in Table 4.2.17.

Table 4.2.17 Assistance Received by Households Under Government Schemes

Detail	No. of HH*	(%)
Received benefit under farm-related government schemes: Yes	299	83
Received benefit under farm-related government schemes: No	61	17
Total	360	100

Sources of Assistance Replied 'Yes' (multiple answer for 299 HH)	No. of HH*	(%)
Integrated Watershed Development Programme (IWDP)	5	2
Integrated Wasteland Management Programme (IWMP)	2	1
New Land Use Policy (NLUP)	291	96
Others	4	1
Total	302	100

Note: HH means household*
Source: Household Survey December 2013 - January 2014, JICA Study Team

(2) Department of Horticulture (DOH)

Assistance for the horticulture component aims to distribute nursery stocks of various fruits and perennial crops, as shown in Table 4.2.18.

Table 4.2.18 Beneficiaries for the Horticulture Sector

Trade	No. of Beneficiaries				
	1st Phase	2nd Phase	3rd Phase	4th Phase	Total
Grape	324	231	45	19	619
Passion Fruit	166	132	78	40	416
M. Orange	4,396	4,142	2,007	922	11,467
Pineapple	1,217	1,024	585	181	3,007
Chayote	285	131	30	18	464
Areca Nut	2,753	2,515	1,087	567	6,922
Aloe Vera	23	6	7	3	39
Tung	141	206	109	20	476
Tea	22	205	84	73	384
Mango			17	2	19
Total	**9,327**	**8,592**	**4,049**	**1,845**	**23,813**

Source: Department of Horticulture, Government of Mizoram

(3) Soil and Water Conservation Department (SWCD)

SWCD has implemented three trades such as boom, rubber, and coffee under the NLUP. The annual progress and performance of the above trades are shown in Table 4.2.19.

Table 4.2.19 Progress and Performance of Plantation of Coffee, Rubber, and Broom Under NLUP

Name of Trade	No. of Beneficiaries				
	1st Phase	2nd Phase	3rd Phase	4th Phase	Total
Broom	3,865	2,697	1,516	691	8,769
Rubber	659	436	265	114	1,474
Coffee	872	412	241	93	1,518
Total	5,396	3,545	2,022	898	11,861

Source: Soil and Water Conservation Department, Government of Mizoram

4.2.12 Problems and Constraints to Development

Through close cooperation with DOA and DOH in the course of the JICA Study, the JICA Study Team identified several problems and constraints in agricultural production. Most of them are fundamental problems for agricultural production and stemmed from institutional issues involved in the state government, DOA, and DOH, in particular. Various problems of farmers themselves and farming practices were also identified; however, those underlying problems are mainly or partly attributed to the institutional issues.

(1) Institutional and Human Resources Issues

(a) Improper Agricultural Statistics

There is a lack of system of collecting accurate agricultural information and data in both departments. Agricultural data collection in the field is not extensively carried out and/or not made according to adequate standards due to the lack of proper technical knowledge, shortage of field staff, and shortage of operational fund. In addition, the field staffs have not been well educated and trained so far. Therefore, data processing by the departments are not carried out based on real information; hence, it can be said that the present agricultural statistics are not reliable and rather distort the real status of the agriculture sector in Mizoram. Statistics is the foundation of all the activities undertaken by the government and private sector, therefore, no realistic policies nor programmes in the agriculture sector could be established without accurate agricultural statistics. This problem is an issue that needs to tackled urgently.

(b) Lack of Mizoram's Own Targets and Programmes

There are no specific policies, targets, and approaches in agricultural administration; therefore, realistic short- and long-term development plans for the agriculture sector have not been prepared yet. The main activities of the departments are concentrated in transacting CSS of which subjects fluctuate from time to time due to the policy of the union government such as patch works. Prioritizing the CSS due to the lack of state's budget, the establishment of Mizoram's own agricultural targets and programmes will be given the first priority, and then funds for CSS can be fully utilised in the form of suiting it to own targets and programmes.

(c) Insufficient Human Resources Development

Through joint activities between the JICA Study Team and the departments, it is recognised that most department staffs are insufficiently trained and experienced in their professions. As mentioned above, their activities are fully involved in the CSS programmes under the guidelines provided by the union government, technical guidance and extension works to the farmers based on their knowledge and ideas considering particular agricultural environment of Mizoram are lacking, and this is typically seen in the NLUP. Capacity development of the department staff from the higher level down to the field level is also an urgent issue that needs to be resolved immediately, although this would span over a long period.

(d) Shortage of Mizoram's Own Fund for Agriculture

CSS have various conditionality in fund sharing between the states and the union government, ranging from 0% to 25% incurred by the state governments. Due to fund shortage, the state government tends to prevail over the scheme with lesser state's share. Unbalanced developments may take place among the

subsectors of agriculture, or the schemes once started may face discontinuity. The oil palm scheme under DOA (CH) with 25% sharing seems to be the case at present.

(e) Administrative Gap Between District and Villages

DOA (CH) had field offices in the respective rural development blocks, but there are neither rural development block offices nor circle offices at present. An extension officer is stationed in each circle; however he/she only works around his/her house, without actually any function. At least, he/she is engaged in crop production survey in and around his/her house, but not in remote areas due to lack of funding, transportation (motorcycle), etc. This is one of the reasons for inaccuracy of the agricultural statistics.

(f) Weakness of Research and Extension System

Seeds and seedlings for horticulture production are disseminated by DOH in a standardised way; however, without enough consideration on diversification of the natural environment, or utilising varieties and crops suitable for geographical characteristics. Crops and varieties have to be selected with due consideration of not only the natural conditions, but also their marketability. In addition, proper guidance on the most suitable cultivation techniques for each variety is needed. Since DOH does not have an experimental research unit, collaborative research with the Indian Council of Agriculture (ICAR) and KVKs is essential. However, such a system has not been established yet. In addition, the number of extension workers in the horticultural centres and circle offices is small, and these workers from circle offices do not have any transport means, such as cars or motorcycles. It is important to establish a cooperation system between DOH and other agriculture-related departments for improving the extension services on all agricultural technologies.

(2) Farmers and Farming Practice Issues

(a) Poor Farm Management Skills

Change from the traditional *jhum* cultivation to settled agriculture, especially on steep slopes, requires larger inputs of labour and capital. To maintain and improve the livelihood of the farmers, they need to acquire adaptable farm management skills, which are totally different from those for *jhum* farming; however, both the farmers themselves and government staff are kept unrecognised so far. There are cases that fruit orchards developed on lands reclaimed with assistance from the state government remain to have declining productivity because there are no extension services by the government in terms of applicable farming techniquess and marketability; hence, farmers have kept the same farming practices as used in *jhum*. Some vegetable farmers around Aizawl City achieve a relatively higher profit, however even these people do not know how to invest their inputs for the future. Continued support by the government is indispensable for farmers gaining self-sustainability.

(b) Weaknesses in Farmers' Organisations

Farmers' organisations exist only as a nominal window to receive development assistance. Such types of farmers' organisations that function for joint purchase of materials and machineries, joint use of machineries, joint shipment of products, and the construction and use of common facilities have not been developed in Mizoram. It does not exist as an organisation in its own right, and management skills are also lacking.

(c) Fragmentation of Land Holding

Where land holdings are small, scattered, and fragmented, it is difficult to implement a development programme in a compact and comprehensive manner. Commercial plantation of any cash crop requires compact/cluster of sizeable areas in a particular location to facilitate better flow of input-output of farm produce, marketing, etc. This was due partly to the poor land tenure system in Mizoram.

(d) Insufficient Use, Conservation, and Management of Land

People in the rural areas do not acquire proper knowledge on the potential of land resources in their community. Community-based organisations have not been able to adequately formulate the concept of future agricultural development using locally available resources. The farmers also do not understand

the best way to use and manage their land resources. Moreover, there is insufficient recognition of the value of land as a resource. Newly-developed farmlands and lands converted from *jhum* are not properly managed, and soil loss and degradation have become a major problem. It is not only the problem of inadequate fertility management of farmlands, but also, unsustainable practices that degrade the soil without soil conservation are rampant.

(e) Lack of Water Resources in the Dry Season

Although Mizoram received abundant rainfall during the monsoon season, most of rainwater drains out from watershed areas leaving very small amount to percolate into the soil. Such percolated water (groundwater) is the actual source of streams/rivers in the lean period. Since groundwater storage on the sloping catchment area is too small, most of the small streams dry up after one to two months of rainy period. Because of lack of sufficient water harvesting structures, most of the horticulture fields cannot be irrigated during the dry season, thus hampering production and productivity.

(f) Undeveloped Labour and Cost-Saving Technologies

On steep slopes, cultivation, harvesting, and transportation require intensive labour forces. However, there is delay in developing cost and labour saving tools/machineries and techniques such as crop selection, training, and pruning of fruit trees, and management of vegetation in orchards that would be appropriate to this environment.

(g) Short Supply of Local Vegetables

Both producers and consumers are highly conscious of freshness and safety of agricultural products, and there is a high demand for fresh vegetables. However, the supply of these vegetables to market is insufficient. Thus, vegetables have been largely imported from other states such as Assam. The supply of local produce is particularly deficient during the dry and off seasons. Difficulty of accessing irrigation water is one reason why vegetables cannot be grown during the dry season, and during the rainy season, plant diseases can break out in open fields. Investment aimed at producing vegetables during off season has not been forthcoming.

(h) Undeveloped Food and Flower Industries

The productivity of a state-run fruit processing plant is low because the system and capacity of management are inadequate. Thus, more active recruitment or privatisation needs to be considered. On the other hand, according to the grape growers' society, there are new movements in winery operation. The development of a food industry based on these types of special products with grower societies can be expected. However, at present the production scale for wine is still very small.

Since an independent sales network for cut flowers has been established through investment by flower exporters and flower growers' society, the flower industry has a high growth potential. However, according to the producer society, access to the market is weak, and it is hard even to obtain packaging materials.

Although private investment is essential for industrialisation, development of basic infrastructure such as roads and electricity has been delayed. Therefore, the private sector in agriculture and allied industries within the state has not been developed yet. Under the present circumstances, it would have to be said that the environment for growing the industries for food and flowers is quite poor.

4.3 Irrigation and Water Resources Management

4.3.1 Policy, Institution and Plan

(1) National Level

The Ministry of Water Resources (MOWR), GoI is the nodal agency responsible for water-related development including irrigation, hydropower, flood control, and water resources management.

- Overall planning, policy formulation, coordination, guidance and monitoring of irrigation, and flood control;
- Planning and guidance in respect of minor irrigation and command area development, administration and monitoring of CSS, and promotion of participatory irrigation

management;

- Formulation and determination of water balance of different basins/subbasins, and coordination, mediation, and facilitation of differences or disputes relating to interstate rivers.

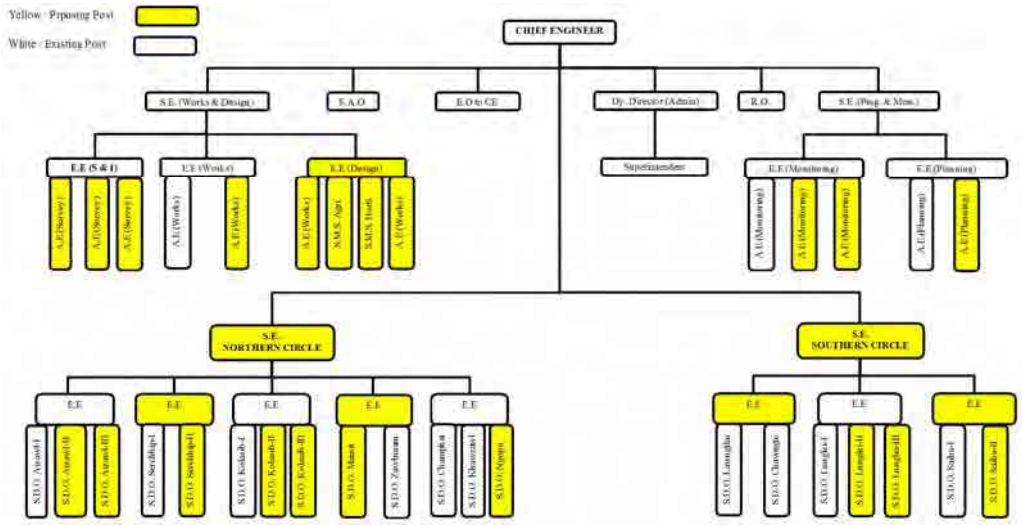
(2) State Level

No administrative unit exists in the state government governing water resources management in an integrated manner. The water-related projects are individually undertaken, i.e., hydropower by the Power and Electricity Department, and water supply by the Public Health Engineering Department.

The Minor Irrigation Department (MID) is the agency responsible for implementation and maintenance of minor irrigation schemes for areas smaller than 2,000 ha[2]. MID was established in September 1984 as a "Minor Irrigation Cell" under DOA, and became an independent unit as the MID in 2007. There are no specific state policies, laws, and regulations governing the irrigation subsector in Mizoram.

(3) Organisation of MID and Staff

MID, as led by a chief engineer, has two cells headed by superintendent engineers for planning and monitoring and works and design at the Aizawl headquarters. It also has four division offices headed by executive engineers in Aizawl, Champhai, Kolasib, and Lunglei, covering eight administrative districts of Mizoram. MID is proposing to establish four additional division offices at Mamit, Serchhip, Lawngtlai, and Saiha. As of March 2014, the total number of MID personnel is 230 (44 at the headquarters and 186 at the division offices).



Source: Minor Irrigation Department

Figure 4.3.1 Existing and Proposed Organisational Chart of the Minor Irrigation Department

4.3.2 Overview of Irrigation Development in Mizoram

(1) Background of Irrigation in Mizoram

The history of irrigation development in Mizoram can be traced back to 1987. The first two irrigation schemes were constructed in Kolasib District. One is river diversion scheme in Chemphai Village with a cultivable command area (CCA) of 45 ha, and the other is pump irrigation scheme in Thingdawl Village with a CCA of 20 ha.

In 1992, Mizoram State entrusted Water and Power Consulting Services (India) Limited (WAPCOS) to prepare a master plan for the development of minor irrigation in Mizoram State. The master plan study

[2] The irrigation projects in India are classified into three categories, i.e., major, medium and minor. Projects having a cultivable command area (CCA) of less than 2,000 ha are regarded as minor projects. All schemes in Mizoram are minor projects.

was carried out for a 32-month period from September 1992 to April 1995. However, the master plan has not been used for planning of MID works for some time.

(2) Present Minor Irrigation Schemes

Since 1987, when the first two irrigation schemes were completed, 439 minor irrigation schemes with a total CCA of 18,228 ha have been constructed to date in Mizoram. Table 4.3.1 shows the year-wise development of minor irrigation schemes together with respective investment cost. Table 4.3.2 shows the district-wise distribution of minor irrigation schemes, and their respective locations are shown in Figure 4.3.2.

Table 4.3.1 Year-wise Development of Minor Irrigation Schemes

Year	No. of Schemes	GCA (ha)	CCA (ha)	Cost (Rs.)
1987 - 1988	2	68	65	926,000
1988 - 1989	2	58	51	2,125,153
1989 - 1990	1	106	100	4,710,807
1990 - 1991	-	-	-	-
1991 - 1992	4	136	126	6,071,429
1992 - 1993	2	87	80	1,859,250
1993 - 1994	3	114	101	3,869,340
1994 - 1995	3	168	148	4,008,390
1995 - 1996	2	101	90	1,362,400
1996 - 1997	-	-	-	-
1997 - 1998	4	279	260	10,399,500
1998 - 1999	16	550	452	28,832,000
1999 - 2000	10	608	544	32,128,400
2000 - 2001	22	757	692	49,871,800
2001 - 2002	14	750	637	52,909,000
2002 - 2003	11	573	401	53,041,000
2003 - 2004	3	435	422	30,270,000
2004 - 2005	2	49	42	7,421,000
2005 - 2006	48	1,396	1,195	230,226,100
2006 - 2007	20	690	592	106,853,400
2007 - 2008	77	3,546	3,186	577,949,100
2008 - 2009	62	3,070	2,769	612,386,600
2009 - 2010	39	1,912	1,729	349,225,000
2010 - 2011	43	2,177	1,907	421,960,000
2011 - 2012	49	2,145	2,639	714,431,900
Total	**439**	**19,775**	**18,228**	**3,302,837,569**

Note: GCA: Gross Command Area, CCA: Cultivable Command Area
Source: Minor Irrigation Department

Table 4.3.2 District-wise Development of Minor Irrigation Schemes

District	Type of Scheme	No. of Schemes	GCA (ha)	CCA (ha)	Cost in Rs.
Mamit	River diversion	41	1,764	1,639	289,156,700
Kolasib	River diversion	76	4,057	3,705	504,032,290
	Pump irrigation	2	44	40	969,000
	Sub-total	78	4,101	3,745	505,001,290
Aizawl	River diversion	63	2,561	2,379	537,457,200
Champhai	River diversion	87	3,913	3,800	685,072,410
	Pump irrigation	1	10	6	3,541,000
	Sub-total	88	3,923	3,806	688,613,410
Serchhip	River diversion	51	2,680	2,528	432,804,107
Lunglei	River diversion	60	2,644	2,129	449,296,153
Lawngtlai	River diversion	33	1,406	1,387	286,805,900
Saiha	River diversion	25	696	615	113,702,809
River diversion total		436	436	19,721	18,182
Pump irrigation total		3	3	54	46
Total		439	439	19,775	18,228

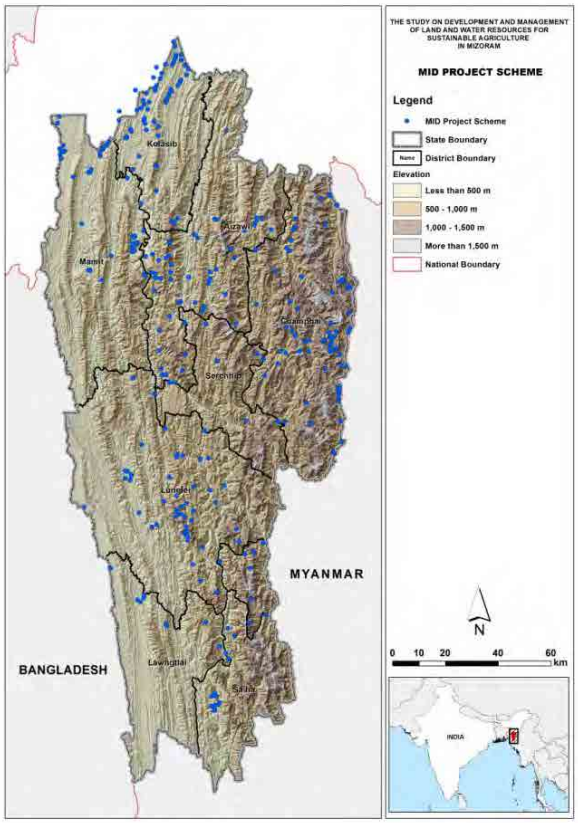
Source: Minor Irrigation Department

The scale of command area in terms of gross command area (GCA) and CCA in the above tables is a planned and designed figure given in the Detailed Project Report (DPR). According to the data given in the DPR, the average scale of river diversion scheme is about 42 ha in CCA, ranging from a maximum of 250 ha to minimum of 3 ha.

(3) Characteristics of Irrigation Systems

Mizoram has a predominantly mountainous and hilly topography where *jhum* is the main method of agriculture on sloping land, while land suitable for irrigated agriculture is confined in narrow areas along the rivers. Its scale is not more than 2,000 ha and categorised as minor irrigation in India. The characteristics of irrigation systems in Mizoram are summarised as follows:

- The minor irrigation schemes service water to two types of agriculture, i.e., WRC, and upland and horticulture crops. The prevailing crops irrigated are water rice in relatively flat land, and irrigation schemes for upland and horticulture crops on sloping land are nominal.
- Almost all of irrigation systems are of run-off-the-river diversion type with gravity distribution, whilst pump irrigation directly from the water sources is limited to as few as only three out of the present 439 schemes in Mizoram.
- Most schemes rely on small streams as water sources. Running water in these rivers becomes scarce during the *Rabi* and summer periods; therefore, there is virtually no irrigated agriculture practised in Mizoram, except for schemes having water storage facilities.



Note: Four schemes located in Assam State in the map are under control of MID Mizoram due to border issues between two states
Source: JICA study team

Figure 4.3.2 Locations of Minor Irrigation Schemes in Mizoram

4.3.3 Development Investment by the Government

(1) Centrally Sponsored Schemes (CSS)

Since the beginning of irrigation development in 1987 in Mizoram, all the schemes have been constructed on a centrally sponsored basis. MID is currently undertaking the following four schemes supported by the respective programmes of MOWR, GoI:

i) Minor irrigation schemes under the Accelerated Irrigation Benefits Programme (AIBP);
ii) Anti-erosion schemes under the Flood Management Programme (FMP);
iii) On-farm development works in completed minor irrigation projects under the Command Area Development and Watershed Management Programme (CAD&WMP); and
iv) Coordinating statistics relating to the Minor Irrigation Projects under the Rationalisation of Minor Irrigation Statistics (RMIS).

In the 12th Five-Year Plan of Mizoram State (2012–17), MID proposed the following financial targets, amounting to Rs.7.5 billion, to be achieved within a five-year period for the respective four schemes:

(i) Minor Irrigation Scheme:	Rs.6,441.3 million
(ii) Anti-Erosion Schemes:	Rs.878.7 million
(iii) CAD and WMP:	Rs.160.0 million
(iv) RMIS:	Rs.20.0 million

Total	Rs.7,500 million

(2) Accelerated Irrigation Benefits Programme (AIBP) for Minor Irrigation Scheme

The AIBP was conceived in 1996 by GoI in order to provide financial assistance to states to complete various ongoing projects so that the envisaged irrigation potential of the project could be created and thereby extend irrigation to more areas. Since its formulation, the terms of the programme have been widened and liberalised over time. The present AIBP makes the following projects eligible: (i) major, medium, and extension, renovation and modernisation (ERM) projects; and (ii) surface water minor irrigation schemes of special category states covering northeastern states including Mizoram, hilly states, and drought prone areas.

The latest AIBP guidelines, modified in October 2013, provide the following eligibility criteria for assistance to minor irrigation schemes: (i) individual schemes should have at least a CCA of 10 ha and a cluster of schemes within a 5 km radius having a CCA of 20 ha; (ii) proposed schemes should have a benefit-cost ratio of more than 1.0; and (iii) development cost per ha of CCA of individual scheme is less than Rs.2.5 lakh. For new schemes in special category states, the central assistance grant under the AIBP is 90% of the project cost (work component). The construction period for projects under AIBP assistance is two years starting from the financial year of the first release of funding.

(3) Other Small Irrigation Schemes

In addition to MID, other agencies of the state government provide supplementary and miscellaneous irrigation facilities including minor rehabilitation. These agencies are DOA, DOH, and the Rural Development Department (RDD). The features of these irrigation schemes are summarised below.

(a) Department of Agriculture (DOA)

DOA is committed to attain self-sufficiency in food grain production and to make agriculture a sustainable and viable vocation for livelihood support. To achieve this, the department is implementing various state and central schemes, including relevant infrastructure development, to enhance agricultural crop production, thereby improving the income level of farmers. The following are the expected related outcomes, which are described in the 12th Five-Year Plan of DOA:

- At the end of the 12th Five-Year Plan, additional 20,000 ha of WRC will be created and then 31,000 ha will be available for crop production with targeted cropping intensity of 150%, which is expected to meet at least 50% of the rice requirement of the state.
- The area under the improved package of practices of rice will be increased from 3,000 ha to 5,000 ha with targeted productivity increase from 2 t/ha to 2.5 t/ha.
- The irrigated area will be increased significantly.

1) Land Development

With the implementation of the NLUP, RKVY, and Macro Management of Agriculture (MMA), a total of additional 1,790 ha of WRC have already been developed until February 2013 and more than 1,000 ha of WRC have been improved and maintained.

2) Construction of Potential Area Connectivity (PAC)

During the 11th Five-Year Plan, a total of 120 km of new PAC was constructed, connecting potential areas of different locations. About 540 km of existing PAC was maintained at different places. In 2012-13, new construction of PAC at different locations was proposed under RKVY covering the eight districts of Mizoram.

Table 4.3.3 Irrigation-Related Project Plan under RKVY (2012-2013)

Name of projects	Target (Rs. lakh)	
	Physical	Financial
Diesel/electric-driven water pump set up to 7.5 HP/5 kW	365	36.50
Development of irrigation facilities : Rainwater Harvesting Tank/Ponds (15×15×1.5 m) with a capacity of 3.3 lakhs-L	120	120.00
Pipes for carrying water from source to the field	500	75.00

Development of Rainfed Farming System in Watershed Areas: Assistance for Land Development	5,634 (ha)	676.00

Source: Department of Agriculture

(b) Department of Horticulture (DOH)

Table 4.3.4 shows the achievement of irrigation-related facilities under DOH.

Table 4.3.4 Development Achievement of Irrigation-related Facilities under DOH

	Unit	Aizawl	Kolasib	Lunglei	Saiha	Mamit	Lawngtlai	Serchhip	Champhai	Total
2012-13/ National Mission on Micro Irrigation										
Community water tank	No.	0	0	0	0	0	0	0	0	0
	Rs. lakh	0	0	0	0	0	0	0	0	0
Water harvesting system for individual water storage	No.	53	10	10	6	10	6	10	56	161
	Rs. lakh	54.59	10.3	10.3	6.18	10.3	6.18	10.3	57.68	165.83
2013-14/ National Mission on Micro Irrigation										
Community water tank	No.	9	7	7	3	7	3	7	7	50
	Rs. lakh	155.25	120.75	120.75	51.75	120.75	51.75	120.75	120.75	862.50
Water harvesting system for individual water storage	No.	400	65	60	30	55	15	50	80	755
	Rs. lakh	412.00	66.95	61.80	30.90	56.65	15.45	51.50	82.40	777.65

Source: Department of Horticulture

(c) Rural Development Department (RDD)

Irrigation is part of RDD's programmes, which mainly provide irrigation channels with a length of 1 to 3 km upon the request of the community. According to RDD, rehabilitation of damaged canals constructed in minor irrigation scheme is also one of their services. The annual budgets allocated to irrigation works in RDD have been minimal, i.e.: Rs.49 lakh in 2008-09, Rs.11 lakh in 2009-10, Rs.29 lakh in 2010-11, Rs.50 lakh in 2011-12, and Rs.20 lakh in 2012-13.

4.3.4 Management and Operation and Maintenance (O&M) of Irrigation Facilities

Irrigation facilities are to be handed over from MID to water user associations (WUAs) after the completion of construction works. Management and O&M of irrigation systems, including collection of water user's fees, use of the collected fees and ensuring optimum utilisation of created irrigation potential, will be vested in the WUAs along with ownership of the assets. A WUA is an association of farmers and membership is limited to beneficiary landowners of the scheme. A WUA will be formed before the completion of a minor irrigation project and registered with the Revenue Department. However, a few existing WUAs completed registration because of document procedures and so on.

With regard to the existing O&M conditions of irrigation facilities, it was found out that the capacity and sense of ownership of existing WUAs are not enough for sustainable management and O&M of irrigation facilities. The major findings from the inventory survey are as follows:

- 70% of the WUAs under minor irrigation scheme think that rehabilitation (big or small) is necessary.
- More than half of the schemes have experienced flood damage (permanent: 16%, temporary: 48%).
- Only 7% of WUAs collect water use fees from their members regularly.

Besides, the MID side that is supposed to support WUAs has also problems in management and O&M of irrigation facilities. MID does not have concrete policies and projects for handling such problems and their budget that can be used for the problem is very limited.

Under this circumstance, it is important to promote awareness campaigns and strengthening of WUAs from the planning stage in order to improve the current situation.

4.3.5 Facts on Existing Irrigation Schemes

(1) Inventory Survey for Existing Irrigation Schemes

The JICA Study Team together with MID conducted an inventory survey to clarify existing conditions of completed MID projects, since MID did not possess enough information on their completed projects. An outline of the survey is shown below.

Objective	Understanding the real conditions and establishment of a database system for existing irrigation schemes
Period	4 November 2013 to 31 January 2014
Targeted Schemes	439 existing minor irrigation schemes
Methodology	The MID officers filled out the inventory sheet with necessary data and information through interviews with WUAs (beneficiaries) of the respective irrigation schemes.

(2) Summary of Survey Results

Table 4.3.5 gives an overview of the existing irrigation schemes, as extracted from the results of the inventory survey.

Table 4.3.5 Abstract of Inventory Survey Results

Projects Summary from the MID project list	No.: 439, Total cost: Rs.3,302,837,569 Total GCA=19,775 ha, Total CCA = 18,228 ha, Total Irrigation Potential Created (IPC) = 37,730 ha Average CCA= 41.5 ha, Average cost per CCA=Rs.181,195 Average number of schemes per year in the last 5 years = 48
Valid response for survey	374 out of 439
Accessibility to site	All seasons: 108 (36%), Seasonal: 186 (62%), No: 7 (2%)
CCA area	Valid responses: 260, Average CCA: 32.0 ha Survey result/DPR average: 77% Survey result/DPR average (100%～): 80/260 = 31% Survey result/DPR average (50～100%): 135/260 = 52% Survey result/DPR average (～50%): 45/260 = 17%
Other major crops in Kharif (Except paddy)	Average area: 1.9 ha Mustard: 8/374 = 2%, Maize: 14/374 = 4%, Other vegetables: 30/374 = 8%, Fruits: 11/374 = 3%, Peas and beans: 5/374 = 1%
Other major crops in Rabi (Except paddy)	Average Area: 2.6 ha Peas and beans: 115/374 = 31%, Mustard: 105/374 = 28%, Other vegetables: 72/374 = 19%, Potato: 36/374 = 10%, Cabbage: 52/374 = 14%, Maize: 7/374 = 2%, Fruits: 3/374 = 1%
Other usage of irrigation water	Fishery: 150 (40%), Domestic: 83 (21%)
Sufficiency of water (Sufficient percentage)	Rabi: 14%, Kharif: 72% , Summer: 8%
Irrigation facilities	Scheme with pump: 36 (10%) Scheme with micro irrigation: 19 (5%) Scheme with storage tank: 233 (62%)
Needs for rehabilitation	No. of needed schemes: 262/374 (70%) Diversion weir: 148, Average estimated repair cost: Rs.2.0 lakh Gate: 66, Average estimated repair cost: Rs.0.7 lakh Canal: 208, Average estimated repair cost: Rs.3.1 lakh
Type of flood damage	Permanent: 52 (16%), Temporary: 162 (49%), Never: 120 (35%)
WUA conditions	Valid responses: 362 schemes Total beneficiaries: 5148 persons Average beneficiaries: 19 persons/WUA No. of schemes which WUA could not confirm: 18 No. of WUA collecting fees: 26 (7%) ・ Average WUA collected fees: Rs.6,691/ha/year
WUA O&M conditions	Satisfactory: 66 (23%), Medium: 133 (46%), Poor: 89 (31%)

	Sediment problems: 202/374 (54%) Landslide problems: 206/374 (55%) Damaged: 101/374 (27%)
Agriculture input	Fertilizer: 73/374 (20%), Pesticides: 54/374 (14%), Farm machineries: 140/374 (37%), Animal ploughs: 232/374 (62%) Extension service: 164/340 (48%) received, No.: 176/340 (52%) Agriculture loan: 6/344(2%) received, No.: 338/344 (98%)
Needs for assistance (1-5 ranking)	Irrigation: 1.8, Road: 2.8, Flood: 3.4, Postharvest: 4.4, Marketing: 4.4

Source: MID Inventory Survey 2013

(3) Findings of the Inventory Survey

1) General Features

- WUAs do not have basic information such as scale of facilities, CCA, catchment area, and quantity of intake water.
- As for other usage of irrigation water, fisheries account for the most. While harvest from paddy is mainly for self-consumption, it is said that harvest from fisheries is an important source of income. Fishery activities are relatively high in Kolasib and Mamit districts.
- About 80% of schemes irrigate paddy fields and 13% of schemes are non-functional (damaged or ongoing). It is expected that about 7% of schemes are used for horticulture and irrigating other crops.

2) Gap between the DPR and Actual

- There is a gap between the CCA in the DPR and the survey results. The survey results show that only 31% of CCA schemes are more than the DPR plan, and the average CCA ratio (survey result/DPR) is 77%, while 17% of the schemes are less than 50%. Therefore, it is expected that the total existing CCA of Mizoram is about 13,000 ha, which is 70% of what was specified in the DPR (18,228 ha).
- There is a gap between the IPC in the DPR and the survey results. The survey results show that the average cultivated area in the dry season is about 2.6 ha, which is 6% of 18,228 ha. Therefore, it is expected that the total existing IPC of Mizoram is about 19,300 ha (18,228×106%), which is 51% of the specified IPC in the DPR (37,730 ha). According to the survey results, the shortage of irrigation water is the main reason for the gap.
- There is a gap between the length of canal lining in the DPR and the survey results. The survey results show that the average length of existing canal is about 86% of the DPR plan.

3) Constraints

- The inventory survey results indicate that the season-wise sufficient rates are 72% in the *Kharif* season, 14% in the *Rabi* season, and 8% in the summer season, and the practice of cultivation according to the DPR planned crop schedule is difficult to be followed especially during the dry season. As for water shortage in the *Kharif* season, it is observed that the reason is due to insufficient irrigation system and not from shortage of irrigation water volume.
- Seventy percent of the schemes consider rehabilitation (big or small) as necessary, especially the canal and intake facilities. Regarding flood damage, 52 schemes (16%) are permanently damaged, and 162 schemes (48%) are temporarily damaged. The results show that more consideration to expected facility damage is necessary at the planning and design stages.
- The survey results show that only 26 out of 374 WUAs (7%) collect water user fees from their members regularly, and the capacity of existing WUAs is not enough for sustainable O&M of facilities.

4) Needs and Requirements

- As for agriculture inputs, the survey results show that less than 20% of WUAs have fertiliser and pesticide inputs, and only 48% of WUAs have received agricultural extension services. The results show that majority of existing schemes' farmers are mainly engaged in paddy.
  It was found out that there is a large need for irrigation infrastructure and access roads. However, needs for postharvest facilities and marketing are relatively low.

4.3.6 Water Resources Management

(1) Existing Condition

MID had implemented 439 projects as of 2013, and most of the schemes are taking water from streams where the catchment area is small and irrigation is by gravity flow system. Basically, this type of irrigation will not be changed in the future. Therefore, here in this section, water management should be considered and targeted in mini-watershed level or smaller in Mizoram.

River basins in India are to be classified into the following seven categories (from large to small scale): Basin ＞ Catchment ＞ Sub-Catchment ＞ Watershed ＞ Sub-Watershed ＞ Mini-Watershed ＞ Micro-Watershed. The catchment area of Mizoram is divided into three, namely: the Barak River, the Kolodyne River, and the Karnaphuli River. There are 7 sub-catchments, 34 watersheds, and 2,405 micro-watersheds.

Legally, the Public Health Engineering Department (PHED) is in charge of water resources management in Mizoram, and basically MID submits project application for irrigation water use. However, this procedure is not taken customarily considering the scale of the MID schemes. However, in case MID plans to take in water from major rivers for further water resources development in the future, the MID side has to take the necessary steps.

Water balance calculation was conducted to understand the balance of river discharge and water requirements (irrigation + drinking + industry), targeting 34 watersheds in Mizoram. It was found out that the annual total discharge quantity is more than 50 times larger than the requirement in most of the watersheds, and the discharge quantity is more than the water requirement even during the dry season. It was observed that river water potential in Mizoram is high at the watershed level. However, water balance of mini-watersheds or smaller level streams that MID schemes are generally targeting at a deficit in the dry season, as discharge from small streams become scarce. This is a major constraint for promoting irrigation for winter crops.

(2) Requirement for Water Resources Management

When it comes to small-scale water management, a comprehensive approach, including not only the engineering aspect but also soil and forest preservation and managed *jhum* and so on, is needed to make the most of limited water resources. The examples of recommended activities for water resources management are as follows:

- Zoning within the target catchment area, such as forest preservation, paddy/horticulture, agroforestry, and managed *jhum*.
- Setting up forest preservation and afforestation areas, e.g., steep sloping areas, erosion risk areas, and areas along rivers and streams.
- Promotion of managed *jhum* and agroforestry in relatively steep sloping areas.
- Low sloping alluvial areas are for WRC and fishery activity.
- Horticulture can be promoted in gentle sloping areas together with terraced land and micro irrigation.
- Construction of check dams to prevent slope erosion and intake stream water.
- Construction of water harvesting tanks on upper slopes.
- Formulation of small watershed resources management group, including WUA, community and village level groups, and relevant departments.
- Subsidy system for soil and water management activities.

4.3.7 Data collection and monitoring of water discharge and soil erosion.Problems and Constraints for Development

Through close cooperation with MID in the course of the JICA Study, the JICA Study Team identified several problems and constraints in the minor irrigation schemes. In addition to the findings obtained from the inventory survey as mentioned in Section 4.3.5 (2), the problems and constraints in minor irrigation development obtained from this study are described below.

(1) Problems of MID

- Although MID has prepared the 12th Five-Year Plan, which presents the figures of future development area, a detailed concrete future plan, which includes development strategy, evaluation of potential area, development priorities, collaboration with relevant departments, etc., has not been prepared yet.
- Collaboration with relevant departments, such as DOA, DOH, and the Department of Fisheries (DOF), has not been conducted. Then, some irrigation-related scheme sites are overlapping with each other.

(2) Problems of MID Projects

- Involvement of farmers is not enough in project planning and implementing procedures, and farmers' attitude to MID project tends to be passive. This is one of the reasons why existing WUAs do not have enough sense of ownership.
- The DPR does not include impact assessment in terms of social, economic, and environmental aspects and an agricultural action plan.
- Capacity of contractors of MID's construction works is not high enough. Then, poor quality of MID construction works has been observed at times.
- Although WRC has been practised in most of the minor irrigation scheme areas, a large portion of the produced rice is used for self-consumption, and not for selling. Therefore, income generation through agriculture is not big enough to enable farmers to live on. Most farmers need to be engaged in other works such as construction labour.

(3) Problems of O&M

- Majority of the schemes need rehabilitation of irrigation facilities (big or small), although the capacity of WUAs is not enough for sustainable O&M activities. It is anticipated in the future that abandoned and uncultivated land areas may increase.
- WUAs' problems include shortage of sense of ownership (dependency on public support is relatively strong). It is important to promote awareness to improve the sense of ownership and responsibility of WUAs from the preparation and planning stage.
- Although many schemes need repair or rehabilitation of irrigation facilities, CSS such as the AIBP basically cannot be applied to repair or rehabilitation projects. Therefore, MID depends on the state government's small budget for the works.

(4) Others

- A large number of potential WRC development sites are located along rivers, and some parts of these areas overlap with forest reserves. Special consideration and approval procedure are necessary in case relatively large irrigation development is planned within the designated forest area.
- In Mizoram, generally the western and northern areas are gently sloped where the potential of WRC development is higher. However, development in these areas is delayed because of poor road conditions and existence of autonomous district.

4.4 Agricultural Supporting Services

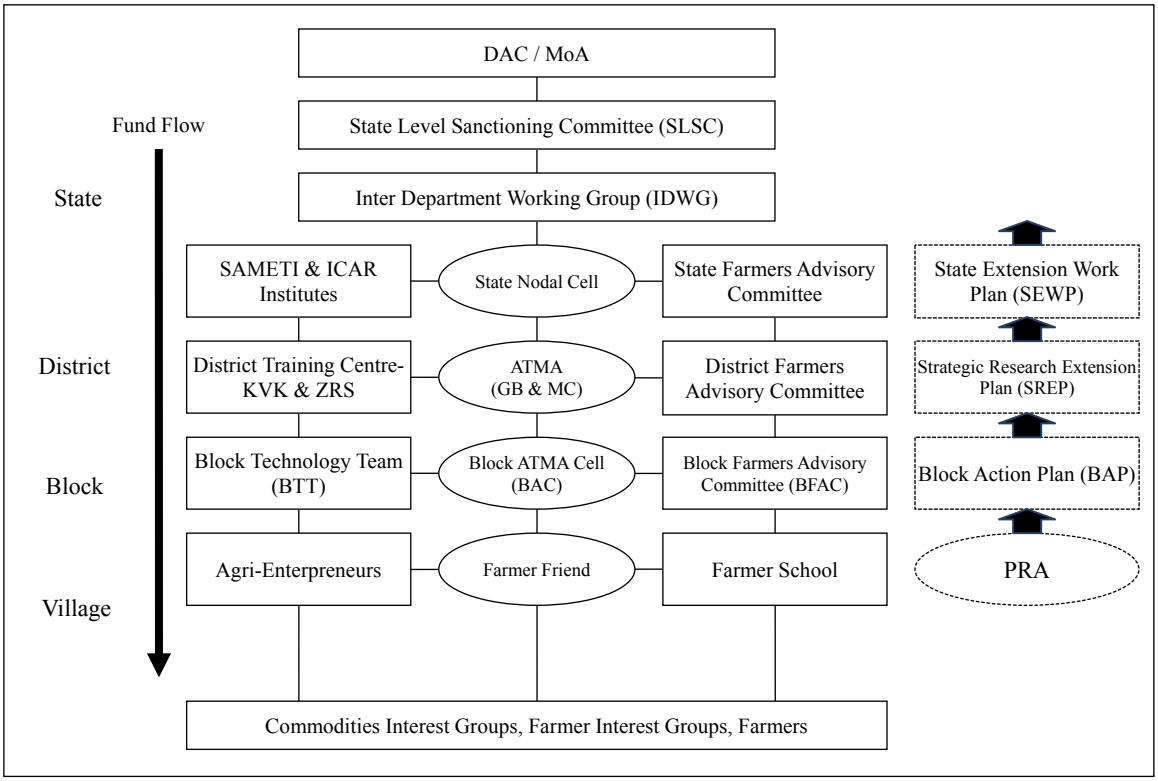
4.4.1 Policy, Institution and Plan

(1) National Policies and Institution

Agriculture development in India is basically the state government's responsibility, while GoI plays a major role in formulating national policies in the agriculture sector, and mainly provides a road map through its policies, programmes, and budgetary support. The Department of Agriculture and Cooperative (DAC) and the Department of Agriculture Research and Education (DARE) are responsible agencies for agricultural support services at the national level. Both the departments developed and have been engaged in two flagship supporting programmes, namely, the Indian Council of Agricultural Research (ICAR), and the Agricultural Technology Management Agency (ATMA).

Indian Council of Agricultural Research (ICAR) under DARE is an apex body at the national level that supports research and extension activities. The KVKs or "Farm Science Centre" developed by ICAR is a prime programme for farmers to learn about agricultural technologies. KVK that is usually established at each district level of the state works at the grassroots level as a vocational training institution to bridge the gap between the available technologies and their application to increase production and productivity. However, their services have so far not been able to reach a reasonable expected scale due to the limited staff in each district.

Agriculture Technology Management Agency (ATMA) was set up by DAC as a new extension system to converge and integrate extension activities at the district level with participatory approach. It is a major reform in extension in collaboration with ICAR / KVK. ATMA for agricultural extension reforms was implemented as part of the World Bank-funded innovations, and then ATMA expanded to all districts of India during the 11th Five-Year Plan period. The block to village extension link was formally institutionalised through the concept of “farmer friend” (FF) for every two villages. In each state, an Agriculture Management and Extension Training Institute (SAMETI) has been established. This institute provides training and undertakes human resources development, according to the concepts of ATMA, to junior- and middle-level extension functionalities. The current performance of ATMA at all levels varies from state to state. ATMA has expanded its range of extension activities (field technology demonstrations, farmer trainings, study tour, farm schools, exhibitions and farmer-scientist interaction) at the district and block levels. The flow chart of ATMA activities is shown in Figure 4.4.1.



Source: Prepared by JICA Study Team based on DAC ATMA in Phase II

Figure 4.4.1 ATMA (Phase II) Organization and Activities Flow Chart

(2) Outline of Agricultural Supporting Services in Mizoram

The services institutionally provided by the state are the following: (i) research and education, (ii) extension of technology, (iii) seed multiplication, (iv) provision of agro-machinery, (v) market information, (vi) agricultural credit, and (vii) cooperative. These agricultural support services, except for agricultural credit and cooperative, are handled by the four agro-allied departments, i.e.: DOA (CH), DOA (R&E), DOH, and SWCD. The roles and functions of the four departments in agricultural support services are outlined in Table 4.4.1.

Table 4.4.1 Outline of Agricultural Support Services Provided by Agro-allied Departments

Description	DOA (CH)	DOA (R&E)	DOH	SWCD
General Roles in Agricultural Support Services	・ Provide technical know-how ・ Supply inputs and services	・ Transfer improved agricultural technology	・ Disseminate new technologies in horticulture farming	・ Promote proper land use through soil and water conservation
Research and Education	・ Entrust DOA (R&E)	・ Undertake research works and on-farm trial on food and horticulture crops, livestock, livelihood improvement at KVKs	・ No research activities ・ Collaborate with ICAR and KVKs, however virtually no progress so far	・ Entrust research works on coffee and rubber to the Coffee Board and the Rubber Board, respectively
Extension of Technology	・ Undertake training and field demonstration ・ Manage ATMA deployed in eight districts	・ Undertake training at the Integrated Training Centre ・ Demonstrate outcomes from on-farm trial at KVKs ・ Train and educate farmers at KVKs	・ No specific schemes for extension services ・ Provide farmers with technical guidance by horticulture officers at circle offices	・ No specific schemes for extension services ・ Distribute nursery stocks of coffee and rubber, subject to technical guidance by the Coffee Board and Rubber Board, respectively

Description	DOA (CH)	DOA (R&E)	DOH	SWCD
Seed Multiplication	・ Produce certified seeds including sugarcane	・ Produce certified and improved seeds at experiment farm and KVKs	・ Produce nursery stock for fruits ・ Try tissue culture of banana (no function yet)	・ Produce nursery stocks for rubber and coffee
Provision of Agro-machinery	・ Provide farmers with subsidy for buying tractor, ploughing machine, etc.	・ NA	・ Provide farmers with subsidy for buying mini-ploughing machine	・ NA
Market Information	・ NA	・ NA	・ Facilitate market infrastructure by CSS fund, but no market information	・ NA
Agricultural Credit	・ Provide subsidy, but no credit	・ NA	・ Provide subsidy, but no credit	・ NA
Cooperative (Farmers' Organisation)	・ No function to support farmers' organisation, but provide various schemes through farmers' organisation	・ No function to support farmers' organisation, but provide various schemes through farmers' organisation	・ No function to support farmers' organisation, but provide various schemes through farmers' organisation	・ No function to support farmers' organisation, but provide various schemes through farmers' organisation

Note: NA, Not available
Source: JICA Study Team

4.4.2 Activities of Agro-allied Departments

(1) Department of Agriculture (CH and R&E)

Both DOA (CH) and DOA (R&E) are undertaking agricultural extension and advisory services. Extension activities and other support services are being implemented with the ATMA system in collaboration with KVKs. However, systems and functions are not yet fully established. At present, the agricultural support programmes shown in Table 4.4.2are implemented by DOA.

Table 4.4.2 Agricultural Support Program Implemented by DOA

Programme	Objective / Details
EXTENSION	
Establishment of Agri-Clinic and Agri-Business Centre	・ To provide extension services to farmers on payment basis through setting up of economically viable self-employment ventures
Mass Media Support to Agriculture Extension	・ To provide agricultural information and knowledge to farmers using infrastructure of Doordarshan and All India Radio
INFORMATION TECHNOLOGY	
Strengthening/Promoting Agricultural Information System	・ To promote e-Governance in agriculture at the centre and to provide support to the states for the same.
INTEGRATED NUTRIENT MANAGEMENT	
National Project on Management of Soil Health and Fertility	・ To facilitate and promote integrated nutrient management (INM) through judicious use of chemical fertilisers, including secondary and micro nutrients, in conjunction with organic manures and bio-fertiliser for improving soil health and its productivity. ・ To promote the use of organic manures, soil amendments, and micro nutrients for improving soil fertility and crop productivity.
National Project on Organic Farming	・ To promote production, promotion, and market development of organic farming in the country.
MECHANISATION AND TECHNOLOGY	
Post-Harvest Technology and Management	To train farmers on the use and maintenance of equipment for post-harvest and by-product management, to train manufacturers of agricultural machinery to encourage them to take up commercial production of technologies developed through ICAR/ Council of Scientific & Industrial Research (CSIR) institutions, and to train scientists of All India Coordinated Research Project (AICRP), KVKs
SEED	

Development and Strengthening of Infrastructure Facilities for Production and Distribution of Quality Seeds	Upgrading of infrastructure facilities for production and distribution of quality seeds
CREDIT	
National Agriculture Insurance Scheme	・ To provide insurance coverage and financial support to the farmers in the event of failure of any of the notified crops as a result of natural calamities, pests and diseases ・ To encourage the farmers to adopt progressive farming practices, high value inputs and higher technology in agriculture. ・ To help stabilise farm incomes, particularly in disaster years.
Pilot Weather Based Crop Insurance Scheme	To provide insurance protection to farmers against adverse weather incidence, such as deficit and excess rainfall, frost (low temperature), heat (temperature), relative humidity, etc. which are deemed to impact crops adversely during their cultivation period.

Source: DOA

DOA (R&E) is looking after innovative science-based institutions which undertake vocational training of farmers, farm women, rural youth, etc. The institutions under the directorate are also engaged in conducting on-farm research for technology refinement and front-line demonstrations to promptly disseminate the latest agricultural technologies to the farmers as well as extension workers. Trainings in these institutions were imparted through the learning process of 'Teaching by doing' and 'Learning by doing'. Integrated Training Centre (ITC) Hnahthial under Lunglei District, which was established in 1981, conducts basic agricultural training. DOA (R&E) supports the activities at the eight KVKs established in Mizoram. Production of seeds and demonstration of new farming systems are the other thrusts of the department.

Source : JICA Study Team

Photo 4.4.1 KVK in Champai District

(2) Department of Horticulture (DOH)

DOH does not have research facilities, and therefore depends on research works of ICAR and the agricultural university across the county for application in farmers' fields. The department operates a Nurseries and Horticulture Centre where quality planting materials are being produced. The department also operates 28 circles within Mizoram in which HEOs are posted and engaged in extension services.

(3) Soil and Water Conservation Department (SWCD)

Mizoram State introduced rubber and coffee recently as new industrial crops, which are the responsibility of SWCD. Scientific research is undertaken by expert teams of the respective Rubber Board and Coffee Board on agro-climatic suitability, evolution of suitable clones, pest and disease management, and harvesting and post-harvesting technology. SWCD has eight district officers with 35 soil conservation rangers across the state. Presently, there are 38 officers with 186 supporting field staff at various levels working as extension personnel. In addition, officials from both the Rubber Board and Coffee Board also assist them in extension services in the form of workshops, on-site training, tours to plantation areas outside the state, etc. Pamphlets and various media are also utilised for extension services.

4.4.3 Producers' and Farmers' Organisations

Many farmers' and producers' organisations are located in Mizoram. These organisations could be mainly categorised as follows: (i) cooperative societies registered under the Mizoram Cooperative Societies Act 2006; (ii) associations or societies registered under the Mizoram Societies Act 2005; or (iii) self-help groups (SHGs) that are not registered.

(1) Cooperative Societies

The objectives of cooperatives are to promote and serve the social, economic, and overall interests of their members or the public through self-help and mutual aid. In case of primary cooperative societies, a group with not less than 20 members from different families undertaking production, distribution or service-oriented activities could apply for registration as a cooperative according to the Mizoram Cooperative Societies Acts and Rules. Once the application is accepted, a member of a cooperative society has to purchase a share and to carry out the duties as provided in its by-laws. As of 2010/11, there were 1,480 primary cooperative societies and ten state-level cooperative societies. Of these, 756 cooperatives were related to agricultural fields such as dairy/livestock, piggery, fishery, farming, poultry, sericulture, and floriculture.

The cooperative societies have access to possible assistance such as: (i) governments' subscription of share capital; (ii) loans; and (iii) financial assistance (subsidies and grants). Share capital of cooperatives of relatively high ratio is paid for by the government. Cooperatives can obtain loans from the National Cooperative Development Corporation (NCDC), Mizoram Cooperative Apex Bank Ltd (MCAB), etc. In 2013-14, Rs.34 million was allocated by the Cooperation Department to mainly state-level cooperatives (81%), and to district level and primary cooperative societies. Training and cooperative education are conducted by the Mizoram State Cooperative Union (MSCU).

Despite these forms of assistance, a large number of cooperatives are not functioning and not viable. All cooperatives are subject to annual audit by audit officers of the Cooperation Department. The audits revealed that quite many cooperatives were in "no business activities" or "not functioning" and poorly graded (mostly grades of "C" or "D"). The factors causing such situations to cooperatives are regarded as follows:

- It is difficult for cooperatives to ensure active membership and build their awareness.
- Their governance is not adequate due to their insufficient management ability.
- Their efforts for capital formation are insufficient.
- Staff of the Cooperation Department are not able to carry out all necessary works.
- The state government has not emphasised strengthening cooperatives.

(2) Associations

Any group of seven or more individuals associated for any objective may subscribe their names to the registrar for registration under the Mizoram Societies Act. Upon acceptance, the association is registered as a society under this act. Unlike cooperative societies, general information on the associations registered under this act (e.g., numbers by category) were not obtained. Some farmers' associations or organisations visited and interviewed by the JICA Study Team (e.g., All Mizoram Farmer's Union, Champhai Grape Growers Society, Zo Anthurium Growers' Society, Mizoram Iskut Growers' Association, Daklazau Association, and Sihpuizau Association) are those registered under the Mizoram Societies Act. It was learned from these associations that they received assistance from the government (grant, subsidies, loans, etc.) which they have not been able to receive as individuals.

(3) Self-Help Groups (SHGs)

Swarnajayanti Gram Swarozgar Yojana (SGSY) has been implemented as a CSS to provide sustained income to the rural poor to enable them to cross the poverty line. To achieve this objective, the scheme has its focus on community mobilisation by forming SHGs, capacity building, infrastructure facilities, subsidised credit linkage, and market support. For the last ten years, 2,906 SHGs have been formed, 2,742 of which received financial assistance for their economic activities.

Considering the shortcomings of SGSY, it was restructured as a new CSS of the National Rural Livelihood Mission (NRLM), which started in the two blocks of Kolasib and Serchhip in 2013-14. Although both schemes have similar objectives of reducing poverty by enabling poor households to have access to gainful self-employment opportunities and by improving their livelihood through building strong grassroots institutions for the poor, NRLM provides SHGs with more generous assistance in terms of involvement of RDD, larger capital subsidies, and organisational strengthening. NRLM has just started and the monitoring/evaluation of its performance has not yet been done.

The Integrated Watershed Management Project (IWMP), as a CSS, has been implemented since 2009/10 with the objective of restoring ecological balance by harnessing, conserving, and developing natural resources while providing sustainable livelihood options to people residing in watershed areas. Although IWMP includes a component for forming and assisting SHGs, the budget for this component is very limited. Under this component, an SHG is formed with five to ten women who are BPL, do not hold lands, and have common interests. Once their action plan of economic activities is approved, a grant of Rs.25,000 is provided to their group as seed money, which would be used for revolving loans among their members. So far, 220 SHGs have been formed under this scheme. However, RDD estimates that SHGs which have revolving funds among their members for economic activities would only make up around 20% of the total. However, it seems that the activities of SHGs and their members have not been fully followed by IWMP due to limited budget and personnel, causing poor performances of SHGs.

Table 4.4.3 SHGs Formed and Assisted under SGSY

No.	Year/ District	No. of SHGs Formed	No. of SHGs Assisted for Economic Activities	Total Expenditure (Rs. million)
1	2001 - 02	379	230	10.18
2	2002 - 03	294	156	8.40
3	2003 - 04	216	128	13.80
4	2004 - 05	290	153	18.36
5	2005 - 06	255	192	20.08
6	2006 - 07	146	102	13.96
7	2007 - 08	229	251	26.85
8	2008 - 09	274	850	35.25
9	2009 - 10	356	259	49.32
10	2010 - 11	467	421	49.32
District-wise (2010-11)				
1	Mamit	189	46	4.94
2	Kolasib	15	22	2.83
3	Aizawl	98	102	11.21
4	Champhai	25	107	8.40
5	Serchhip	30	30	2.95
6	Lunglei	15	29	8.82
7	Lawngtlai	70	27	6.89
8	Saiha	25	58	3.29
	Total:	**467**	**421**	**49.32**

Source: Statistical Abstract of Mizoram (2011)

World Vision India (WVI) has promoted SHGs in three districts of Saiha, Lawngtlai, and Lunglei in collaboration with the State Bank of India and Mizoram Rural Bank (MRB) through the formation of SHGs and providing guidance and training. So far, WVI has assisted in forming 900 SHGs which have been linked to the bank for credit and involved with some livelihood activities. While the good effects of promoting SHGs have been observed, some constraints were pointed out by the project manager, such as the awareness of rural communities on SHGs is still low and constant monitoring of SHG activities is lacking.

(4) Results of Rural Household Survey

The JICA Study Team conducted a household survey covering 360 sample households in 24 villages in the eight districts. More than 20% of the total respondent households participate in agriculture/farming cooperative societies, followed by horticulture (12.5%) and fishery (3.1%) cooperative societies. Regarding benefits gained as members of cooperative societies and groups, 66 respondents answered "received technical guidance and training", 41 "obtained information", 25 "cooperative shipping/sale", eight "obtained cash grant", and five "obtained subsidy". From the survey, 147 respondents were satisfied (12 were highly satisfied, and 135 were satisfied to a certain extent) as members of cooperative societies and groups.

(5) Constraints and Problems

The following constraints and problems regarding farmers' groups were identified:

- Many cooperatives, associations, and SHGs have been formed under several government schemes and guidance with government assistance; however, those that continued its economic activities with government assistance are limited.
- It is difficult for such organisations to ensure active membership and build awareness.
- Majority of organisations and their members lack capacity (skill and knowledge) necessary for continuing economic activities.

- Knowledge and skill inputs from the government are insufficient, and not provided systematically without follow-up system and coordination amongst related government departments and institutes.
- Non-governmental organisations (NGOs) which could enhance awareness of organisation members and support their economic activities are limited.

4.4.4 Agricultural Credit and Rural Finance

(1) Institutional Finance

Table 4.4.4 shows the network and outreach of banking in Mizoram. There is a sufficient number of banks in Mizoram: 19 commercial banks (52 branches) including the State Bank of India (29 branches); Mizoram Rural Bank (65 branches); and Cooperative Apex Bank (12 branches). The number of persons served per branch in Mizoram is around 8,500 (2011 census), which is much better than the national average (around 15,000). However, the locations of their headquarters and branches are concentrated in Aizawl and other urban centres.

Table 4.4.4 Bank Network and Outreaches

Agency	As of 30/06/2012		As of 31/03/2011					
	No. of Banks	No. of Branches	No. of Banks	No. of Branches			Per Branch Outreach	
				Total	Rural	Urban	Villages	Households
Commercial Banks	19	52	12	42	22	20	20	6,075
Mizoram Rural Bank (MRB)	1	65	1	62	52	10	14	4,083
Coop. Apex Bank (MCAB)	1	712	1	12	7	5	74	22,645
Total	21	129	14	116	81	35	7	2,204

Source: Figures of 2012 are from Statistical Abstract of Mizoram (2011) and Statistical Handbook Mizoram (2012).
Figures of 2011 are from State Focus Paper 2012-13 Mizoram State, National Bank for Agriculture and Rural Development (NABARD), Mizoram Regional Office, Aizawl.

Table 4.4.5 shows the loan amounts in Mizoram by broad sector. The share of loan in the agriculture sector is not high. It accounts for only 30% in 2009/10 and 21% in 2010/11.

Table 4.4.5 Loan Amount by Broad Sector

Broad Sector	2009-10			2010-11		
	Target (Rs. million)	Achievement (Rs. million)	Achievement (%)	Target (Rs. million)	Achievement (Rs. million)	Achievement (%)
Crop Loan	46	227	493.5	140	188	134.3
Term Loan (Agriculture)	428	490	114.5	512	272	53.1
Total Agriculture Credit	**474**	**718**	**151.5**	**652**	**460**	**70.6**
Non-Farm Sector	365	217	59.5	465	222	47.7
Other Priority Sector	1,388	1,536	110.7	1,949	1,509	77.4
Total Priority Sector	2,286	2,434	106.5	3,067	2,192	71.5

Source: State Focus Paper 2012-13 Mizoram State, NABARD, Mizoram Regional Office, Aizawl.

The National Bank for Agriculture and Rural Development (NABARD) functions as provider and regulator of credit and other facilities for promoting agriculture and rural development-related fields through credit planning and monitoring, refinancing to rural financial institutions, providing loans to state governments for developing rural infrastructure, strengthening the cooperative credit structure, and so forth.

Table 4.4.6 Loans and Grants Provided by NABARD

	2010/11	2011/12	2012/13
Loans	(Rs. lakh)		
Commercial Banks	-	-	282.00
MRB	80.00	100.00	110.00
MCAB	-	-	-
Total	**80.00**	**100.00**	**392.00**
Grants			
Commercial Banks	3.73	-	-
MRB	20.48	88.58	31.43
MCAB	-	-	-
Total	**24.21**	**88.58**	**31.43**

Note: Loans and grants were provided to MCAB prior to 2010/11; thus, MCAB still has outstanding loan from NABARD despite no loans and grants for the last three years.
Source: NABARD, Mizoram Regional Office.

NABARD Mizoram Regional Office has implemented schemes/programmes, such as (i) credit linked subsidy scheme, (ii) government-sponsored programme, and (iii) promotional and development programme, by providing loans and grants to end users not directly but through intermediary banks (commercial banks, MRB, or MCAB). Table 4.4.6 shows the amount of loans and grants provided by NABARD to commercial banks, MRB, and MCAB for the last three years.

As another scheme for farmers, the Kisan Credit Card (KCC) was introduced to mitigate the difficulties faced by farmers in accessing timely and hassle-free credit for meeting their production needs. The KCC scheme covers all categories of farmers including oral lessees, tenant farmers, and share croppers. By the end of March 2013, a total of 36,884 KCCs have been issued by commercial banks, MRB, and MCAB.

Table 4.4.7Number of KCCs Issued in Mizoram by March 2013

Agency	No. of KCCs Issued
Commercial Banks	11,129
Mizoram Rural Bank (MRB)	23,178
Mizoram Cooperative Apex Bank (MCAB)	2,577
Total	36,884

Source: NABARD, Mizoram Regional Office.

(2) Support for SHGs, Cooperatives, and NGOs

Loans are provided by intermediary banks not only to individuals but also to SHGs and cooperative societies. By the end of March 2013, Rs.2,092 lakh worth of loans have been provided to 2,746 SHGs through intermediary banks. Table 4.4.8 shows the lending activities of MRB and MCAB. While majority of the borrowers are individuals, there are some loans given to cooperative societies by MCAB.

For the purpose of promoting SHG linkage, NABARD provided grants to NGOs which assisted in formulating SHGs and their activities. Twenty NGOs received grants from NABARD amounting to Rs.115.35 lakh in 2010/11, 14 NGOs received Rs.83.33 lakh in 2011/12, and 14 NGOs received Rs.49.15 lakh in 2012/13.

Table 4.4.8 Agency-wise SHG Linkage (as of the end of March 2013)

	Agency	No. of SHGs Savings Linked	No. of SHGs Credit Linked	Amount of Loan Disbursed (Rs. lakh)
1.	Commercial Banks	205	148	221.97
2.	Regional Rural Bank (MRB)	1,336	2,568	1,808.49
3.	Cooperative Bank (MCAB)	653	30	61.04
	Total	**2,194**	**2,746**	**2,091.50**

Source: NABARD, Mizoram Regional Office.

(3) Constraints and Problems

The following constraints and problems regarding agricultural and rural finances were identified:

- Since the headquarters and branches of banks are concentrated in Aizawl and other urban centres, farmers' access to financial institutions including banks is limited. According to the results of the rural household survey by the JICA Study Team, only three out of 360 respondent households obtained loans from banks, four from cooperatives, and two from SHGs for the last three years.
- There seems to be many cases where borrowers have used loans for activities other than their intended purposes such as for investing in their economic activities mainly due to their lack of understanding of the banking system. Even if borrowers use loans for its intended purpose such as agricultural production activities, there are also many cases where they could not obtain profit for several reasons, such as difficulties in obtaining inputs, insufficient agricultural production facilities, insufficient agricultural skills, and difficult access to markets. Accordingly, they could not repay their debts.
- Although banks have held awareness campaigns to make farmers understand the banking system and procedures, their coverage is limited. Follow-up activities by bank staff on how farmer borrowers should properly utilise loans for their economic activities are not sufficient.
- Bank staffs are not the ones who could provide technical and knowledge inputs for agricultural production activities. Related government departments and NGOs are the ones which can provide such inputs to farmers. However, banks rarely work together with these relevant departments. NGOs that can provide high-quality technical and knowledge inputs to farmers are very limited.
- As a result, the rates of overdue debts and non-performing loan (NPL) have become high. The ratio of the number of loan clients holding overdue debts and those holding NPL against the number of loan clients in 2012/13 are 22% and 6.4% for MRB, respectively, and 46% and 18.7% for MCAB, respectively. The rates of NPL are high especially in the agricultural sector and in loans to individual clients.

4.5 Post-harvest Processing and Agro-processing

4.5.1 Development Plan

The "National Twelfth Five Year Plan (2012–2017)" provides the objectives and strategy for promotion of the Micro, Small and Medium Enterprises (MSMEs) in the Industry Section, especially for the food processing industry to develop the food processing sector to enable containment of food inflation and food wastage and to create one million additional jobs during the 12th plan period. While in the state level, the Industry Department in Mizoram State, through "the Mizoram Industrial Policy, 2012" and "Approach Paper & Action Plan for 12th Plan", point out the strategy of industrial sector as follows;

(a) Vision

- Sustainable Industrial growth especially in the MSME sector in Mizoram
- Encourage increasing value addition in various local produces and giving better income mote direct to farmers
- Conductive environment for investment
- Promote direct and indirect employment opportunities

(b) Objectives and Challenges

Objectives and challenges are listed in the Table 4.5.1.

Table 4.5.1 Objective and Challenges

	Objectives	Challenges
1	To create infrastructure facilities, provide incentives and marketing as well as technical support to industries	Creation of infrastructure in a speedy and fast track mode for creating conducive investment climate. The potential thrust for infrastructure development can be summarized as below: 1) Administrative infrastructure. 2) Industrial infrastructure in the form of construction of industrial estate, park, centre, etc. 3) Marketing infrastructure.

	Objectives	Challenges
		4) Infrastructure for resource management and quality improvement. Providing Incentives to MSME sectors. Market promotion and competitiveness.
2	To create employment opportunities particularly to the vulnerable section of the society and people in rural area, ensuring inclusive development	Employment generation
3	To provide skill development and training for educated youth to develop entrepreneurial skills and make them self-employed	Skill development and enhancing employability.
4	To attract investment in the State	Investment promotion. The poor infrastructure condition of the State as a hold is not attractive for investors outside the state. The potential investors in the state are facing capital scarcity. More effort is still needed to attract investment and make use of the central policy and State policy.
5	To reduce procedural formalities to speed up industrialization	Creation of reliable and up dated data. Administrative restructuring and strengthening.
6	To reduce sartorial and regional imbalance in the industrial development in the State by promoting Industries under all sectors	Revitalization and privatization of Public Small Enterprise (PSE).
7	To create proper linkage of processing Industries with the farm produce of agriculture, horticulture, forest and livestock's	Thrust may be given to the following potential sectors utilizing locally available raw materials. 1) Food processing, 2) Textile and garments, 3) Handloom, 4) Handicraft, 5) Bamboo based industries, 6) Wood based industries, 7) Khadi and Village Industries.

Source : " the Mizoram Industrial Policy, 2012", ID

4.5.2 Current Situation of Agro-processing Industry

(1) Overview of Post-harvest Processing

The post-harvest processing carried out by farmers are very outdated and conventional in general and seems low motive for farm mechanization including post-harvest processing among farmers. Manual practice for harvesting, threshing and drying is popular even for paddy as the staple food and same for other products as they are packed in bags or baskets without any processing after harvesting and forwarded.

According to the farm household survey, more than 80% of respondents have no special treatment on post-harvest processing. Farmers consider that lack of labour (71%) is the biggest constraint to proper post-harvest management of their products, more than technology (knowledge) and facilities (storages and processing machines). Lack of manpower is the one of the serious constraint among farmers for not only post-harvest processing stage but production stage. Then the mechanization should progress for saving labour but farmers seem not to have a way of thinking that machineries and equipment could reduce labour cost and improve profitability of farming.

The small rice mills (called "Huller") spreading out in villages and towns provide hulling and whitening service to farmers in their surrounding areas for their consumption because more than 70% of rice consumption is supplied from out of the State by the NDP (National Distribution Programme). Machine used in such mills is Engerberg type milling machine made in India which is economic by low investment and maintenance cost and is repaired easily, but recovery rate of milled rice is rather low, comparing to modern machine using rubber roll husker. Some of the rice millers also provide grinding service for making powder of grains and crops such as rice, corn and turmeric by using a grinder or a pulveriser.


Rice harvesting


Engerberg type milling machine


Grinder for powder making

Source : JICA Study Team

Photo 4.5.1 Post-harvest Processing

(2) Overview of Agro-processing

According to the statistical data in the Industry Department (ID), 631 numbers (8.8%) of enterprises as type of "Food Processing" among all 7,211 enterprises were registered. Total numbers of employee are 40,433 and the majorities work in micro and small enterprises as average 5.6 numbers of employees.

The following is the information of selected enterprises among all enterprises where the study team visited.


Source : JICA Study Team

Photo4.5.2 Concentrated Juice Factory (Chhingchhip)

(a) MIFCO

Mizoram Food and Allied Industries Corporation (MIFCO) Ltd. is one of the State Owned Enterprises (SOEs) under the Industry Department and established 1989. They operate three agro-processing factories namely Fruit Juice Concentrate Plant, Chhingchhip, Food Processing Plant, Sairang, and Pork & Poultry Processing Plant, Zemabawk. Their business has been operating under unprofitable condition by the financial support of the State Government, due to the common constraints as ineffective management by the managing board of official persons. Deloitte Touche Consulting India Pvt Ltd, was employed to study the functioning of State Government corporate bodies. After conducting a thorough examination of the SOEs, Deloitte judged that MIFCO would be more profitable if the government privatize them. The State Government is yet to take any action on the recommendations.

(b) CDAR and HCP

Community Development Action & Reflection (CDAR) was established as a NGO in 2004 for supporting young women in poor farmer's families to become self-support. Around year 2006, they started the support activities for marketing of the products because many farmers faced to difficulties for sales of their products.

They deal in ginger, turmeric and bird-eye chilli and sell them to exporters mainly in Bombey after processing (wash and slicing) and drying. But the market of turmeric has been almost vanished in these years.In the contrast, the market condition of ginger is very stable in high demand trend.

There are 5,440 farmers as members in 69 villages in five districts located in the north from Serchip and all farmers are authorized as organic producers by the Agricultural and Processed Food Products Export Development Authority (APEDA) and produce the organic products in their total cultivation area extend to 15,448 acres.

As mentioned above, the CDAR is one of the limited numbers of success enterprises in agro-processing field of the State that has been establishing their purchasing networks and exploring supply chains by themselves. Same to CDAR, Hnamchhantu Pawl (HCP) has also developed their collecting, processing and marketing business of the broom products by establishing their own purchasing networks and supply chains.


Washing Drum


Slicing Machine


Sun Drying

Source : JICA Study Team

Photo 4.5.3 Ginger Processing Facilities (CDAR)

4.6 Agricultural Marketing and Distribution

4.6.1 Development Plan

(a) National Level

In order to overcome the limitations and constraints of present agricultural marketing system, Ministry of Agriculture (MOA), Govt. of India formulated a Model Agricultural Produce Marketing Committee (APMC) Act/Rules. In this, the MOA took this major initiative to set up an Empowered Committee of State Ministers in-charge of Agricultural Marketing on 2nd March, 2010 to implement the reforms in agriculture marketing through adoption of Model APMC Act and Model APMC Rules, suggest further reforms necessary to provide a barrier free national market for the benefit of farmers and consumers and also suggest measures to effectively disseminate market information and to promote grading, standardization, packaging, and quality certification of agricultural produce.

The Committee set up the challenges to the agricultural marketing system in the country, which needs to be strengthened and revitalized.

・ Limited Access of Agricultural Produce Markets	・ Long Gestation Period of Infrastructure Projects and Seasonality of Agri. Produce
・ Licensing Barriers	・ Lack of National Integrated Market
・ Lack of Market Infrastructure in Agricultural Markets	・ Less Farmers' Price Realization
・ High Incidence of Market Charges	・ Large Number of Marketing Channels with Long Supply Chain
・ High Wastages in Supply Chain	・ High Marketing Cost Affects Small and Marginal Farmers

The Model Act provides for following major issues:

・ Establishment of Private Markets/yards, Direct Purchase Centres, Consumer/Farmers Markets for direct sale	・ To regulate and promote contract-farming arrangements in the country
・ Promotion of Public Private Partnership in the management and development of agricultural markets in the country	・ Prohibition of commission agency in any transaction of agricultural commodities with the producers.
・ To separate constitution for Special Markets for commodities like Onions, Fruits, Vegetables, Flowers, etc.	・ State Agricultural Marketing Boards to promote standardization, grading, quality certification, market led extension and training of farmers and market functionaries in marketing related areas.

(b) State Level

Trade and Commerce Department (TCD) in the State Government are responsible to manage and regulate the trade and commerce activities concerning marketing and distribution of agricultural commodities. The department has regional offices in Lunglry, Champhai and Kolasib other than its head office in Aizawl and presently total 159 staff.

Now the TCD has been still reviewing and revising the Mizoram State Agricultural Produce Marketing (Development and Regulation) Act in conformity with the Model Act. In the 12th Five Year Plan

(2012-2017), the TCD plans to establish new two District offices at Mamit and Serchhip and to improve and establish necessary facilities at international border gates under the national issue of expansion of border trade.

4.6.2 Distribution of Agricultural Products and Stakeholders

(a) Market

The TCD is responsible to manage and regulate all markets in the State. Actually there are 220 markets in the State where the Department manage 22 major markets directly and the rest 198 markets indirectly through Local Councils in Mizoram Districts and Village Councils in other Districts. For 22 major markets, the Department select and contract the private firm who manages a market even called "managed by TCD directly" by a bid in each six month.

Market facility condition of major towns does not have serious defects excepting the area of meat and fish sales. The area shall be improved to the sanitary condition required by the hygiene regulation.

Source : JICA Study Team

Photo.4.6.1 Roadside Market

(Dulte, Champhai Dist.)

The road networks have not been developed well due to mountainous location of the State and the areas where farmers face to difficult access to markets still exist. The market location and density is analyzed and indicated on the map of Figure 4.6.1. The color gradation between high accessibility of red and low of blue on the map shows the accessibility of each area to markets.

New Market (Aizawl)

Meat Shop
(Super Market, Lunglei)

Fish Shop
(Treasure Market, Aizawl)

Source: JICA Study Team

Photo 4.6.2 Retailers in Markets

(b) Boarder Trade to / from Other States

Distribution of agricultural commodities in the State are regulated by the Mizoram Agriculture Products (Prohibition of Movement) (Amendment) Order and is currently allowed 138 commodities covering almost all commodities produced in the State. For these commodities, distributers need to receive the permission and pay fee to the TCD. The TCD have the four check gate officies at border gate sites namely Vairengte (Kolasib District), Bairabi (Kolasib District) , Kanhmun (Mamit District) and Mualkawi (Champhai District).

(c) International Trade

TCD has been appointed as the nodal department by the Ministry of Commerce and Industry, Government of India for promoting border trade with the neighboring countries of Myanmar and Bangladesh. International Trade Gates in Mizoram are proposed at three gates excepting Aizawl airport:

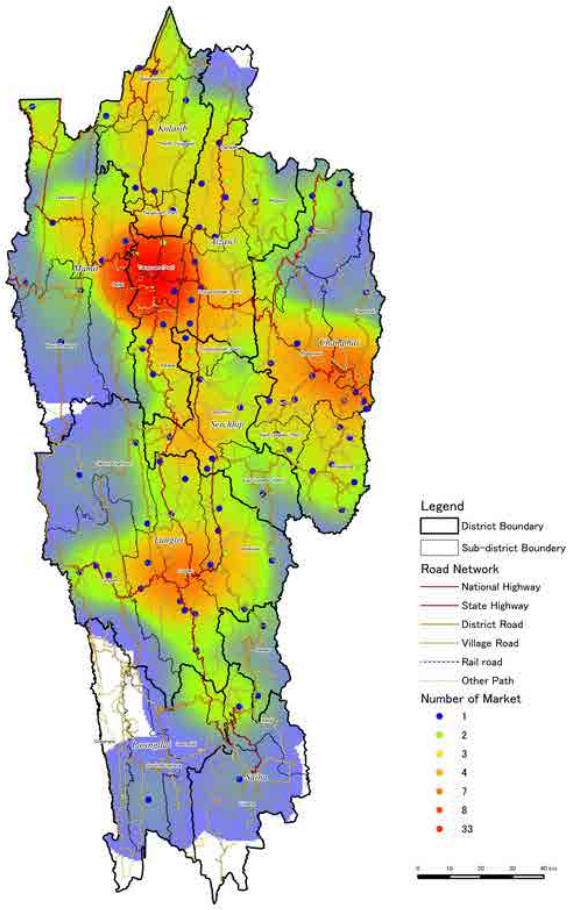
- Zokhawthar, Champhai District, for Indo-Myanmar trade
- Kawrpuichhuah (Tlabung), Lunglei District, for Indo-Bangladesh trade
- Zorinpui, Lawngtlai District, for Indo-Mynamar trade

The TCD is proposing three more border gates to Myanmar namely Vaphai and Farkwan in Champhai District and Sangau in Lawngtlai District as sub-gates to Zokhawthar and plans to construct Border Trade Centres (BCTs).

At present, 62 items of commodities are allowed for export and import trading by the Government of India.

The progress condition of infrastructure development differs in each border gate as Zokhawthar to Mynmar and Tlabung to Bangladesh as of March 2014. In Zokhawthar, there is the bridge already and the integrated office facility has been constructed recently, then it seems that formal and regulated official procedure and activities concerning border trade with Myanmar can be started soon.

On the contrary, even though political and protocol agreement was exchanged by the both countries, the official procedure to open the formal trading gate in Korupuichhah, Tlabung has been delaying and not progressed well.



Source:JICA Study Team

Figure 4.6.1 Accessibility to Market

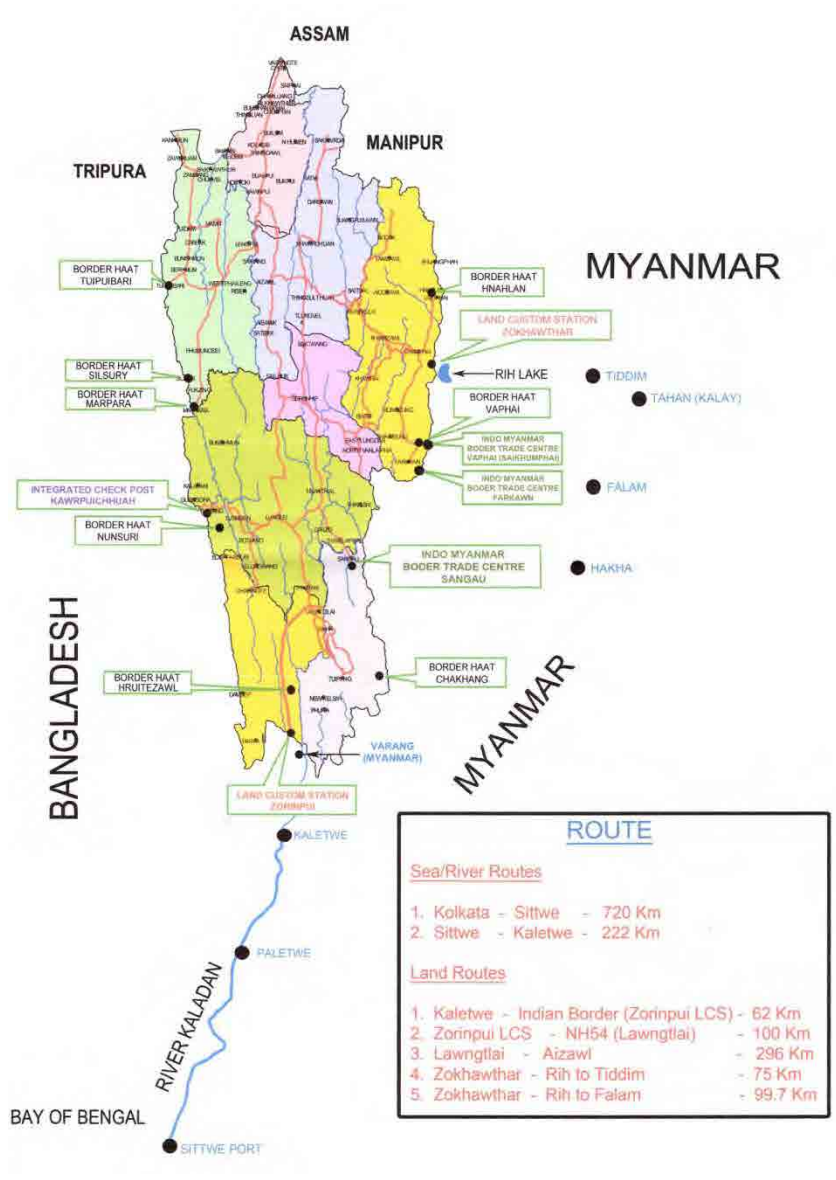
Boarder Gate

Police Office

Transhipment of Commodities

Source:JICA Study Team

Photo 4.6.3 Condition of Border Gate with Myanmar (Zokhawthar)




Boarder River
(Opposite: Bangladesh Side)


Inhabitants cross border fleely


Proposed Bridge Construction Site
(Opposite: Bangladesh Side)
Source: JICA Study Team

Photo 4.6.4 Condition of Border with Bangladesh (Kawrpuichhuah)

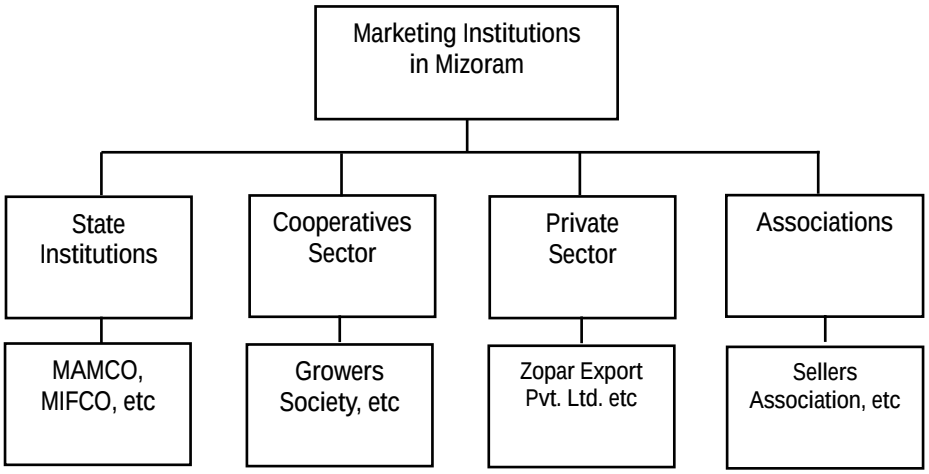
Source : TCD

Figure 4.6.2 Facilities Construction Plan for Border Trade

(d) Overview of Marketing Institutions

The existing agriculture marketing institutions of the State can be broadly divided into four categories as shown in Figure 4.6.3.

Various institutions from the State organizations like the TCD, NGOs like CDAR engaging ginger trading and traders associations of wholesalers, middlemen and retailers are involved in agricultural distribution in the State. Under the present rigid distribution system, the activities that can be expected to improve and restructure the present system are not found in almost all institutions but very limited organizations such as CDAR and HCP are only exist.



Source: Market Survey, JICA Study Team

Figure 4.6.3 Organization Chart of Agricultural Marketing Institution in Mizoram

1) Traders from Assam State

Traders coming from other Indian States occupy a crucial part in the marketing of agricultural products. They are called *Marwari*, the name of one Indian ethnic group of Rajasthan origin. These people frequent the state, even the interior areas, throughout the year to procure surplus production of cash crops and transport the commodity purchased from the farmers to their base, generally located in Cachar District of Assam. The commodities that they generally procure from the state are ginger, chilli, betel nuts, orange, squash, turmeric, banana and broom. Moreover, they are also the main agents for the import of vegetables from other states like potato, fish, cabbage, cauliflower, onion, garlic, etc. Therefore, these agents play a significant role in the flow of agricultural products to and from the state.

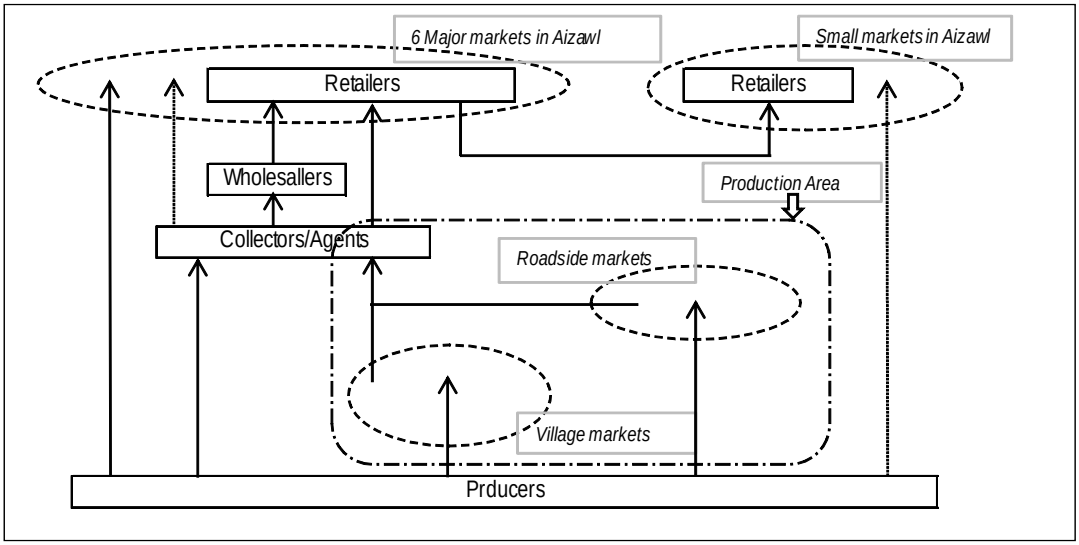
2) Associations

Traders or farmers dealing in the same commodities in certain areas usually form themselves in associations in order to protect their welfare. There is a complicated network of associations of different sorts in the state which are very influential in their respective areas in terms of price controls and prevention of the entry from outside. These associations take different forms at various levels, village, block, district, state, specific area (markets). In respect to agriculture produce marketing, these associations may be broadly classified into three major groups as farmers/producers/growers, wholesalers/commission agents and retailers associations.

In the system, farmers as well as consumers cannot have options for price negotiation but they do not seem to have any doubts and motives for improvement of the system.

(e) Distribution at Village Level and to Near Town Market

Basically farmers in Mizoram give a priority to their self-consumption on their agricultural production, and then their surplus produce such as vegetables is small volume and sold at a village market and roadside market in their area. In some area where farmers produce more volume of products for earning cash income and some of them transport their produce to the nearest big town market by "Sumo", public small bus, and sell to retailers or consumers directly. Collectors also carry the products to a nearest big market like Aizawl and sell to retailers and some farmers behave like collectors after gathering the products from neighbouring farmers.

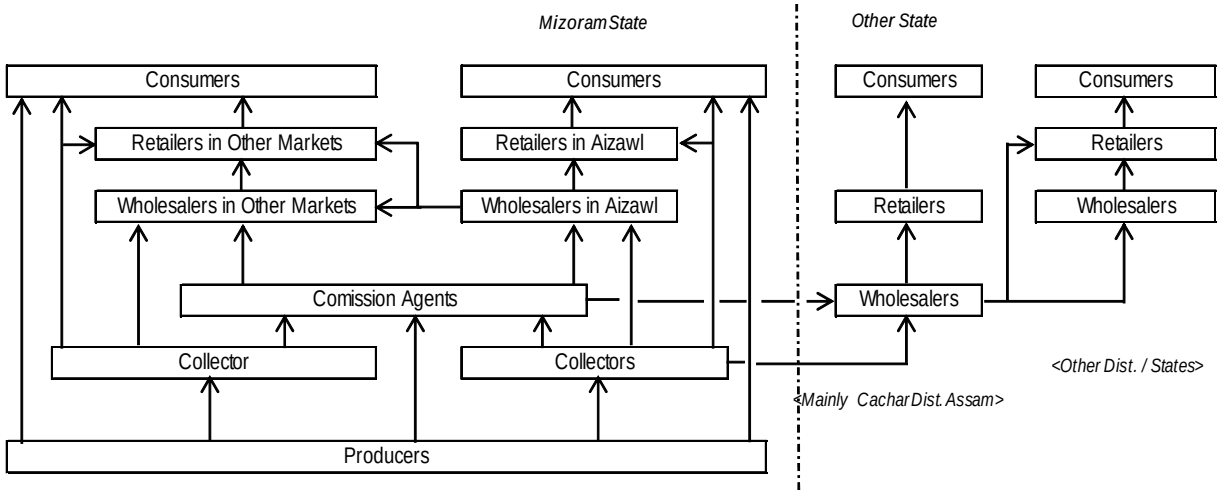


Source: Market Survey, JICA Study Team

Figure 4.6.4 Distribution Chart in Production Area and to Aizawl Market

(f) Long Distant Distribution

In addition to the above distribution, some local produces having the market in other states is bought by collectors or commission agents and transported to wholesalers / brokers in other states, mainly in the Silchar in Assam State.



Source: Market Survey, JICA Study Team

Figure 4.6.5 Long Distant Distribution Chart of Local Products

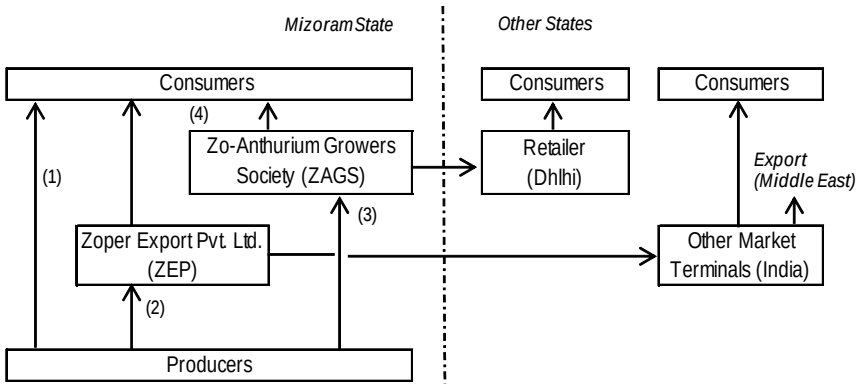
For the products like squash and ginger, the commission agents are usually agents of the wholesalers / brokers as buyers in other states. For example, there are five agents in Sihphir village who collect and buy squash in the village, and ship them to wholesalers in Silchar by trucks.

Additionally, the distribution beyond a district border in Mizoram state is broadly observed for local produces. For example, vegetables produced in Sihphir in Aizawl District are sold in markets in Kolasib in the north and even in Lunglei and Saiha in the south after transportation by collectors. Other than the direct distribution by collectors from production area, distribution via wholesalers in Aizawl is common to almost all town market within the state.

Photo 4.6.5 Shipping of Squash (Sihphir Village, Aizawl Dist.)

Source : JICA Study Team

In addition to CDAR and HCP, two organizations, namely Zoper Export Private Limited (ZEP) and Zo-Anthurium Growers Society (ZAGS), engaging cut flowers trading also establish the purchasing networks and supply chains by themselves separately to the present rigid marketing channels, but the numbers of such organization are still very little. The distribution channels of anthurium flower is shown in Figure 4.6.6.



Source: JICA Study Team

Figure 4.6.6 Distribution Channels of Anthurium Flower

(g) Distribution of Products Coming in to Mizoram

Agricultural products sold in the state have been depending heavily on outside sources and the local market is being dominated by such import products. The products like potato, onion, garlic, rice, egg, apple and fish are sold in grocery shops as well as markets throughout a year. The products that are produced widely in Mizoram are also imported and sold in local markets seasonally and timely when arrival of local products are less than demand in markets. Such products are tomato, broccoli, cauliflower, cucumber, eggplant, cabbage, water melon, mango, pineapple, etc. including various leaf vegetables. Even though numerical output cannot be estimated due to lack and unreliable statistical data, self-sufficiency of agricultural products in the State seems very low.

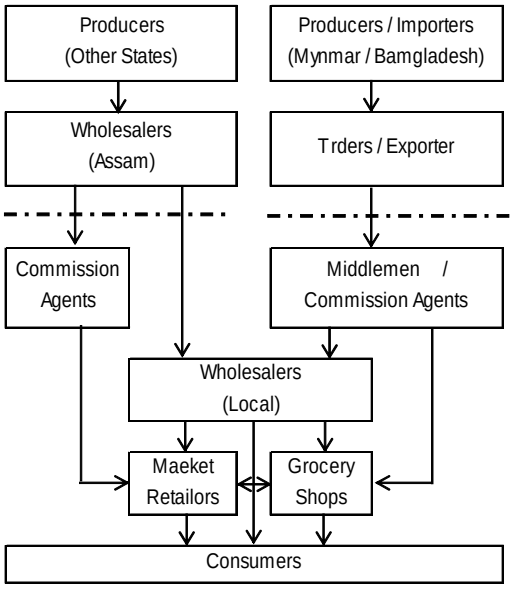
Among the products above, some shares of onion, tomato, garlic, apple, etc. are imported from Myanmar and Bangladesh and more other products from two countries can be seen in local market seasonally. Additionally, the both countries' products are mixed and sold in markets near the border gates of both countries.

The products coming into the State are transported in mainly through the border gate in Vairengte sharing about 80% among all four gates to other States and some agricultural products from Myanmar such as garlic and Chinese apple are distributed from Zokhawthar to Aizawl via Champhai. The main gate of the products imported from Bangladesh is Tlabung, Lunglei District but the import quantity is rather less than one from Myanmar because of no bridges on the border river.

The distribution of routes of such products are presented in Figure 4.6.8 and the annual total volume by category and major commodities passed by check gates were indicated in Table 4.6.1.

Source : JICA Study Team

Photo 4.6.6Imported Products sold in Grocery Shop



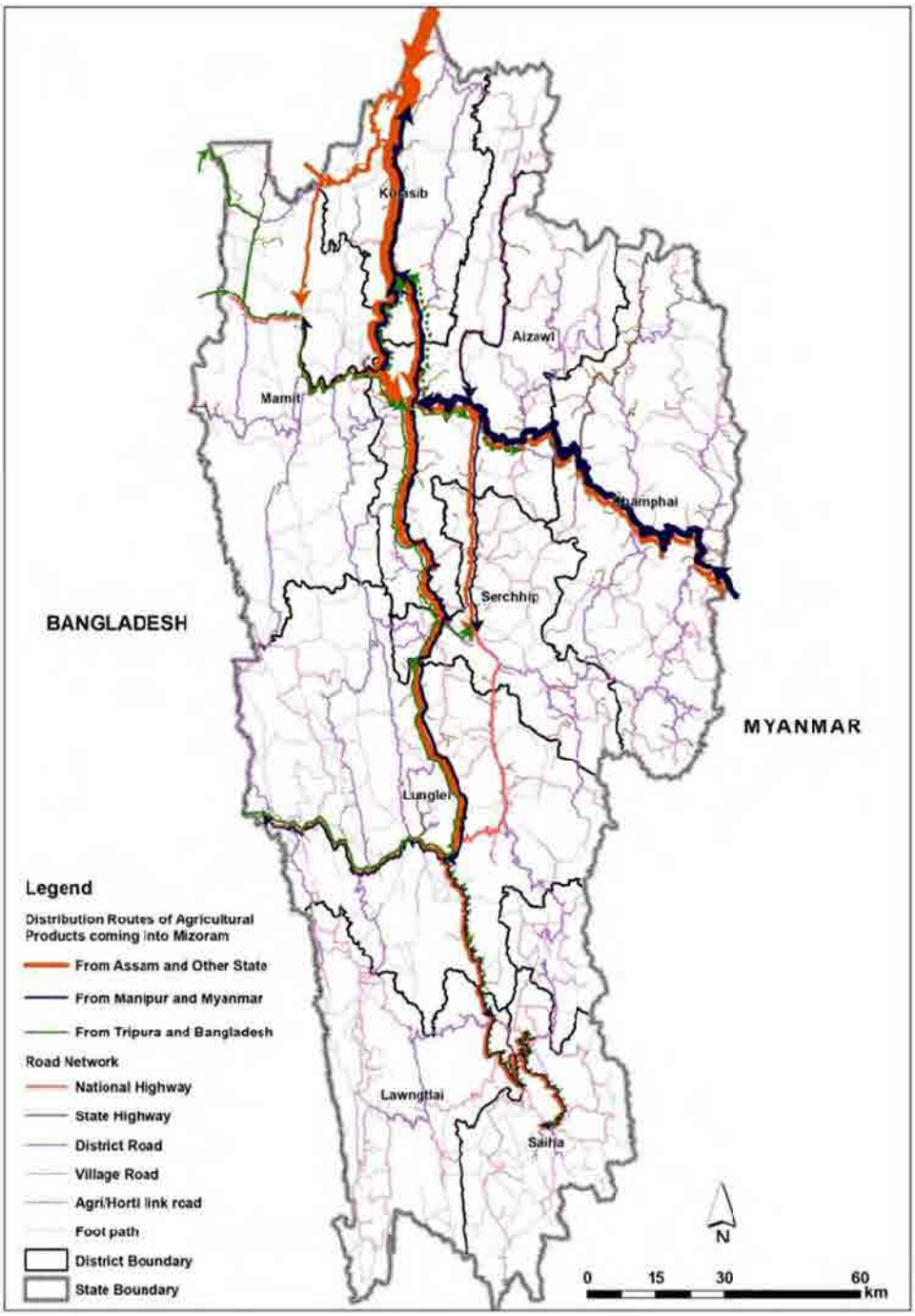
Source: JICA Study Team

Figure 4.6.7 General Distribution Channels of Products Coming into Mizoram

Table 4.6.1 Major Agricultural Products Coming in and Going out the State

No.	Item <Coming in>	Unit	2011 – 12			2012 - 13		
			Q'ty	Rs. / Unit	Amount (Rs.)	Q'ty	Rs. / Unit	Amount (Rs.)
1	Vegetables	Qtls.	39,247	3,500	137,364,500	60,807	4,000	243,228,000
2	Potato	Qtls.	59,632	2,500	149,092,500	74,400	5,000	372,000,000
3	Onion	Qtls.	23,372	3,500	81,802,000	47,050	7,000	329,350,000
4	Pineapple	Qtls.	1,877	3,200	6,006,400	9,174	3,600	33,026,400
5	Cattle	No.	1,300	25,000	32,500,000	1,337	32,000	42,784,000
6	Pig	No.	420	20,000	8,400,000	240	27,000	6,480,000
7	Goat	No.	2,137	3,000	6,411,000	4,913	3,300	16,212,900
8	Poultry	Tukrie**	14,271	5,500	78,490,500	2,623	6,200	16,262,600
9	Egg	Box	87,138	1,050	91,494,900	85,370	1,155	98,602,350
10	Fish	Box***	33,091	6,000	198,546,000	48,157	7,200	346,730,400
11	Betel leaf	Tukrie	29,639	4,500	133,375,500	47,596	5,500	261,778,000
12	Betel nuts	Qtls.	43,610	2,500	109,025,000	39,608	3,500	138,628,000
13	Rice	Qtls.				15,322	1,600	24,515,200
	Total				1,032,508,300			11,919,597,850
No.	**Item <Going out>**	**Unit**	**Q'ty**	**Rs. / Unit**	**Amount (Rs.)**	**Q'ty**	**Rs. / Unit**	**Amount (Rs.)**
1	Squash	Qtls.	12,874	800	10,299,200	29,063	1,000	29,063,000
2	Hatkora	Qtls.	9,676	2,000	19,352,000	43,313	3,000	43,313,000
3	Orange	Qtls.	6,469	3,000	19,407,000	7,689	7,000	53,823,000
	Total				49,058,200			126,199,000
No.	**Item* <Going out>**	**Unit**	**2011**			**2012**		
			Q'ty	**Wholesale Rate Rs. / kg**	**Amount (Rs.) By Av. Rate**	**Q'ty**	**Wholesale Rate Rs. / kg**	**Amount (Rs.) By Av. Rate**
1	Ginger	Qtls.	184,045	25 – 35	552,135,000	90,721	15 – 18	149,689,650
2	Turmeric	Qtls.	78,790	8 – 10	70,911,000	67,870	8 – 10	61,083,000
3	Chilli	Qtls.	18,970	80 – 150	218,155,000	12,475	80 – 150	143,462,500
4	Sesame	Qtsl.	5,440	40 - 60	27,200,000	3,547	40 - 60	17,735,000
	Total				868.401,000			371,970,150

*Source: TCD (*Mizoram *Agricultural Marketing Development Corporation Limited, MAMCO) Note: ** 34kg, ***40kg*



Source : JICA Study Team

Figure 4.6.8 Distribution Routs of Incoming Products to Mizoram

(h) Value Chain Analysis

Value chain estimation was carried out on the selected commodities together with clarification of distribution channels and stakeholders by the market survey. The remarkable outputs of the analysis are summarized as follows.

The advantages of well-organized marketing institutions and channels have been indicated to result in higher producer's share in the final price, while the inverse is the case for unorganized market channels. For example, the case of broom and betel nuts. The former is marketed through a well-organized marketing channel (i.e. Hnamchhantu Pawl <HCP>) and the latter is characterized by non-transparent and unorganized channels. The advantage of organized market channel is a relatively higher producer's share in the final price and earnings and by generation of employment opportunities in the process of

value addition by various stakeholders. At the same time, marketing of betel nuts shows low producer's share in the final price with the consumers being the loser as well.

In spite of it being grown largely across the state, ginger market is still characterized by unorganized and non-transparent channels. Then prices remain uncertain and the producers have to take the risk of growing it.

For the staple food items of the people, there is no regulated market mechanism for these commodities to check price increase and to facilitate regular flow of supply. The producers as well as the consumers are exposed to the market controlled by a network of intermediaries, which results in high prices with uncertainty on quality delivery and un-remunerative price earned by the producers.

The study found good scope for the introduction of modern marketing chains of vegetables and fruits in the state. This would include contract farming, emergence of facilitative NGOs and Self Help Groups (SHGs), private investment, etc.

(i) Market Information

The Department of Economic & Statistics (DES) collects data for both wholesale and retail price of various commodities. Wholesale price of 20 food items are collected from eight district capitals quarterly, while, retail prices of 101 food items and 71 non-food items are collected from 16 urban markets of Mizoram. This role of DES is assigned by the programme for calculating Wholesale Price Index (WPI), Retail Price Index (RPI) and Consumer Price Index (CPI) managed by the Central Statistical Organization (CSO). The collected data is sent to the CSO in Delhi firstly, accumulated and processed to the data of "Price, Price Index and Minimum Wages" of the quarterly bulletin. This bulletin is published by the DES and distributed only to all the departments of the State and not disclosed in public.

On the other hand, the Trade and Commerce Department (TCD) also collect market price of 99 agricultural commodities in major markets every week together with trade volume through the District Offices. The data is not collected as the rule permanently and data sheets are kept in the filing holders in the head office after sending a copy to Directorate of Marketing & Inspection (DMI), Ministry of Agriculture where the data is processed and loaded up to the market information portal web site in India named "Agrimarknet". In the same manner, the data of commodities and volume passing out and in at check gates of state border are collected and recorded by the check gate offices and sent to the head office. The data sheets are unreliable and only kept in filing holders without any processing by a computer.

(j) Road Condition

National, State and District roads in the State are generally in bad conditions as one lane exists many sections even on two lane roads and paved condition is limited due to inadequate road design and insufficient maintenance works. As the result, it takes longer time for driving and makes damage to transported commodities.

Photo 4.6.7 Private Small Bus "SUMO"

Source : JICA Study Team

The study team carried out the interview survey to staffs and drivers of private small bus (Sumo) enterprises and passengers in Aizawl regarding service routes starting from Aizawl, fare and road condition of each route.

- Small bus service covers 74 destination places from 25km distance of Sairang to 700km of Saiha in the State. A passenger charge is Rs.50 – 700 and transportation charge of a bag is Rs 20 – 200.
- They operate bus services through a year but cannot operate on some routes sometime by landslides in rainy season. Some section of the route to Mamit is the worst road condition.
- They also cover the routes to big cities out of the state via Vairengte such as Bagha, Guwahati, Silchar, Shillong, Churachanpur and Imphal.

4.6.3 Constraints for Development in Agro-processing and Marketing Fields

Constraints extracted and analyzed from the result of the survey indicate as the relational diagram in Figure 4.6.9. Based on the diagram, issues that must be overcome for the agricultural sector development are summarized below.

(1) Private Sector

(a) Lack of basic knowledge on business management

Human resources regardless of farmers, agro-processing industry managers and market retailers who can manage their business by the basic knowledge of business management are very limited.

(b) Consolidated pricing mechanism in market

Through distribution channel of most agricultural products, associations are organized in each stage of collectors, middlemen, wholesalers and retailers and determine and fix price of each product.

(c) Less number of independent local wholesalers

Numbers of wholesalers who trade products by their own network of purchasing and sales other than wholesaler who receive products from Assam traders and distribute them to local markets are very limited.

(2) Official Sector

(a) Insufficient components and procedure of support programmes

Various official support programmes provide equipment, facilities and funds for activities in wide area from production to processing. However most of programmes cannot show the expected results. Lack of basic knowledge on business management among farmers and processing business managers is crucial constraints and most of them cannot have adequate business mind. Under the situation, the recipients of the support programme who can manage and use the inputs well. The programme does not provide training component and software by which recipients can use inputs properly and manage their business to reach self-reliant condition.

(b) Constraints of programme planning and implementation by departments and agencies

As business management covers a series of activities from production to sales for farmers, and then synchronized provision of support programmes along their activities is desirable. In the contrast, as support programmes are planned and implemented by each department and agency due to the government institutional mandates, their support components and implementation could not meet to recipient needs described above. Additionally, such support programmes made much waste by overlap of components. These samples are displayed along the main roads. The similar facilities has been constructed here and there beside roads by various departments and programmes.

(c) No extension system of market information

Nowadays market information is one of the most important inputs for business management and various strategies can be considered and decided by it. It is also essential infrastructure for promotion of economic development in the State. However both the TCD and DES have not established market information extension system yet and the awareness of officers in charge is very low about importance of it.

(d) Inadequate economic infrastructure

1) Difficult accessibility to adequate loan programme

Direct intervention of the grant support shall be avoided as much as possible for maintaining healthy market condition according to the general theory. Therefore, it is desirable for the development of economic sector in the state that the MSMEs including farmers can access an appropriate loan programme. However, it is difficult to access to the loan programme suited to borrower's condition like

repayment period and condition, interest rate and guarantee and borrower's qualification that banks check and screen is high.

2) Insufficient road networks and maintenance

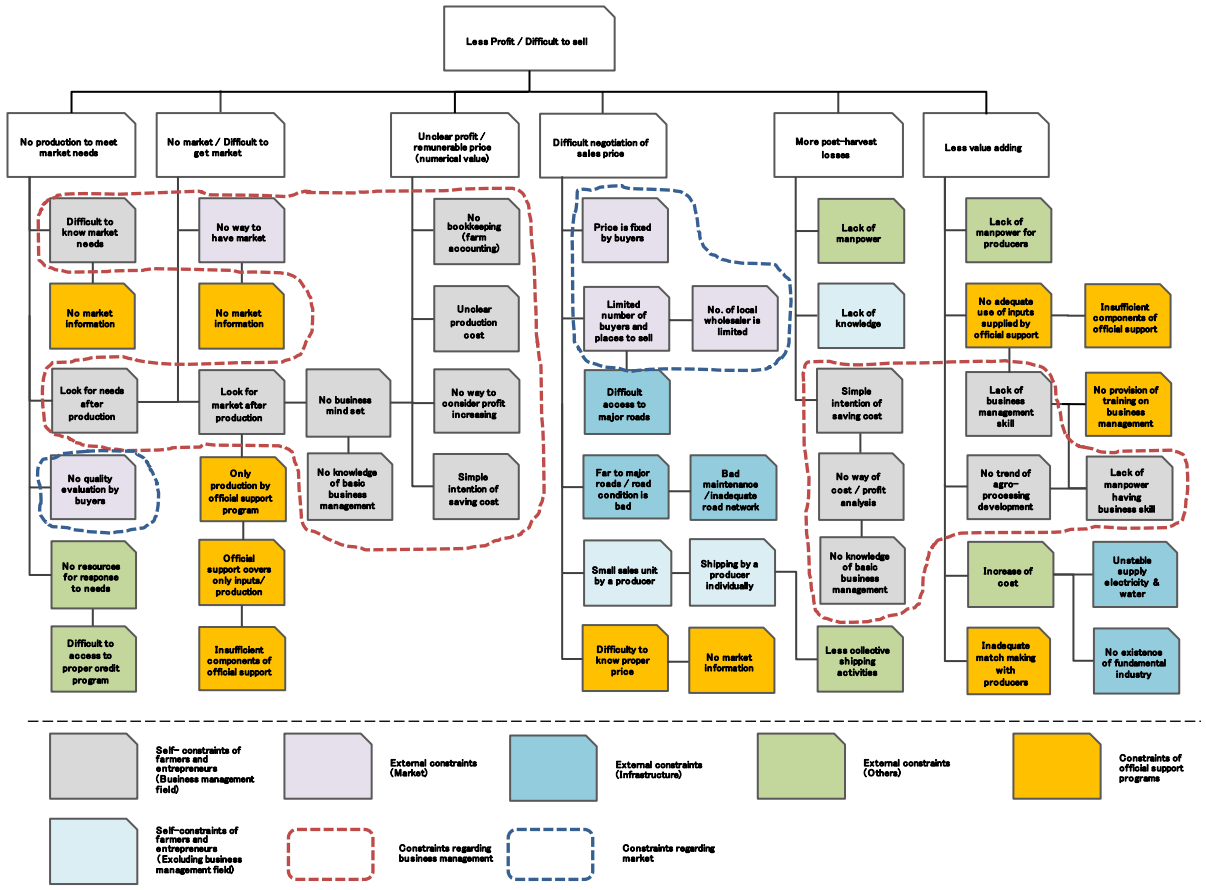
Existing road network still remains the area where farmers are difficult to transport their products to markets. Even for existing main roads their surface condition is not good in general and some parts of them are serious bad condition for smooth traffic driving due to insufficient maintenance system.

3) Unstable supply of electricity and water

Stable supply of electricity and water is also inevitable requirement for development of industry including agro-processing. However, the public water supply system and the electric power supply is unstable and stop frequently as some owner of agro-processing factory said that average electricity supply was only about 50% of operational eight hours a day during a dry season. Under such circumstance, it is impossible to call and promote investments from out of the state.

4) Lack of fundamental industry

There is no fundamental industry that supplies raw materials and inputs to various industries such as simple machines and package materials used by agro-processing industry, and they purchase such inputs from out of the state and increase their production cost.



Source : JICA Study Team

Figure 4.6.9 Relational Diagram of Constraints in Agro-processing and Marketing

4.7 Inland Fishery

4.7.1 Policy and Organisation

The Department of Animal Husbandry Dairying and Fisheries (DADF) of the Ministry of Agriculture is the responsible both for inland and marine fisheries sectors and assisting, through the National Fisheries

Development Board (NFDB), both financially and technically, the state governments in promoting intensive aquaculture in ponds. The main thrust area in the fish sector is the expansion of aquaculture in fresh and brackish water, and welfare of fisher-folk. In entire India, about 2.41 million ha of water bodies are available for freshwater aquaculture. The DADF anticipates that productivity would be increased to 5 tonnes/ha/year from the present level of about 2.2 tonnes/ha/year with better inputs in terms of seeds, feeds, and fertilizers.

The responsible agency for the fisheries sector in Mizoram is the Department of Fisheries (DOF), and its leading role are fingerling procurement and distribution, and training through demonstration for pond and open waters (rivers, reservoir) fisheries. The department has about 150 staff both at the state level (Aizawl) and in the field (eight districts) at the district level. The DOF has eight district-level fisheries offices (DFOs) that are headed by the District Fisheries Development Officers (DFDOs).

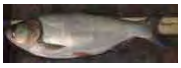
4.7.2 Current Situation of Inland Fishery

(1) Fish Seed Distribution and Fish Production

(a) Fish Species Cultured in Mizoram

There are six fish species commonly cultivated in Mozoram as shown in Table 4.7.1, namely, rui (*Labeo rohita*), catla (*Catla catla*), mrigal (*Cirrhinus mrigala*), silver carp (*Hypothalmichthys molitrix*), grass carp (*Ctenopharyngodon idella*), and common carp (*Cyprinus carpio*). These fish species originally belong to riverine environment and are cultured in ponds and tanks.

Table 4.7.1 Fish Species Commonly Cultured in Mizoram

No	Fish Species	Salient Characteristics	Pictures
1	Common carp *(Cyprinus carpio)*	・ Bottom feeder and omnivorous ・ Breeds during January to March and can breed in stagnant water ・ Can reach 1-2 kg in one year	
2	Catla *(Catla catla)*	・ Surface feeder ・ Breeds during June to August ・ Can reach a weight of 2-3 kg in one year	
3	Rohu *(Labeo rohita)*	・ Column feeder ・ Breeds during June to August ・ Can reach a weight of 2-3 kg in one year	
4	Mrigal *(Cirrhinus mrigala)*	・ Bottom feeder ・ Breeds during June to August ・ Can reach a weight of 2-3 kg in one year	
5	Silver carp *(Hypophthalmichthys molitrix)*	・ Surface feeder ・ Breeds during June to August ・ Can reach a weight of 2-3 kg in one year	
6	Grass carp *(Ctenopharyngodon idella)*	・ Feed on grass ・ Breeds during June to August ・ Can reach a weight of 2-3 kg in one year	

Source: DOF

(b) Fish Seed Production and Distribution

There are 11 government fish seed producing hatcheries in Mizoram; of which only four hatcheries are operated by DOF while the rest are leased to Mizoram Cooperative Fish Farming Marketing and Processing Federation Ltd (ZOFISFED), "Mizoram Fish Farmers Federation" established in 1998 by 22 primary fisheries cooperative societies. In addition, there are three private hatcheries in Mizoram that produce and supply to DOF as well as its own sales to fish farmers. The total number of fingerlings procured and distributed by DOF's four hatcheries was 64.5 million fingerlings in 2011-2012, including the government fish seed production of 1.0 million. While, no records are available for private and ZOFISFED farms.

(c) Fish Production

Fish farming (culture fisheries) is very dependent on the availability of fish fingerlings. Fish production corresponds to the increase in the number of fishponds and area. The fish production during the period

of 2005/2006 to 2012/2013 have been steadily increased from 3,750 t in 2005/06 to 5,450 t in 2012/13 except for a drop below 3,000 t for three years (2007/08 to 2009/10). While, the area of fish pond has been increased from 2,580 ha (7,192 in number) to 4,465 ha (10,838 in number) during the same period.

(2) Fisheries Support Facilities

(a) Fish Farms and Fingerling Production

There are 13 government-owned fish farms, and three privately-owned fish hatcheries in Mizoram with breeding, hatching, and rearing ponds. The government-owned fish farm facilities are located in seven districts except Champhai District. Of the 13 government-owned farms, three are demonstration farms, and the rest are fish seed producing farms being leased to ZOFISFED. However, only three are functional, the other five have been left non-functional since1995 due to rain damages.

(b) Ice Plant Cold Storage (IPCS), Fish Feed Mill (FFM), and Other Facilities

DOF has an IPCS facility in Aizawl with an installed capacity producing 130 blocks (50-kg/block) a day, and a 5-ton cold storage. Currently, it produces only 90 blocks a day and sells at subsidized price of INR 200/block (market price is INR 400/block). The peak demand for ice is from April to August. The cold storage is in fairly good condition, but it is not in operation now due to non-availability of fish for storage.

DOF has two ice plants without cold storage facilities, which are located in Kolasib District; each has a capacity to produce 100 blocks (15 kg/block) daily. The sale price is Rs.30/block (the market price is Rs.60/block). The shortage of water is the main problem according to the technician in charge.

DOF has a fish feed mill in Mamit district. The mill was established in 2013 under Rashtriya Krishi Vikas Yojana (RKVY) during 2012-2013 with the financial fund of GoI, and it has a capacity to produce fish feed at 200 kg/day (56 t/year), however none of them are being operated due to fund lacking. The DOF is constructing two similar fish feed mills in Aizawl District.

Four cold storage rooms and 12 refrigerated vans had been established in 2013 under the joint funding of GoI (75%) and a private proprietor (25%), and the latter was to operate and manage these facilities. The cold rooms are located in Aizawl and other three places, however these marketing facilities are not yet in operation.

4.7.3 Development Plan of Fish Farming (Aquaculture)

According to the policy of Mizoram State, the ultimate target of the inland fishery sector is to attain self-sufficiency in fishing in order to provide per capita consumption of 11 kg by 2015. Toward this target, the state government has to challenge various issues and constraints that the fisheries sector is currently facing.

(1) Ongoing Programmes of the DOF

The ongoing programmes of the DOF are summarised in Table 4.7.2.

Table 4.7.2 Ongoing Programmes of DOF

No	Project/Programme	Sponsored by National or State	Outline of Project/Programme
1	Fish Seed Production cum Farming	GoM	・ Maintenance of existing departmental fish seed farms ・ Cost of inputs, labour charges, etc., for production of fish seed
2	Freshwater Aquaculture	CSS and NFDB GoI: GoM 75:25	・ Construction of new pond ・ Renovation/reclamation of existing ponds ・ Cost of inputs: fish seed, fish feed, etc. ・ Integrated fish farming through the Mizoram Cooperative Fish Farming and Processing Federation Ltd. (ZOFISFED) ・ Installation of aerator
3	Development of Inland Capture Fisheries (Reservoir/ Rivers, etc.)	CSS GoI: GoM 75:25	・ State plan ・ Maintenance of existing infrastructure developed in the past ・ Through the Centrally Sponsored Scheme for Development of Inland Fisheries Statistics (CSS &NFDB)

No	Project/Programme	Sponsored by National or State	Outline of Project/Programme
			・ Cage culture ・ Cost of inputs for reservoir fisheries ・ Purchase of crafts and gears ・ Establishment of landing centre ・ Reservoir fisheries conservation and awareness programme
4	Development of Cold Water Fisheries and Ornamental Culture	GoI	・ Maintenance of the existing one ornamental hatchery unit ・ Capacity building of entrepreneurs
5	Development of Inland Fisheries Statistics	CSS (100%)	・ The scheme provides for maintenance of the ongoing Centrally Sponsored Scheme for Development of Inland Fisheries Statistics through information, networking, and survey. The scheme is functioning with 100% grant-in-aid from the central government towards salaries of staff.
6	Inland Fish Marketing	State	・ Maintenance of existing ice plant and cold storage and wages of labour
7	Information Extension and Training	CSS GoI: GoM 75:25 (Training 80:20)	・ Publication of magazines, booklets, display of advertisements, etc. ・ Farmers' tour to outside state and training of in-service personnel/ stipend and book grant for Bachelor of Fisheries Sciences (BFSc) candidate.
8	National Scheme for Welfare of Fisherman	CSS GoI: GoM 75:25	・ Construction of fishermen house ・ Construction of water point ・ Construction of community hall
9	National Mission for protein Supplement of Rashtrya Kishan Vikas Yojana (RKVY)	GoI (100%)	・ Supply of first year input to ponds and tanks ・ Establishment of feed mill ・ Establishment of fish seed infrastructure in the government and private sector including first year input ・ Construction of godown and marketing infrastructure ・ Construction of district godown ・ Construction of minor retail market ・ Capacity building of farmers ・ Training of farmers ・ Establishment of farmers' training centre including cost of teaching aids ・ Establishment of a museum

Source: DOF

(2) Proposed Development Activities under the 12th Five-Year Plan

DOF proposed to develop another 3,000 ha of new fishponds and tanks to have a total of 7,000 ha in the fish culture sector of the state, wherein it expects the production level at the end of the 12th Five-Year Plan to be around 14,000 t. The proposed plans are summarised in Table 4.7.3

Table 4.7.3 Proposed Activities of the 12th Five-Year Plan

Proposed Activities	Outline of Activities	Physical Target	Financial Target (Rs. lakhs)
1. Construction of additional new ponds for fish farming	Create another 3,000 ha of new aquaculture ponds in the private sector in a cluster approach in order to facilitate connectivity of marketing and input supply through NFDB, Fish Farmers Development Agency (FFDA), NLUP, NEC, ACA, and state plan scheme programmes.	3,000 ha	827
2. Renovation of existing fish farms		2,000 ha	375
3. Supply of one-time inputs covered under SL numbers 1 and 2	Supply one-time (first year only) inputs to newly constructed and renovated ponds in order to augment unit area productivity from the existing 1.25 t per ha to 2.0 t to 2.50 t per ha.	5,000 ha	625
4. Integrated farming including freshwater prawn polyculture in existing ponds and tanks covered under SL 2.	Popularise and adopt integrated farming by the farmers integrating livestock, crustacean, and horticultural plants, where the excreta of the livestock and leaves and seeds of the horticultural	2,000 ha	600

Proposed Activities	Outline of Activities	Physical Target	Financial Target (Rs. lakhs)
	plant can be utilised in order to compensate fertilizers/feed requirements of fish stock. Thereby production cost of the fish can be largely reduced offering higher financial return.		
5. Cultivation of *Pangasius sutchi* in existing ponds		500 ha	325
6. Installation of aerator for intensive farming	Install aerators to support proposed activities above SL numbers 2 and 3.	200 ha	160
7. Establishment of new freshwater fish seed hatcheries	Establish fish seed farm with hatchery to operate on Public Private Partnership (PPP) basis involving capable private individuals in order to attain self-sufficiency in fish seed production to achieve a production level of at least 65 million annually by the end of the 12th Five-Year Plan Period.	4 units	64
8. Establishment of new freshwater prawn hatchery and ornamental fish seed hatchery	Establish initially one prawn hatchery in the government sector to take up prawn farming in limited potential areas, which is considered highly return-oriented.	2 units	60
9. Development of rearing farms for raising fingerlings	Establish fry rearing farms to raise fingerlings that would encourage small-scale farmers to participate in seed production to cater local demand of fish seed.	70 ha	200
10. Development of reservoir fisheries	Develop reservoir fisheries in the hydro-electricity and irrigation reservoir by providing water rights to DOF for piscicultural activities.	7,000 ha	100
11. In-situ pen culture units for reservoir fisheries	Develop reservoir fisheries in the hydro-electricity and irrigation reservoir by giving water rights to DOF for fish culture activities.	28 units or 14 ha	50
12. Incentive to caretaker villages (VC/YMA) for conservation of riverine/reservoir fisheries		200 units	100
Total			3,486

Note; YMA; Young Mizo Association
Source: 12th Five-Year Plan and Department of Fisheries

4.7.4 Implementation and Progress of NLUP

The NLUP programme in the fishery sector aimed to create and develop 1,500 ha or 3,000 fish farmers of new ponds and tanks for additional production of fish in a period of five years from 2009/10. It will also develop an efficient marketing network for smooth distribution and marketing of fresh fish and other products produced under the programme by way of establishing a mini-ice plant and creating a fish transporter in the private sector. The total expenditure was estimated at about INR 317 million, consisting of INR 300 million for developing fish ponds of 1,500 ha and INR 17 million for providing related infrastructure. The progress so far achieved are respectively: about 1,830 ha of fish ponds with an amount of INR 365.4 million more than initial target; whereas about 20% progress in infrastructural development in amount of expenditure.

4.7.5 Problems and Constraints for Development

(1) Development Issues/Constraints

The study team identified several problems and constraints the fisheries sector is facing, particularly in the fish farming or aquaculture. The problems and constraints are categorised into three issues as described below.

(a) Institutional and Human Resources Issues

- Lack of accurate and timely data/information on aquaculture activities due to poor system of regular data collection in field, insufficiently trained field staff and limited operation budget;
- Weak extension and support services by the DOF to fish farmers due to lack of skilled and trained staff;
- Limited or no-skills in fish farmers who are originally agro-farmers without knowledge and/or technical skills in fish farming practices;
- No record of fish traders and fingerlings suppliers because of lack of licensing system to provide permits; and
- Weak and poor enforcement of laws and regulations on fisheries.

(b) Fish Seed and Fingerling Production

- Severe shortage of fish fry and fingerlings due to only three fish seed farms (FSFs) in operation out of DOF's 11 FSFs with lower productivity than its capacity;
- Poor quality of brood stock for breeding due to poor supply of new brood stocks, low quality of brood stock and lack of funds; and
- law quality and high mortality of fingerlings imported from neighbouring states due to longer transportation from those sources.

(c) Fisheries Support Facilities

- Under-utilisation of the existing fish farms due to poor government's fund for operation and maintenance;
- Under-utilisation and poor maintenance of ice plant and cold storage due to lower subsidised sales price of ice blocks insufficient for covering operation and maintenance costs; and
- Irregularly operated, idling or deteriorated fish feed mills due to operational budget insufficient for timely procurement of raw materials and essentials for operation

4.8 Livestock

4.8.1 Policy, Organization and Plan

(1) National Level

India’s livestock sector is one of the largest in the world. It has 56.7% of the world’s buffaloes, 12.5% of cattle, 20.4% of small ruminants, 2.4% of camels, 1.4% of equines, 1.5% of pigs, and 3.1% of poultry. The total output worth was higher than the value of food grains. Despite significant increase in livestock production, the per capita consumption of milk (69 kg) and meat (37 kg) in 2007 have been much lower against corresponding world averages of 85 kg and 40 kg, respectively. Nevertheless, activities in the livestock sector in India play an important role in the national economy and for socio-economic development of the country. In addition, generally livestock and its production system are mostly part of a mixed crop-livestock farming system that is vital for the security and survival of large numbers of poor farmers / people, particularly among marginal and landless farmers.

The divisions of the Department of Animal Husbandry and Dairying under MOA advise the state governments in the formulation of policies and programmes for animal husbandry and dairy development focussing on (i) development of requisite infrastructure in states for improving animal productivity, (ii) promoting infrastructure for handling, processing, and marketing of milk and milk products, (iii) preservation and protection of livestock through provision of health care, and (iv) strengthening of central livestock farms for development of superior germplasm for distribution to states.

(2) State Level

States in the North Eastern Region are ethnically and culturally akin to Southeast Asia, and for the majority of the tribal population, livestock keeping especially pig keeping is integral to their way of life. Most of Mizoram people are non-vegetarian, and consumption especially of meats and eggs is relatively high, except for milk. There is a growing demand especially for pork due to the increasing per capita income, urbanisation, changes in lifestyle and food habits. Also, much of this demand is met by imports from the other states of India and from Myanmar. However, the present growth rates of egg and meat production are very slow at 1.99% and 9.19%, respectively, and the state has limited potential to achieve considerable growth of the livestock sector over the next 10 to 20 years as they have to depend mostly on the other states for quality animals, some feed ingredients, semen, vaccines, and also the high cost of transportation of goods.

The contribution of the livestock sector to the agricultural gross state domestic product (GSDP) was around 9% only during the 12th Five-Year Plan period. Therefore, further improvement of reality-based strategic planning system, and effective and efficient implementation/management and monitoring systems are indispensable for significant advancement of the livestock sector. Policy of the state livestock and strategic plan / action / indicators for the 12th Five-Year Plan are to (i) achieve 50% of self-sufficiency in production of milk, meats, eggs, and fodder by 2014-2015, and (ii) increase self-employment by 20% and entrepreneurship by gainfully employed rural youth by 2014-2015.

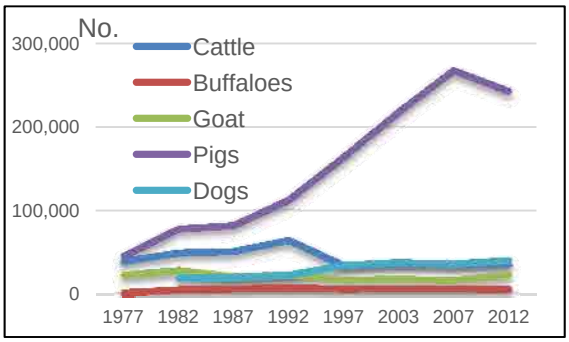
The Department of Animal Husbandry and Veterinary (DAH&V) has eight district offices, and two sub-divisional offices at Chawngte and Tlabung. DAH&V is responsible for (i) animal husbandry and veterinary services, and (ii) dairy development and upgrading of existing infrastructures for maintaining livestock health, and prevention and control of animal and poultry diseases. There are 273 main staffs in the department, and they are engaged in 12 major works and operating a veterinary college in Aizawl.

The state is going to continue to develop infrastructure and create conditions to increase production of animal products. In order to enhance and promote meat production and to generate livelihood for the farmers and unemployed youth in the state, it is necessary to adopt new approaches in livestock and poultry farming, for which DAH&V envisaged on formulating schemes and programmes for the 12th Five-Year Plan, which has a proposed budget of Rs.8,659 lakh.

4.8.2 Current Situation of Livestock Raising

(1) Kinds and Number of Livestock in Mizoram

The population of poultry in Mizoram is the largest, followed by the population of pigs. The population of other livestock, such as cattle, buffaloes, and goat, is minimal in Mizoram. The livestock population during the past 35 years does not show a significant upward trend, except for pigs, as shown in Figure 4.8.1. The livestock population in 2012 is shown in Table 4.8.1 The population of pigs other than poultry is high in every district. Neary 30% of the livestock population is concentrated in Aizawl District, and then in Champhai District. Almost half of the population of buffaloes, mithun and horses are in Champhai District, and almost half of the duck population is in Kolasib District.



Source: DOA&V, Government of Mizoram

Figure 4.8.1 Population of Livestock of Mizoram 1997-2012

Table 4.8.1 Livestock Population 2012

Species	Population (no.)	Share
Pigs	242,500	69.5%
Dog	39,700	11.4%
Cattle	34,800	10.0%
Goats	22,100	6.3%
Buffaloes	5,000	1.4%
Mithun	3,300	0.9%
Others	1,300	0.4%
Total of Dom. Animal	**348,700**	100%
Poultry	1,253,000	99.4%
Others	7,000	0.6%
Total of Fowl	**1,260,000**	100%

Note: Mithun is a kind of cow prevailing in the North Eastern Region of India
Source: Department of Animal Husbandry & Veterinary, Mizoram 2014, Quinquennial Livestock

The Land and Livestock Holdings Survey in 2003 suggested that there is a trend of ownership pattern of livestock across operational holding sizes, as shown Table 4.8.2. It shows that cattle is mostly owned by medium farmers, while poultry and pigs are important sources of livelihood for the landless and marginal, and small and semi-medium farmers. Half of the large farmers also own poultry and pigs.

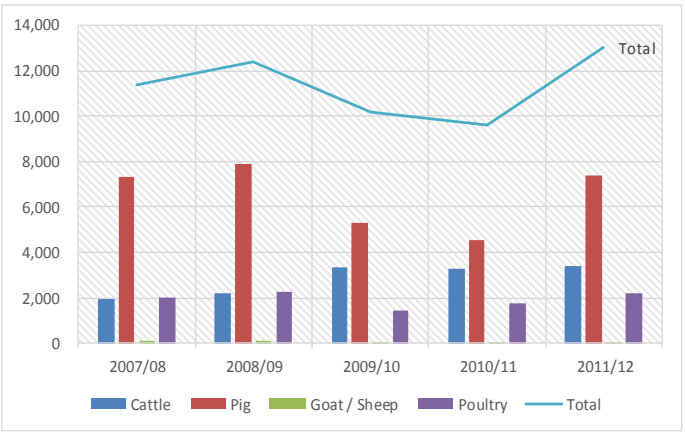
Table 4.8.2 Ownership of Key Livestock and Size of Operational Holdings

Size of Operational Holding	% of Households Reporting Ownership of			
	Cattle	Sheep and Goats	Poultry and Duck	Pigs and Rabbits
0 > 0.5 ha: Landless and Marginal	3.3	0.3	67.1	55.5
0.5 > 2.0 ha: Small	3.0	3.2	66.5	47.1
2.0 > 5.0 ha: Semi-medium	6.2	19.3	59.6	53.6
5.0 > 10.0 ha: Medium	50.0	0.0	50.0	0.0
10.0 > 20.0 ha: Large	0.0	0.0	50.0	50.0
All Size	**3.0**	**4.7**	**53.4**	**45.2**

Source: Land and Livestock Holdings Survey, National Sample Survey Organization, 2003

(2) Livestock Production

The total production of meat from cattle, sheep/goats and pigs in 2011-2012 was estimated at 10,821 t, of which pork and beef accounts 7,393 t and 3,364 t, respectively. Meat production from poultry (chicken and broiler) in 2011-2012 was estimated at 2,201 t. Out of the total meat production including poultry, pork accounted for the highest quantity with 56.8%, followed by beef with 25.8% and poultry meat with 16.9%. The progress of meat production in the past half-decade in the state is shown in Figure 4.8.2. Meat production has decreased in 2009/10 and 2010/11 for

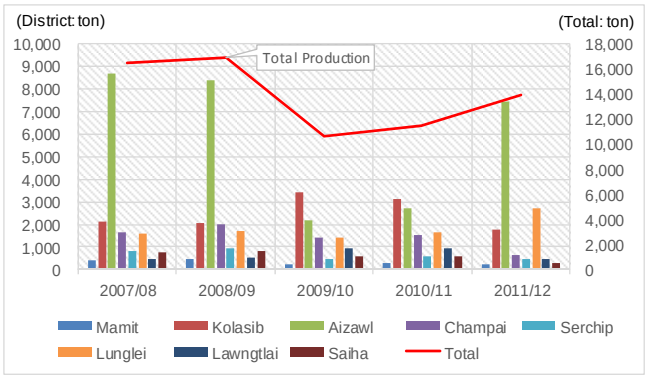


Source: Department of Animal Husbandry & Veterinary, Mizoram

Figure 4.8.2 Progress of Meat Production in Five years

reasons such as outbreaks of classical swine fever. It again increased by 26% over the previous year. The amount of meat production in Aizawl District from pigs, cattle, and poultry is the highest, and then followed by Lunglei District.

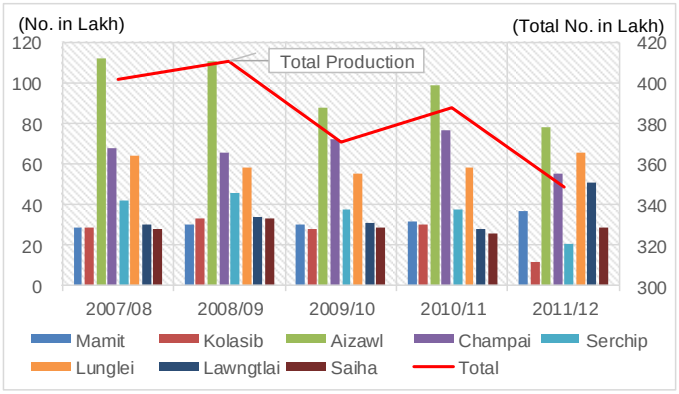
The total milk production in 2011-12 was 13,950 t; the production amount increased by 24% and 18% as compared with those in 2009-10 and 2010-11, respectively, as shown in Figure 4.8.3. The growth of milk production has not been well-sustained during these five-year period, as possibly caused mainly by the lack of well-planned improvement of milk cattle quality and extension system in Mizoram. In addition, the per capita availability of milk per day in Mizoram was estimated at 35.23 g, against the Indian Council of Medical Research recommendation of 240 g of milk per day per individual. The main production area of milk is in Aizawl District, followed by Kolasib District and Lunglei District. However, the milk production growth trend is unstable.



Source: DOA&V, Government of Mizoram

Figure 4.8.3 Progress of Milk Production in Five Years

The total egg production in 2011-12 was 349 lakhs. The total egg production is estimated to have decreased by 11.1% over the previous year, and decreased by 17.8% as compared with that in 2008-09. The main production area of eggs is in Aizawl District, followed by Champhai and Lunglei districts. The egg production growth trend is also unstable.



Source: DOA&V, Government of Mizoram

Figure 4.8.4 Progress of Egg Production in Five Years

(3) Veterinary Supporting System

The department has veterinary infrastructure for animal health, i.e., five veterinary hospitals, 35 veterinary dispensaries, and 103 rural animal health posts that provide treatment to animals. The state has nine disease diagnostic laboratories for diagnosing various diseases of livestock. Free of charge, the department also vaccinates animals against the foot-and-mouth disease, haemorrhagic septicaemia, black quarter, fowl pox, Ranikhet (Newcastle) disease, rabies, and swine fever. All vaccines are procured from West Bengal or Assam as there are no veterinary biological research institutes in Mizoram.

The department does not have any separate department for livestock extensions. However, a senior veterinary officer attached to the Veterinary Information, Extension, Research and Training Division and other veterinarians attached to other sections are together trying to educate farmers on breeding and nutrition aspects. They are also organising fodder demonstrations, cattle health camps, and clean milk production demonstrations, with relevant printed materials. The budget allocation for extension activities and capacity building is about 0.5% of the total budget of the department. With regard to capacity building of the department officers, training is organised in training institutes of other states. According to the department, availability of technical manpower for animal husbandry to carry out the development work as well as treatment of animals are adequate. On the other hand, the JICA Study Team, through field investigation, received rather negative responses from farmers on the performance of the department. The present deployment of animal health care services is outlined in Table 4.8.3.

Table 4.8.3 Deployment of Institution and Veterinary Personnel (2011-2012)

No.	District	Hospital	Dispensary	Rural Animal Health Centre	No. of AI Centre	No. of Vet. Doctor	No. of *VFA/SVFA/JM, etc.
1.	Mamit	0	3	12	0	3	12
2.	Kolasib	1	4	6	8	12	16
3.	Aizawl	1	6	30	16	51	64
4.	Champhai	1	7	13	10	12	21
5.	Serchhip	0	4	7	6	9	25
6.	Lunglei	1	6	26	13	15	41
7.	Lawngtlai	0	2	2	3	3	5
8.	Saiha	1	3	7	2	9	7
Total		**5**	**35**	**103**	**58**	**114**	**191**

Note: VFA: Veterinary Field Assistant, SVFA: Senior Veterinary Field Assistant, JM: Junior Manager*
Source: Department of Animal Husbandry & Veterinary, GoM, 2013

With the aim of timely reporting of disease outbreaks for their effective monitoring, surveillance and ultimate eradication, a CSS called "National Animal Disease Reporting System" has been taken up for implementation. The scheme envisages linking of blocks with districts, districts with division, and state with the Central Monitoring Unit for prompt reporting and feedback. Presently, 36 nodes are available in the state, consisting of two state nodes, eight district nodes and 26 block nodes.

4.8.3 Promotion Plan of Livestock Raising

The department is operating various CSS as outlined below.

(1) Cattle and Buffalo Development

The Government of Mizoram does not have any specific breeding policy or specific approach for cattle and buffaloes. However, the Jersey/Holstein Friesian (HF) breed is mostly used for crossbreeding of non-descript cows and indigenous descript breeds for upgrading of local cows, and the Murrah[3] breed for upgrading of local buffaloes. The state has 32 artificial insemination (AI) centres to provide AI services for cattle and buffaloes. It works for one AI unit for every 695 breedable animals as against the norm of one unit for 1,000 breedable animals. The semen is being procured from Hesarghatta, Bangalore. In addition, there are 20 private AI workers providing the breeding services for cattle.

(2) Piggery Development

About 82% of the total pig population are crossbreeds (as of 2012) and the demand for pork is very high in the state. The state breeding farms provide piglets for rearing and breeding purposes, as well as provide training, technical assistance, etc. to farmers. AI in pigs has been initiated in Aizawl District at the department farm in Selesih since 2003, and it will be expanded during the 12th Five-Year Plan.

(3) Poultry Development

Backyard poultry with local birds is very common in rural areas. The ten existing state poultry farms are maintaining breeds such as Vanaraja and Grampriya, and are supplying 4-6 week old pullets to farmers for backyard poultry. In order to increase the production of eggs and meat, the poultry farms and hatcheries that produce chicks and supply chicks to farmers at reasonably lower costs shall be maintained, and the existing departmental poultry farms shall be designated as commercial/production farms, through insertion of financial input for the upgrading of facilities aimed at sustainable development.

(4) Dairy Sector

The Mizoram Multi Commodity Producers Cooperative Union (MULCO) is involved in the procurement and marketing of milk and products. There are 76 dairy cooperative societies, of which

[3] Murrah: a breed of domestic water buffalo kept for dairy production. It is originally from Punjab and Haryana states of India

72 are functional with a total membership of 1,520. MULCO has a dairy plant in Aizwal that has a capacity to handle 15,000 L per day (LPD) and is operating at around 50% capacity. In addition to this, there are three more dairy plants of 15,000 LPD capacity and 11 chilling centres of 500 LPD capacity. Milk prices are not controlled by the state government. Presently, the cost of dairy is Rs.22-24 per L of milk with 4% fat.

(5) Institutional Arrangement

Apart from DAH&V, MULCO and the Pig Producers Cooperative Federation, there are other institutions working for livestock development in Mizoram. These institutions have proper convergence and coordination among their activities and roles. Aside from these organisations, veterinary colleges, KVKs, and private sector organisations are also involved in promoting the livestock sector in the state.

(6) Feed and Fodder Development

Mizoram lacks concentrated feeds for daily cattle, poultry, and pigs, and the major source of feeds is from outside at high costs. The department envisages rendering assistance to farmers by providing them feeds price support and transport subsidies. In addition to this, the establishment of grazing grounds will be promoted in villages throughout Mizoram during the 12th Five-Year Plan.

(7) Biogas Development

The main activity is installation of biogas plants for farmers to maximise the utility of their livestock by-products in order to obtain lighting and cooking fuel, organic manure, and also permanent sanitary fitting in rural areas. It will be continued during the 12th Five-Year Plan. The results of distribution of biogas plants totalled to 462 by 2012.

4.8.4 Implementation and Progress of the NLUP

(1) Components of the NLUP

Table 4.8.4 shows the project packages / trades adopted for the livestock subsector. Farmers could choose the most suitable option from the six options in relation to market opportunities, etc. Assistance was given in kind or in cash by the department. Each project includes construction cost of stall, poultry house, other necessary facilities/tools, and feeds to assure that the first income of farmers lead to sustainable income generation.

Table 4.8.4 Estimated Project Unit Cost and Estimated Income of Livestock Development for Farmers

No.	Project Package / Trade	Project Size	Beneficiary's Contribution	Unit Project Cost (Rs.)	Gross Income for the 1st Year (Rs.)	Expenditure for the 1st Year (Rs./year)	Estimated Income (Rs./year)
1	Dairy Cow Farming	2 Crossbred Cows	20%	138,600	140,000	28,100	111,900
2	Pig rearing	2 Sows and 5 Fatteners	20%	99,897	117,000	30,880	86,120
3	Mithun / Hill Cattle Rearing	9 Female and 1 Male	20%	99,750	192,000	73,000	119,000
4	Poultry Farming (Layer)	150 Layer	20%	99,839	135,000	49,635	85,365
5	Poultry Farming (Broiler)	200 Broiler	20%	97,440	86,400	35,200	51,200
6	Goat / Sheep Rearing	48 Female and 2 Male	20%	99,750	60,000	3,000	57,000

Source: NLUP Achievement, DOA&V, Government of Mizoram

(2) Progress and Constraints

The following project packages for dairy, piggery, mithun, and poultry (layer and broiler) have been implemented by the department from 2010-11 to 2013-14. More than 50% of the beneficiaries chose piggery farming, while 5% only chose daily cow farming. The department encountered several problems during the implementation of the NLUP, such as: (i) although the piglet multiplication centre

was established to produce more piglets, many piglets and breeding sows died due to outbreak of porcine reproductive and respiratory syndrome (PRRS); (ii) distribution of dairy cows to the beneficiaries was delayed; (iii) despite insurance for dairy cows was covered, no insurance company was willing to take up insurance for pigs; (iv) there is no surplus of animal feeds in Mizoram and farmers cannot afford to buy high concentrated animal feeds without any subsidy; (v) adequate training programmes could not be implemented due to shortage of funds; and (vi) fund release to beneficiaries was delayed in non-banking areas due to insufficient cash at the bank.

4.8.5 Problems and Constraints to Development

(1) Profitable Livestock Management

One of the major constraints in livestock production is the lack of orientation and education, and awareness among farmers about the potential of livestock as an income generating activity, along with a strategic livestock development plan shared with farmers. In addition, there is an overall shortage of nutritional feeds. As a result, more than 90% of feed ingredients are imported from outside the state. Highly priced feeds and fodder arising from the shortage is another major constraint for income generation of livestock activities. Consequently, farmers have no interest or intention to continue or develop livestock farming beyond self-consumption level without certain management knowledge and techniques.

(2) Dairy Development

Besides a sizeable milk production from the private sector, the state government has implemented four dairy development projects which were initiated under the central scheme of the Intensive Dairy Development Project (IDDP). Dairy plants in Aizawl and Champhai have been handed over to the union at the district level, while the other two projects in Lunglei and Kolasib are being maintained by the state government. About 8,750–11,250 L/day of milk is being marketed through these schemes against the plant's capacity of 30,000 L/day. In spite of the estimated availability of 11,427 t of milk, there was still a demand gap of 86,339 t of milk in 2010-11, as per the requirement recommended by ICAR.

4.9 Sericulture

4.9.1 Policy and Organization

(1) Policy

India is a unique country producing all four known types of silk, namely: domesticated Mulberry silk, semi-domesticated Eri silk, wild Tasar silk, and exclusive Muga silk, which is the wild golden silk unique to India. Sericulture is a labour intensive industry in all its phases with employment generation of about 7.65 million persons per annum in India, resulting in contributing to poverty alleviation.

The policies of sericulture development both at the national and state levels are to: create greater opportunities of employment and improved levels of income through sericulture in the state; make continuous efforts in research and development and technology transfer; improve productivity in all stages of silk production; and improve all the process of sericulture from mulberry cultivation to production of high quality of raw silk.

(2) Organisation

The Central Silk Board (CSB), of which the headquarters is in Bangalore, is a statutory body under the Ministry of Textiles, Government of India. The CSB is the apex body for overall development of sericulture and silk industry in India. The functions assigned to the board are to promote development of the silk industry by all appropriate measures like undertaking, assisting, and encouraging scientific, technological, and economic research, improvement of mulberry cultivation, production and distribution of healthy silkworm seed, production of quality raw silk, and promotion of silk market.

The Department of Sericulture (DOS) of Mizoram was established in 1985. The DOS is functioning with 264 personnel.

4.9.2 Current Situation of Sericulture

There are 3,880 farmers involved in sericulture in Mizoram, of which 90% are engaged in Mulberry sector, followed by Eri at 4%, Oak Tasar at 4%, and Muga at 2% in 2012-13 (Table 4.9.1). The number of farmers is high in Aizawl District (46%), followed by Lunglei, Kolasib, Champhai, and Mamit. Quite few numbers are shown in Lawngtlai and Saiha districts. Oak Tasar sector is concentrated only in Champhai District.

The statistics related to productive area under silkworm food plant, consumption of disease free layings (Dfls), production of reeling cocoons, production of raw silk, cocoon productivity, and raw silk productivity in Mizoram are shown in Table 4.9.1. Productivity of Mulberry cocoon per Dfls is 43.8 kg in Mizoram. It is low compared with the national average productivity of 60.0 kg in 2007. Productivity of Mulberry raw silk per area of silkworm food plant is also very low, average productivity of national and Mizoram are 90.9 kg/ha (2011-12) and 15.9 kg/ha, respectively.

Table 4.9.1 Area of Silkworm Food Plant, Consumption of Dfls, Production of Reeling Cocoon, Production of Raw Silk, and Productivities of Cocoon and Raw Silk in Mizoram, 2012-13

Sector	Area of Food Plant (ha): (A)	Dfls (nos.)	Cocoon Production	Raw Silk Production (kg): (B)	Cocoon Productivity (kg/100 Dfls)	Raw Silk Productivity (kg/ ha) : (B/A)
Mulberry	1,864	685,000	300,000 kg	29,670	43.8	15.9
				National Average	**60.0**	**90.9**
Eri	280	67,200	7,100 kg	5,400	25.4	19.3
Muga	186	116,000	1,392,000 nos	323		1.7
Oak Tasar	80	30,000	118,000 nos	19		0.2

Source: Sericulture Profile of Mizoram and Status for 2012-13, Department of Sericulture, Government of Mizoram

Producers bring their cocoons to each district office of DOS and collected cocoons are transported to the reeling centre operated by the DOS. There is no private reeling factory in the state of Mizoram. Raw silks are sold to private weavers in and out of the state. Table 4.9.2 shows the prevailing market prices of reeling cocoon and raw silk.

Table 4.9.2 Market Prices of Reeling Cocoon and Raw Silk

Mulberry Raw Silk (Price in: Rs./kg)		
Year	**Reeling Cocoon (Bivoltine/Crossbreed)**	**Raw silk**
2011-12	100-180	700-1500
2012-13	120-200	700-1500
Oak Tasar (Price in: Rs./1000 nos. and kg)		
Year	**Reeling Cocoon (1000 nos.)**	**Raw silk**
2011-12	400	1500-3000
2012-13	450	1500-3000
Muga (Price in: Rs./1000 nos. and kg)		
Year	**Reeling Cocoon (1000 nos.)**	**Raw silk**
2011-2012	400	1500-3000
2012-2013	954	2000-4000
Eri (Price in: Rs./1000 nos. and kg)		
Year	**Reeling Cocoon (1000 nos.)**	**Raw silk**
2011-2012	200	500-700
2012-2013	250	500-700

Source: Sericulture Profile of Mizoram and Status for 2011-12 and 2012-13, Department of Sericulture, Government of Mizoram

4.9.3 Plan for Sericulture Development

(1) 12th Five-Year Plan

During the 12th Plan period (2012-2017), the increase in production of bivoltine Mulberry silk is given importance by the DOS. For this, the maximum quantity of high yielding Mulberry variety, Som/ Soalu and Castor/ Kesseru will be introduced in the private sectors. In the meantime, seed grainages, rearing and post cocoon technologies shall be upgraded as far as practicable. The DOS proposed a total outlay of INR 7,149 lakhs for the 12th five year plan.

(2) National Project / Programme

The following national projects and programmes are being implemented to develop sericulture in the state of Mizoram.

Table 4.9.3 Ongoing National Project/ Programme for Sericulture Development

Title	Sponsored by	Period	Outline of Project / Programme
Catalytic Development Programme	CSS/ Central Silk Board	2007-2012 2012-2017	・ Programme for the development of Eri, Muga, Oak Tasar, and Mulberry silk in Mizoram under CDP ・ Components: i) Assistance to seed rearers, ii) Raising of plantation, iii) Construction of rearing infrastructures, iv) Supply of rearing appliances/ farm equipment, v) Support for silk reeling and spinning, vi) Providing of support services (publicity for the sector)
Rashtriya Krishi Vikas Yojana (RKVY)	CSS	2012-2013 2013-2014	・ Projects for the development of Muga, Mulberry, and Eri silk in Mizoram under RKVY programme ・ Components: i) Land development, ii) Raising of plantation, iii) Construction of rearing infrastructures, iv) Post cocoons development

Source: Department of Sericulture, Government of Mizoram

4.9.4 Implementation and Progress of NLUP

The total target for sericulture on NLUP implementation was 8,500 beneficiaries in five years. Of these, only 826 beneficiaries had been covered during the 1st phase and 1,096 beneficiaries had been covered during the 2nd phase. An amount of about INR 1,460 lakhs has been disbursed so far.

4.9.5 Problems and Constraints for Development

(1) Problems Being Faced by the State

- Prevalence of low yielding varieties of Mulberry.
- Lack of irrigation facilities and shortage of fertilizers.
- Inadequate supply of quality silkworm seed for Mulberry, Muga and Eri.
- Inadequate support for conversion of cocoons into quality yarn adopting improved devices.
- Lack of adequate transport facilities and power.
- Lack of organised marketing system for silk commodities.
- Need for training for human resource development both in non-farm and on-farm sectors.

(2) Issues to be Sorted out Between CSB and State

- Settlement of Dfls Cost Balance (DCB) arrears.
- Implementation of Silkworm Seed Regulation Act 2010.
- Constitution of silkworm seed production monitoring body in collaboration with the northeastern states.

(3) Research and Development Issues

- Exploration and conservation of wild Muga, Eri, Mulberry and Oak Tasar fauna and flora and evolving new breeds.
- Evolving package of practices for control of diseases.
- Devising a technology for increasing silk recovery, improvement of yarn quality, and opening of Eri cocoon for extraction of pupa.

(4) Seed Production and Supply

- Timely submission of season-wise indent for Mulberry, Muga, Eri and Oak Tasar silkworm seed.
- Involvement of public participation in basic and commercial Dfls production. Interlinking of infrastructure resources of the state for seed multiplication and production.**Forest**

Conservation and Forest Products

4.10.1 Policy and Institution

(1) Policy

In the national level, the Ministry of Environment and Forests, Government of India, is the nodal agency responsible for conserving forests in India. Its forest conservation policy is based on the Indian Forest Act, 1927 and the National Forest Policy, 1988. In the Mizoram State, the Environment and Forest Department (EFD) is the responsible body for conserving the forest in the state and overseeing forest products. The policy of EFD is to achieve well-stocked high-quality forests with rich biodiversity for maintaining ecological balance and ensuring environmental stability while meeting the forest-based needs of the local people. The state's laws and regulations governing environment protection and forest conservation are as follows:

i) The Mizoram Forest Act, 1955;
ii) The Mizoram Forest Produce Mahal Rules, 2002;
iii) The Mizoram Establishment and Regulation of Saw Mills and Other Wood Based Industries Rule, 2010;
iv) The Mizoram State Biological Diversity Rules, 2010; and
v) Guidelines for Felling of Trees from Non-forest Areas, 2002

With the above policies, laws and regulations, EFD undertakes measures to increase the area under forest cover and enhance the quality of existing forests through [1] application of the principles of sustainable management, [2] adoption of effective silviculture practices, and [3] involvement of the local people in planning, implementation, and monitoring of schemes for conservation of the forests and wildlife. In particular, joint forest management (JFM) is the main thrust in forest conservation undertaking, involving people's participation. The introduction of JFM established a new, mutually beneficial relationship among the forests, the people, and the state, resulting in encouraging active involvement of the local people in enrichment, protection, and sustainable management of the forests.

(2) Organisation of EFD and Staff

EFD has three organisational cells each headed by the Chief Conservator of Forests, Planning and Development, and Administration and Wildlife, respectively. The organisations in the field level under the Chief Conservator of Forests are divided into four circles which look after the northern, southern, and central region, and research & development section. EFD has 885 service personnel in total from the department's headquarter and regional offices.

4.10.2 Overview of Forest Conservation and Land Use Potential

(1) Historical Forest Status

The forest in Mizoram is classified into four groups. The prevailing forest groups are "Tropical Semi Evergreen Forest" with an area coverage of 71.94%, followed by "Tropical Moist Deciduous Forest" (27.4% coverage), "Sub-tropical Pine Forest" (0.62% coverage), and "Sub-tropical Broadleaved Hill Forest" (0.04% coverage).

The "Forest Survey of India" (FSI) conducts national forest survey regularly, and publishes a report titled "India State of Forest Report" since 1987. The historical forest statuses in Mizoram in 2001, 2005, and 2011 according to the FSI reports are indicated in Table 4.10.1.

Table 4.10.1 Historical Transition of Forest in Mizoram

Description	Year 2001	Year 2005	Year 2011
Recorded forest area (km^2) (% to state land)	15,935 (75.6%)	16,717 (79.3%)	16,717 (79.3%)
- Reserved forest (km^2)	7,127	7,909	7,909
- Protected forest (km^2)	3,568	3,568	3,568
- Unclassed forest (km^2)	5,240	5,240	5,240
Forest cover (km^2) (% to state land)	17,484 (82.9%)	18,684 (88.6%)	19,117 (90.7%)
- Very dense forest (km^2)		133	134
- Moderately dense forest (km^2)	8,936	6,173	6,086
- Open forest (km^2)	8,558	12,378	12,897

Source: India State of Forest Reports 2001, 2005 and 2011

The area covered by the forest has increased since 2005 by about 430 km^2 or 2% of state land; however, the above data reveals the virtual decrease of moderately dense forest by 87 km^2 and increase of open forest by 519 km^2. The FSI explained in its report that the changes are attributable to two reasons, namely, interpretational changes of satellite images pertaining to the seasons that coincided with the peak shifting cultivation activities, and the other changes in customary cultivation practices that old shifting cultivation patches have been converted to horticulture crops like banana plantation and pineapple orchards thus preventing growth of secondary forests.

(2) Bamboo

It may not be exaggerated to call Mizoram a bamboo state. The total bamboo bearing area in Mizoram is assessed to be 9,245 km^2 , occupying 6.6% of the entire country's bamboo area of 139,577 km^2, and corresponding to 43.8% of state land (21,081 km^2). The number of bamboo culms in Mizoram is estimated at about 22 billion. No accurate data on district-wise bamboo area is available at present; the EFD's internal information indicates that the bamboo vegetation is prevailing in the three northern districts of the state of Aizawl, Mamit, and Kolasib. Bamboo is prevailing at an altitude ranging from 400 m to 1,500 m above mean sea level. Bamboo forests are found mainly along the river banks and abandoned jhumland (shifting cultivation) as a dominant secondary vegetation. There are 20 species of bamboos in Mizoram of which *Melocanna baccifera* is the dominant forest resource of the state. They are widely used for construction of man-made houses, furniture, fencing, weaving, and pulping. The shoots are widely eaten during the rainy season as a dominant food item.

Bamboos are easy to grow and useful for people's livelihood; however, they have some characteristics that render them less attractive to prospective growers, harvesters, and users. Some bamboo species are known to have a life cycle of a fixed length after which they flower and die and a new generation emerges from the seedlings. In Mizoram, prevailing species, i.e., *Melocanna baccifera* and *Bambusa tulda*, both have lifecycles of 48 years. The fruits of bamboo are edible and the sudden enormous increase causes a rapid explosion of the rat population. The rats not only devastate the naturally regenerating seeds and seedlings and thereby reduce the generation rate, but also destroy other crops and stored grains. This natural phenomenon results in serious famines, such as those that took place in 1915, 1863, 1911, 1959, and 2007 in Mizoram, known as the ‘Mautam’ famine. Paddy production in 2006/07 and 2007/8 decreased sharply down to 40% and 15%, respectively.

4.10.3 Timber and Non-timber Products

The forests in Mizoram are being managed with a vision to "achieve well-stocked high-quality forests with rich bio-diversity for maintaining ecological balance and ensuring stability while meeting the forest-based needs of the local people". Growing stock of timber is limited in the forest; therefore, there is very little scope for commercial felling of trees in Mizoram. The non-timber forest products (NTFPs) are also out of systematic commercial activities except bamboos and broomsticks which are specifically local products in Mizoram crafted for sweeping brooms. Several types of mushrooms are seen in the open markets in Mizoram; however, these productions are quite within small dwellers in and around the forests. The EFD appeals the promotion of medicinal plants to be grown in the forest; however, it seems to be still on a conceptual stage for future development.

4.10.4 Community Forest Management

(1) Traditional Community-based Forest Management

The forest management in Mizoram has been traditionally administered by the village chieftain, having absolute decision-making authority, who is the supreme head of the village council. This authority is implemented for Jhumming (shifting cultivation) regulation within the territory of the village forest. This traditional administration was legislated in 1954 as "the Lushai Hills (Mizo) District (Jhumming) Regulation", and the rules of distribution of Jhum land was amended in 1985.

(2) Joint Forest Management (JFM)

In 1998, the Government of Mizoram introduced the JFM scheme to make local people participate actively in forest conservation. This was based on the government's serious concern about the continued degradation of the forest area in the state due to excessive biotic pressure like illicit felling of trees, jhumming, and fire encroachment in the government forests. JFM is constituted by two parties; one is the state government represented by EFD and the other one is the village forest development committee (VFDC). Upon the guidance of EFD through its range officer, the VFDC is formed with the agreement of a minimum of 50% of households in the village, and registered in the division forest office concerned. A managing committee has to be formed in the VFDC, and composed of the village council president (VCP), representatives elected by VFDC members, representatives of school/college teachers, representatives of NGOs, and the officer-in-charge of EFD.

The duty of VFDC is to ensure protection of the forests against grazing fire, illicit felling of trees, theft of forest products, and encroachment of forestlands, while VFDC is given various fringe benefits as the forest beneficiaries. Members of VFDC are entitled to grasses, leaves, fruits, fallen twigs, lops and tops, prunings and fuelwood free of cost from the designated JFM areas of forests. In addition, the surplus out of silvicultural thinnings and fellings are disposed of VFDC's members (beneficiaries), and the benefit arising from the sale of forest produce is shared among the government, beneficiaries, and VFDC in the ratios of 50% to the government, 30% to beneficiaries, and 20% to a special fund to be called "Village Forest Development Fund" operated by VFDC. At present, there are 615 VFDCs formed in Mizoram.

4.10.5 Ongoing Forest and Wildlife Conservation Programmes

EFD is undertaking various forest and wildlife conservation programmes. These programmes except NLUP are outlined below.

(1) National Afforestation Programme (NAP) Scheme

NAP scheme is a 100% centrally sponsored scheme (CSS) for afforestation initiated in the 10th Five-Year Plan (2000-2005). The overall objective of the scheme is to develop the forest resources with people's participation, with focus on the improvement in livelihood of the forest-fringe communities, especially the poor. The components of NAP scheme are afforestation, soil and moisture conservation, and entry point activity for village development. The Mizoram State was selected as a target state of the NAP scheme together with six other northeast states since 2000. For the last 12-year period from 2002 to 2013, an area of 56,660 ha has been afforestated in Mizoram. The NAP scheme is continuing in the 12th Five-Year Plan (2012 - 2017) with an allocated amount of INR.100 lakh.

(2) Intensification of Forest Management (IFM) Scheme

The scheme is implemented financially on a 90:10 (GoI:state) sharing basis. The components of the scheme are ranging widely, and the main objectives are (i) forest fire control management and (ii) infrastructure development having the following subcomponents: working plan preparation / survey demarcation and strengthening of infrastructure for forest protection. A provision of Rs.20 lakh is allocated in the 12th Five-Year Plan.

(3) National Bamboo Mission (NBM) Scheme

NBM scheme is a 100% CSS which envisages the increase in the areas under bamboo plantation of selected species with intensive management so that the yield improves from the present 3 MT/ha on an

average to about 18 to 20 MT/ha. NBM scheme was set up in 2006, and simultaneously, Mizoram established the State Bamboo Mission, the nodal agency for carrying out all mandated activities, together with seven northeast states. One of the major components of the NBM is to increase the coverage area of economically important bamboo species. The mission activities are taken up both in forest and non-forest areas. The schemes in forest areas are dealt directly by EFD through FDA, while non-forest areas are dealt by the Bamboo Development Agency guided by the Horticulture Department as its nodal department.

(4) Wildlife Preservation Scheme and Eco-development Scheme

EFD is engaged in the preservation of wildlife by designating one tiger reserve named "Dampa Tiger Reserve" with an area of about 988 Km^2 in Mamit Distict, two national parks, and seven wildlife sanctuaries on a 100% CSS basis. The network of protected areas provides healthy habitats for many wild animals, birds, and reptiles. The area set aside for long-term wildlife conservation is 1,728.75 km^2, corresponding to 8.2% of the state's land. A provision of Rs. 750 lakh is allocated in the 12th Five-Year Plan. The Ministry of Environment and Forest, GoI, is financially assisting villagers living at the periphery and around PAs in improving their livelihood through minimizing the level of dependency on forest and forest products. Under the Eco-development Scheme, they are given assistance in the form of free medical camps, distribution of fuel (Liquefied Propane Gas, LPG), poultry, piggery, cultivation of cash crops, terracing for irrigated paddy cultivation, pisciculture, insulation of water tank, solar lamp, and bee keeping.

4.10.6 Implementation and Progress of NLUP

Under NLUP, EFD selected to implement the Bamboo Development Programme. A unit of bamboo planting is set at 2 ha per family, and given an amount of Rs.50,000 for planting bamboo. The bamboo plantation project is operated during the five-year period. Private land holders can take up bamboo plantation in their own land, while the landless are allotted the area on a lease basis. EFD provides the beneficiaries with bamboo seedlings produced at the bamboo nurseries selecting quality species, for which a specific fund is set aside. From 2011 to date, there are 2,609 families which were benefitted by bamboo development under NLUP. The total plantation area is 5,218 ha, with 2 ha for each family. The total fund disbursed for the two phases was about INR 2,600 lakhs including 1st phase maintenance and 2nd phase development works. The 3rd phase and 4th phase beneficiaries are being selected by EFD.

4.11 Livelihood-related Infrastructure

4.11.1 Rural Housing

The Government of India assists the people below the poverty line in constructing or upgrading houses in rural areas through a programmes named Indira Awas Yojana (IAY). In Mizoram, the Rural Development Department (RDD) is undertaking IAY programme, and a total number of 19,570 houses have been constructed likewise, a total of 11,238 houses have been upgraded for the last 11 years from 2001/02 to 2011/12. The total expenditure provided by the programme was about INR 840 million.

4.11.2 Road and Transportation

(1) Road

The total length of all types of roads in Mizoram has increased by 24% during the 11th Five-Year Plan, i.e., from about 6,060 km long in the beginning of 2007 to 7,537 km long to date. The total road length of 7,537 km is composed of national highway (NH) of 986 km (13%), state highway (SH) of 700 km (9.3%) and the rest 5,851 km by district, city, and village roads. However, the current road density of 0.40 km/km^2 is below India's national average of 0.66 km/km^2. The most part of roads (about 83%) is maintained by the Public Works Department (PWD).

The PWD proposed to construct and upgrade the road of about 503 km during the 12th five-year plan period with a total expenditure of about INR 19.6 billion. The funds for the construction and upgrading, other than those allocated annually under the state plan, include those coming from Non Lapsable Central Pool of Resources (NLCPR (Ministry of Development of North Eastern Region:

DoNER)), NEC, Pradhan Mantri Gram Sadak Yojana (PMGSY), NABARD, JICA, Asian Development Bank (ADB) Loan, World Bank Loan, and Ministry of State Road Transportation and Highway.

The Kaladan Multi Modal Transit Project Transport Project within Mizoram, from 100 km of double lane highway to connect Kolkata Port via Myanmar and sea route, has been sanctioned for an amount of INR 5.76 billion. This was recently declared as the National Highway NH-502A. The work was physically started in February 2011 and formation cutting of 60 km have already been completed.

(2) Railways

Railway line extends to Mizoram in Bairabi, near Assam border, measuring only 1.5 km from Katakal Junction. Passengers and goods arrive at this station once a day. Since all major towns are far from Bairabi, the role of railways in the economy of Mizoram until today is almost negligible. The new railway line project from Bairabi to Sairang with a length of 51.38 km was sanctioned in the railway budget of 2008-2009 with a total cost of INR 5.1 billion.

(3) Inland Waterways

The Transport Department has completed the inland waterway project on the Tlawng River with the finance of the Ministry of Shipping. The Transport Department is planning to provide water way on the Tuichawng River and the Khawthlangtuipui River to be implemented in 2013-14.

4.11.3 Water Supply and Sanitation

The Government of Mizoram initiated the National Rural Drinking Water Programme (NRDWP) in 2009 envisaging to cover all the rural habitations by the year 2012. As the result of NRDWP, all the habitations were either fully (above 40 litre per capita per day : lpcd) or partially (above 10 lpcd) covered with drinking water supply, and those habitations accounted for 777 habitations in 2012. In urban areas, water connections were provided to 33,061 houses as of 2010/11, which are around 28% of the total urban households.

The Mizoram state has a relatively higher percentage of households having latrines, in 2011 as high as 92% which is nearly double of the national average of 47%.

4.11.4 Rural Electrification

The total installed generation capacities as of 2011/12 are 0.50 MW diesel generation, 29.35 MW hydropower, and 22.92 MW thermal, totalling 52.77 MW covering only 5% of the power demand within the state and the remaining 95% is being imported mainly from the national power grid. The Government of Mizoram started a scheme for Rural Electricity Infrastructure and Household Electrification (RGGVY) in the year 2008. Electrification of 93 un-electrified villages, intensive electrification of 346 villages and free connection to 14,920 below poverty line households were completed. By April 2012, all villages in Kolasib, Champhai, and Serchhip had been electrified.

4.11.5 Education

Mizoram is well known as one of the most literate states in India. The number of educational institutions by levels as of 2011/12 are; 1,855 primary schools, 1,388 middle schools, 543 high schools, 113 higher secondary schools and 21 colleges. They have steadily increased during the last decade in all levels except college, and many of them (in all levels) are concentrated in Aizawl. Mizoram University (MZU) and Pachhunga University College (Constituent College of MZU) are also located in Aizawl.

The national average of teacher-pupil ratios were 35 for primary in 2011 and 25 for secondary (high school) in 2010, and there is no remarkable difference in those ratios among the districts. Compared with the national level, the situation in Mizoram is regarded as much better.

4.11.6 Health and Medical Services

The number of health institutions by levels as of the year 2011 are; 27 hospitals consisting of 12 government running and 15 private owned, 12 community health centres, 57 primary health centres and 370 sub-centres. Aizawl has relatively more medical institutions than in other districts, such as 5

government hospitals and 10 private hospitals. The one bed of government hospital including community health centres accounts for 844, which is nearly equivalent to the entire India average of 879.

4.11.7 Communications

Telecommunication has been developed only recently in Mizoram. The number of mobile connections has increased by about 70% during the last four years. More than half (55.6%) of the connectors are in Aizawl. AIRTEL has the largest subscribers for mobile connections. Bharat Sanchar Nigam Limited (BSNL) is the comprehensive telecommunication service provider. It has 46,883 landline connections and 33,265 broadband connections aside from mobile phone connections.

Chapter 5 Assessment of Regional Agriculture Characteristics and Zoning

5.1 Method of Assessment

The assessment of agricultural setting in Mizoram is made to figure out the regional agriculture characteristics and zoning, which are basis for establishing regional agriculture development plans. The assessment is made by two-step approach using two types of data set. The first step is to classify all the village into several clusters adopting Principal Components Analysis (PCA) based on village-wise census data, topographic data, meteorological data, geological data, and geographical data. The second step is to overlay the regional information on border trading, market accessibility and agricultural production on clustered village groups, and finally regional zoning having agriculturally similar characteristics are presented on a GIS map.

5.2 Village Clustering

5.2.1 Principal Component Analysis (PCA)

The PCA is a statistical technique applied to sets of many potentially related variables to discover any similarity or positioning of the variables using factors that are found following the relations between the different variables. The data used for the analysis are village area, census 2011, land use, geographical feature, road accessibility, groundwater accessibility and rainfall during rabi season as shown in Table 5.2.1.

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 ・ Marginal agricultural labour zero to three months, male ・ Marginal agricultural labour zero to three months, female	Census 2011	Village-wise numerical data
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 is 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 Census 2011 indicates 727 villages / towns administratively in the Mizoram State, while the source maps obtained by the study team show 689 villages / towns. The unmatched villages between the administrative boundary map and census data are adjusted by checking their locations, names,

geological data, and knowledge of governmental officers. The final number of villages and towns used for the analysis is 539.

5.2.2 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.

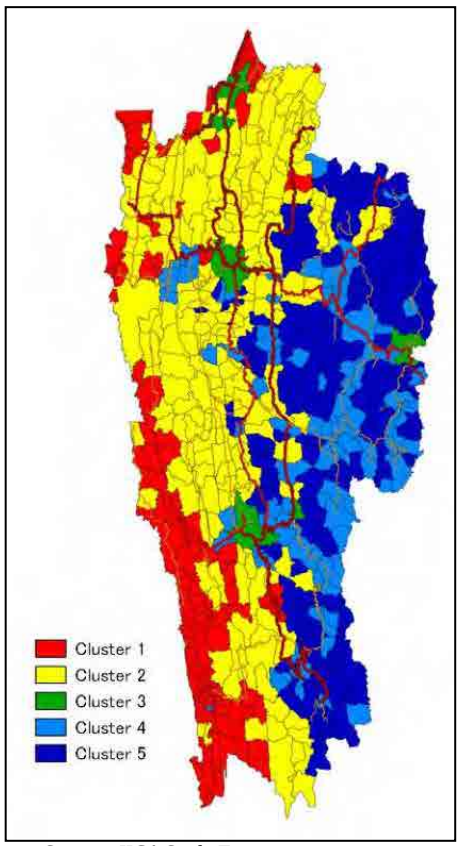
5.2.3 Clustering of Villages

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

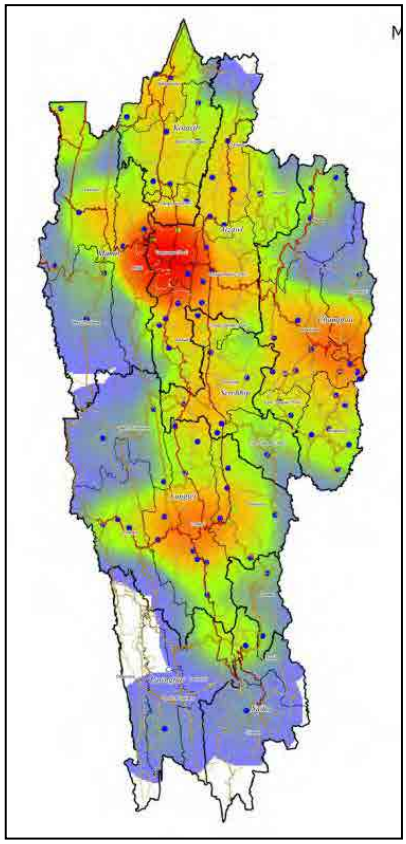
5.3.1 Factors Overlaying on Village Clustering

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

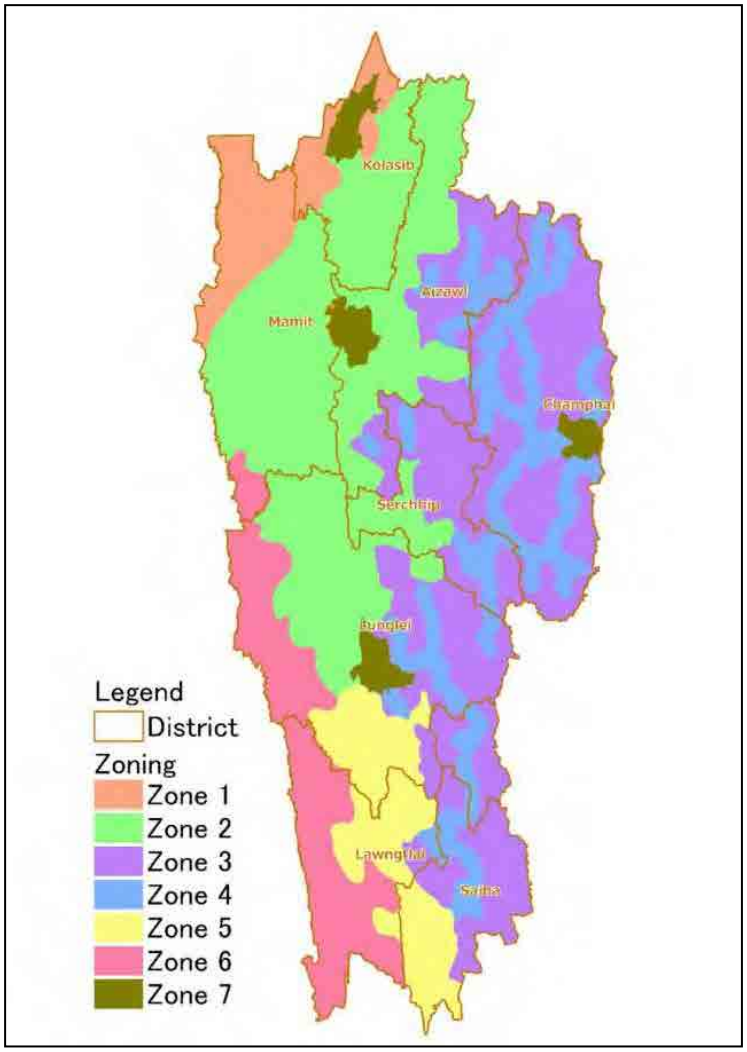
Categories	Type	Description	Source
Agriculture	WRC	Circle-wise WRC area in Kharif and Rabi	DoA, 2009
	Jhum, Maize, Wheat, Pulses, Oilseed, Cotton, Tobacco, Sugarcane, and Potato	Circle-wise area	DoA, 2009
Horticulture	Bitter Gourds, Cabbage, Chayote and Other Vegetables Ginger, Turmeric, Chilli, and 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

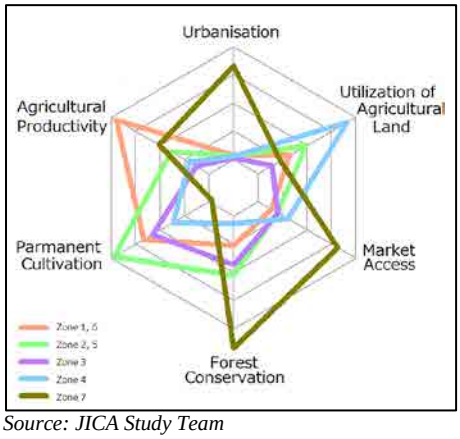
Based on the overlaying of additional data, Mizoram State was divided into seven agricultural zones obtained from five clusters. The map of regional zoning is shown in Figure 5.3.3.

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 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.
	Agricultural Productivity	High	
	Permanent Cultivation	Medium	
	Forest Conservation	Low	
	Marketability	Low	
	Utilisation of Agricultural Land	Low	
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.
	Agricultural Productivity	Medium	
	Permanent Cultivation	High	

Zone	PCA		Characteristic Features
	Components	**Evaluation**	
	Forest Conservation	High	・ 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.
	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-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
	Agricultural Productivity	Medium	
	Permanent Cultivation	High	
	Forest Conservation	High	
	Marketability	Low - Medium	
	Utilisation of Agricultural Land	Medium	

Zone	PCA		Characteristic Features
	Components	**Evaluation**	
			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.
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 General

Taking into consideration the state's socioeconomic conditions as well as its agriculture and rural setting in various aspects as described in the previous chapters, the basic concept and approaches of the master plan for land and water resources development and management for sustainable agriculture are proposed in this chapter. Discussion starts with the state-level challenges, roles of state agriculture, and overall problem analysis of the agriculture sector. After identification of considerable external environment of the state agriculture, the basic concept of the master plan with physical targets and the zonal development direction with approaches to achieve its targets are discussed.

6.2 Development Needs and Surrounding Environment of Agriculture Sector

6.2.1 State-level Challenges in Agriculture Development

The rapid urbanisation of the state causes the deterioration of the living environment in the urban as well as in the rural area. The indicator says that population growth rates in the urban and rural areas are 2.5% and 1.7%, respectively, and the viability of the rural economy through the development of possible industries is one of the urgent issues of the state. In addition, the improvement of tax and revenue status of the state government is also recognised as one of the most remarkable challenges of the state. The tax-GSDP ratio of the state is as low as 1.5 which is the second worst in the country. With including the increase of food security of the state as one of the issues, the major state-level challenges are summarised in Table 6.2.1.

Table 6.2.1 Summary of Major State-level Challenges

Major Challenge	State-level Indicators	Related Policy and/or Plan
Viability of the local economy and environment	(1) Rural population is 49% with a growth rate of 1.7% per annum[1] (2) Average income per capita of the state population is Rs.61,732, which is lower than the national average of Rs.66,747[2]. (3) The estimated poverty indicator in the rural area is 33.56[3]. (4) The unemployment rate was 10.3%[4] (2011, Census of India). (5) 48,580 educated job seekers are registered in five townships	12th Five-Year Plan, India 12th Five-Year Plan, Mizoram New Land Use Policy North Eastern Region Vision 2020
Improvement of tax revenue status of the state	(6) 75% of the amount received is grant-in-aid from the Government of India (GOI) and its contribution. (7) Tax-GSDP ratio is 1.5	12th Five-Year Plan, Mizoram
Increase food security	(8) Self-sufficiency rate of rice was 27% (2011-12)	National Agriculture Policy, 2001 North Eastern Region Vision 2020 Krishi Vigyan Kendra (KVK) Vision 2020, Mizoram

Source: JICA Study Team

In order to overcome these challenges, vitalisation of the agriculture sector is important since the sector absorbs 60% of the state work force especially in the rural area, and contributes nearly 20% to GSDP. By looking at the GSDP growth rate of the agriculture and allied sectors, the overall agriculture and allied sectors achieved an average growth of 5.1%, and the agriculture subsector achieved 8.8%

[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*

per annum from 2005 to 2011 at a constant price[5]. Although the government's rapid effort such as the New Land Use Policy (NLUP) gives 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.

6.2.2 Overall Problem Analysis of Mizoram Agriculture

The potential threat for stagnation of the agriculture sector can be summarised in terms of: low productivity, limited cultivation area, and low value of agricultural products. The JICA Study Team analysed the causes of low productivity as: (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 motivation and aging of farmers. On the other hand, in terms of limited cultivation area, the major causes are: (1) difficulty in land acquisition; (2) insufficient manpower due to aging of the farmers; (3) poor farm management; (4) shortage of irrigation water and flood damage; (5) shortage of funds; and (6) difficulty of access to the farms. The causes of low value of agricultural products are summarised 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) weakness in agro-based industries.

On the other hand, the JICA Study Team assessed the present constraints in the government support services. The JICA Study Team identified four major problems, namely: inadequate planning and monitoring system, undeveloped extension system, less coordination amongst related departments, and low capacity of development partners. The causes of inadequate planning and monitoring system in the government scheme are: (1) inadequate information and management system; (2) less knowledge in planning and monitoring of government officers; and (3) placing priority on the disbursements of centrally sponsored scheme (CSS) and short-term outcomes. The causes of undeveloped extension system are summarised as: (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 of less coordination amongst related departments are summarised into two points, namely, the CSS-oriented mandate allocation to each department and little coordination between bodies and systems at the state, district, block, and village levels.

The constraints summarised above are potential threat for stagnation of the agriculture sector in the state. It is necessary to take immediate actions to address to these constraints in the agriculture sector giving the foundation of the state economy.

6.2.3 Considerable External Environment of Mizoram Agriculture for Planning

Before discussion of the actions to remove the potential threat for stagnation of the agriculture sector the as the basic concept of the master plan, the considerable external environment of the state agriculture is discussed. Under the present government policy, three major programmes are implemented. These programmes target the improvement of connectivity in the region and have the possibility for a landlocked and economically backward region to become the gateway of India to the fast developing Association of Southeast Asian Nations (ASEAN) region. The basic concept of the Master Plan is proposed with taking advantage of geographical advantage of the state supported by these programmes. The summary of the three programmes is as follows:

[5] Final estimates of the state domestic product from 2004–2005 to 2010-2011 Mizoram, DES

(1) Trans-Asian Highway Initiative

The Trans-Asian Highway (TAH) initiative, which plans to foster logistics movement from ASEAN countries to Turkey through the North Eastern Region of India is underway. The Asian Highway Project has been promoting international and bilateral trade and tourism to encourage regional economic and social development.

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

The Government of India is enhancing India's connectivity with Southeast Asian countries under the Look East Policy. There are two major border gates between Mizoram and Myanmar in Zokhawthar (Champai District) and Zorinpui (Lawngtlai District), respectively. Development of the access to the Southeast Asian countries will be provided by the Kaladan Multimodal Transit Transport on both inland and water through Aizawl to Sittwe Port in Myanmar via Lawngtlai. 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. On the other hand, there is one major border gate between Mizoram and Bangladesh in Kawrpuichhuah (Lunglei District). 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.

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

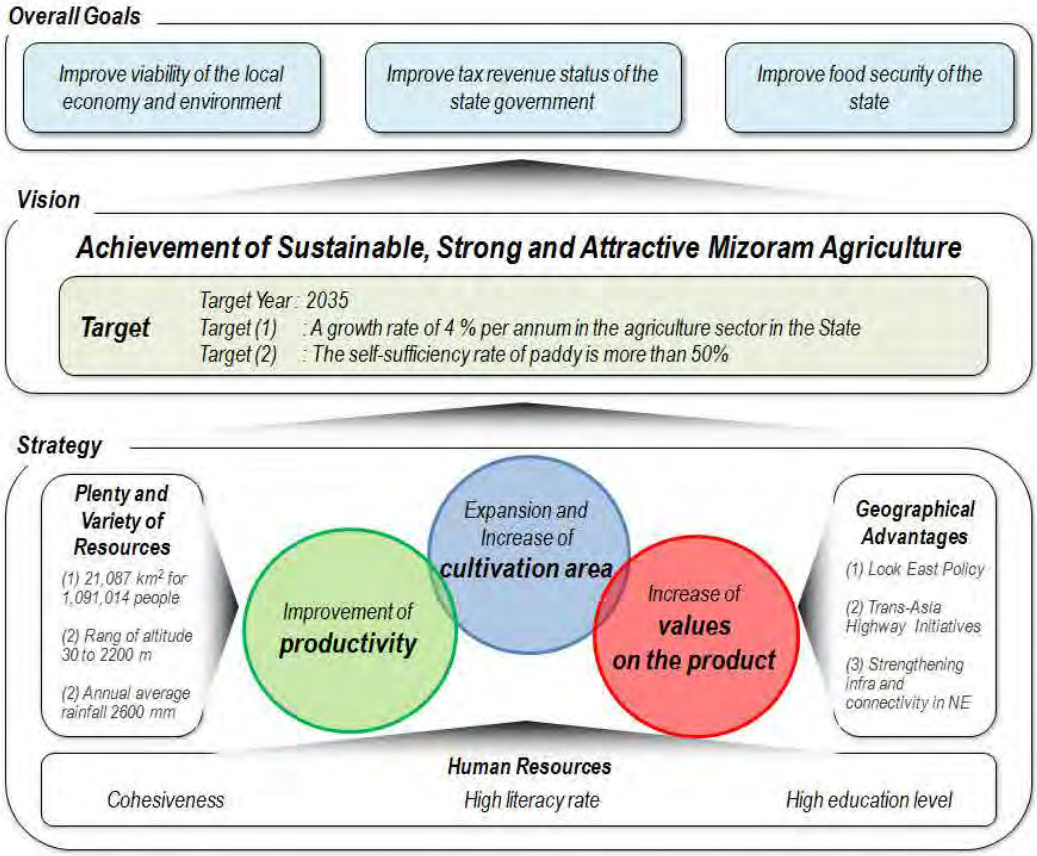
The North Eastern Region Vision 2020 emphasises roads, railways, waterways, and power improvement to interlink potential growth centres. Under this programme, the railway line extention from Bairabi (Kolasib) to Sairang is proposed, and land acquisition is in progress aiming at the completion of the work by December 2017[6]. It is expected that the new railway line will play a vital role in the economic activities of the state including the agriculture sector.

6.3 Basic Concept

6.3.1 Vision and Overall Goals

Figure 6.3.1 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" 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 and education level. Amongst various indicators considered to measure the achievement of the objectives of the master plan, two indicators, namely, agriculture GSDP and self-sufficiency rate of paddy, are proposed.

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



Source : JICA Study Team

Figure 6.3.1 Basic Concept and Framework of the Master Plan

The overall goal of the master plan can address the state-level challenges, namely: (1) improve viability of the local economy and environment, (2) improve tax revenue status of the state government, and (3) improve food security of the state.

6.3.2 Targets

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

Since 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. There is no target growth rate for the agriculture GSDP of the state so far. 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. The direction of crop production to achieve the target is shown in Table 6.3.1. The target yield was decided based on analysis of the data on recorded maximum yield in the state, average yield of Assam, India, Northeast state, Asia and Japan.

Table 6.3.1 Direction of 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 an important cultural activity in the Mizoram rural community. It is securing the income of subsistence farmers in the rural area. Keep the present decreasing rate without positive intervention.	Improvement of farm management such as quality seed multiplication, measures against soil erosion, and enrichment and extension of the fallow period.	Paddy 1.66 t/ha > 2.0 t/ha

	WRC	Promote a more positive development for effective resources utilisation and management. Aiming at 43,000 (ha) new WRC development in 20 years	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 decreasing 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) 0.9 t/ha >1.2 t/ha Brinjal 7.1 t/ha >9.0 t/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 and mulching. Introduce new varieties. Introduce Integrated Nutrient Management (INM).	Ginger 3.9 t/ha >7.0 t/ha Turmeric 3.8 t/ha >7.0 t/ha
	Irrigated Upland	Expand the irrigation area by installing small irrigation system and constructing water conservation facilities. Expand the total cultivation period per year by introducing appropriate technologies and practices on cultivation timing diversification.	Implement soil and water conservation measures such as terracing and mulching. Introduce new varieties. Introduce INM.	Cabbage 13.3 t/ha >30.0 t/ha Okra 6.8 t/ha >12.0 t/ha Tomato 9.2 t/ha >25.0 t/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 12.6 t/ha >20.0 t/ha Onion 9.2 t/ha >16.0 t/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 and mulching. Introduce INM.	Banana 12.1 t/ha >25.0 t/ha M. Orange 2.6 t/ha >10.0 t/ha Lemon 3.2 t/ha > 9.0 t/ha Grape 8.7 t/ha >12.0 t/ha Pineapple 7.3 t/ha >15.0 t/ha

Note: Data of GSDP at constant prices in the horticulture sector are calculated by multiplying the quantity of production in each year with the base year's 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 latest data says that 73% of the main food is dependent on other states although the rate was kept at nearly 50% before *Mautam* started in 2006. The master plan targets to increase self-sufficiency rate of paddy to more than 50% from 27% at present. The scenario to increase self-sufficiency rate of paddy is shown in Table 6.3.2

Table 6.3.2 Summary of Calculation of Self-sufficiency Rate of Rice

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

6.4 Zonal Development Direction and Major Challenges

The state is a diverse area in terms of availability of natural resources and geological and geographical conditions. To achieve the master plan target, the state agriculture should take advantage of the diversity of land and resources. As discussed in Chapter 5, the state land can be divided into seven zones in the viewpoints of urbanisation, agriculture productivity, progress of settled agriculture, forest conservation, and utilisation of farm land. Carefully assessing the strength, opportunity, and weakness of each zone, the development direction of each zone is proposed in Table 6.4.1.

The major challenges that exist in each zone are also assessed and identified. These challenges are classified into three aspects, namely: production, marketing, and infrastructure.

Table 6.4.1 Zonal Development Direction and Major Challenges

Zone	Development Direction	Major Challenges	
Zone-1	Progressing of production and processing of industrial crops (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 mechanisation in the low land. (4) Enhancement of winter crop production in WRC area.
		Marketing aspect	(1) Diversification of market channels which are 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 utilisation. (4) Improvement of post-harvest technologies of industrial crops. (5) Incubation and/or strengthening of business manager or enterprise for agricultural industries.
		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 are 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 practice 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) Improvement of 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.

Zone	Development Direction	Major Challenges	
			(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 utilisation. (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 of 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 product quality. (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 utilisation. (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. (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 utilisation 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 mechanisation in the 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 fertiliser. (5) Improvement of rice productivity and promotion of winter cultivation. (6) Farm mechanisation.

Zone	Development Direction	Major Challenges	
		Marketing aspect	(1) Diversification of market channels. (2) Efficient use of existing storage and processing facilities. (3) Mizoram branding and promotion of 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

6.5 Development Approach

6.5.1 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.

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

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 Soil and Water Conservation Department. These departments are handling CSS on their own office circle without close coordination and communication with other departments although development committees are organised at the state, district, and village levels in some CSSs. The lack of collaboration amongst the concerned departments has impeded their respective inputs to generate synergistic effect at each state, district, and village level.

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

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

Considering the above, proper institutional development for effective agricultural development through enhancement of government planning and implementation capacity, convergence planning, and provision of one-stop quality support services to the farmers are proposed. The proposed programmes are as follows:

Programme 1-1 : Stakeholders' Capacity Development and Convergence Planning

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

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

The programme proposes to converge the agriculture development plan in the village level with preparation of "regional agriculture development plan" through participatory approach based on land use plan for effective utilisation of the agriculture development resources.

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

Programme 2-2 : Enhancement of Basic Agriculture Support Services

The programme aims to establish agriculture extension system suited to Mizoram. The strategy proposes to unite the circle office of each concerned department into the Agrarian Service Centre (ASC), which is to be established in each block. ASC will act as an interface of agriculture support services to the farmers, group of farmers, SHG, and other stakeholders, and it is expected to link to the research institution such as KVK and other government organisations. Service providers are not only providing the services but also getting the necessary information on farmers and other service providers. Through these bilateral information exchange, the quality of services will be improved.

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 collaborate with the roadside shop and strengthen the marketing networks in the future.

The programme includes enhancement of extension services, such as quality seed production, production and distribution of organic fertiliser, and introduction of proper farm mechanisation to the farmers with collaboration of research institutions, private sectors, and villagers.

There are eight proposed projects under this approach as described in Table 6.5.1.

Table 6.5.1 Proposed Projects 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

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

Mizoram is a forest land in principle and people are used to live within the capacity of the 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 proper land use planning or without awareness of proper resources management and environmental conservation measures. It can be a threat for the disruption of the ecosystem, decline of agriculture production and productivity, and destabilisation of farm economy.

Although the state has more than 20,000 km^2 of land and an average 2,600 mm of annual precipitation, the exploitable resources are limited due to the geological and geographical conditions of the state. To uplift the agriculture production and productivity, a more sensitive management of natural resources through promotion of settled and intensive agriculture is needed. Although there are many possibilities to utilise available natural resources for crop production without high agriculture input,

these possibilities and resources are not extracted yet without proper guidance, awareness, and technology 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 lacking and some of the existing facilities are not utilised to the fullest.

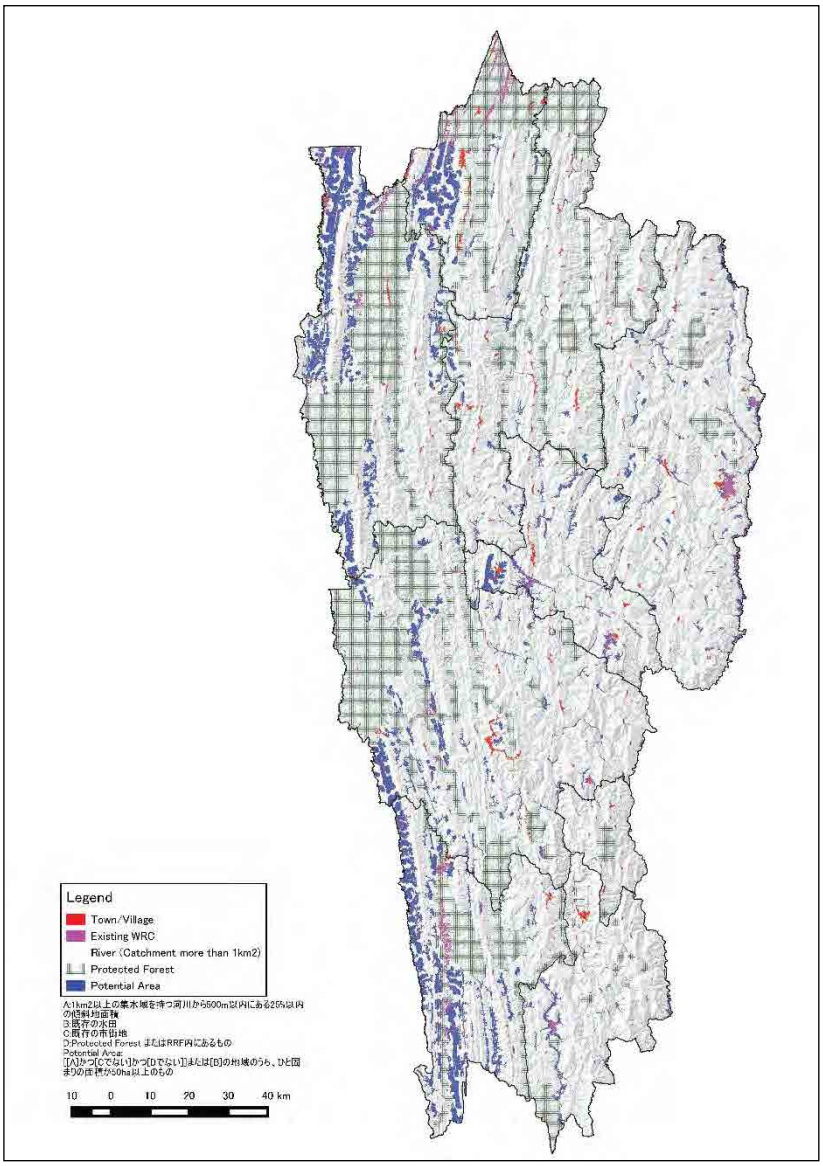
Programme 2-1 : Enhancement of Resources-Managed Farming System

The programme plans to propose the guidelines constituting the base for land management for the elaboration of land use plan. These are essentially classified according to slopes, and the guideline shows the necessary soil and water conservation measures as well as the respective farming systems for different moisture regimes. On steep sloping lands exceeding 70%, essentially, afforestation accompanied by agro-forestry 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.

The programme optimises 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 introduces farm integration with livestock and fishery into crop cultivation.

Programme 2-2 : Enhancement of Fundamental Infrastructure

The 2nd programme targets the 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 minor irrigation schemes 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 the formation of road and installation of drainage facilities such as side drains and culverts, which can improve the road condition and enhance longer durability of farm roads with minor cost. The soil and water conservation facilities are mainly the check dam, water harvesting tank, river bank protection, and small-scale intake structure. The programme focuses on extracting the existing potential of available infrastructure through rehabilitation or upgrading work and development of new needed infrastructure.



Source: JICA Study Team

Figure 6.5.1 WRC Development Potential Map

Ten projects are proposed under Approach 2 as shown in Table 6.5.2.

Table 6.5.2 Proposed Projects 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

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

The values of agriculture products produced in Mizoram are still low and there is room for improvement in the supply chain from production to retailing. Looking at the production side, although consumers demand for Mizoram products, production is insufficient or there is a mismatch in the market needs. Also, a large quantity of vegetables are imported from other states, particularly during the dry season due to the following reasons: (i) difficulty of access to irrigation water, (ii) low motivation because of low profit, (iii) insufficient quality seeds and seedlings, and (iv) underdeveloped technologies adapted to sloping lands that enable labour savings and cost reduction 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 gives unnecessary loss of values in the distribution system. Since projects for 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 both still at low level, there is a sign of 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 made by the private flower exporting enterprise and organisation of an independent marketing network by the flower growers' association. However, regarding the growers' association, the linkage in the market is still weak and they encounter difficulties even in obtaining packaging materials. The approach aims to establish good agriculture value chain, which extracts potential value of agriculture products without losing unnecessary values, give proper profit distribution amongst the stakeholders, and which creates the additional values through processing and industrialisation.

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

The Study Team proposes to enhance the market oriented farming technologies and supporting system at first. Collection of market information on major markets in the state and on checkpoints near the border gates to other states which is the essential for the market oriented farming is the 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 the 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 through which collected information can be sent to the head office. The head office gathers, processes, and uploads 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 stimulate their motivation to invest properly;
- 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 an 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.

In addition, horticultural crops produced in Mizoram will be exported through these actions.

Programme 3-2 : Improvement of Present Rigid Supply Chain

The programme focuses on the establishment of a business model through the 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 amongst all persons concerned on the programme is the basic and fundamental issue that will be addressed in the beginning. Implementation of this programme will keep things in order starting from simple direct sales activities to expanded activities by accumulating experiences and knowhow of the expected synergistic effect. The result is that participating enterprises will be able to manage and develop business by themselves. Furthermore, they will improve their business management ability and expand their sales activities.

Programme 3-3 : Enhancement of Agro-industrialisation

The programme organises a steering committee aiming at creating a brand of horticultural/industrial crops and their processed products through facilitation of the industry-academia-government collaboration, with a view leading to 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. The committee studies the trends and consumers' preferences within the state and the international markets, and elaborates a plan to create a brand of products. The committee finalises the plan for brand creation and constructs 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, and cultivation of market by applying marketing techniques.

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. Nonetheless, 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 terms 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.

There are nine proposed projects under this approach as described in Table 6.5.3.

Table 6.5.3 Proposed Projects 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 the three approaches discussed in the previous chapter and the implementation plan or action plan of the proposed projects. There are 27 projects proposed and the feasibility of the implementation plan is assessed with respect to the available budget and the number and capacity of the human resources available in the state government. The chapter starts with the estimation of the development budget as follows:

7.2 Estimation of Agriculture Development Budget and Human Resources

7.2.1 Agriculture Development Budget

Table 7.2.1 shows the sector-wise actual expenditure for the 11th Five-Year Plan and proposed outlay for the 12th Five-Year Plan. The "Agriculture and Allied Activities" and "Irrigation and Flood Control" sectors could be regarded as agriculture-related sectors. They account for 20.47% of the total expenditure for the 11th Five-Year Plan and 16.79% for the 12th Five-Year Plan.

Table 7.2.1 Sector-wise Expenditure and Outlay of the 11th and 12th Five-Year Plans of Mizoram (Rs., crore)

		Actual Allocation for 11th Five-Year Plan (2007/08-2011/12)	Actual Expenditure for 11th Five-Year Plan (2007/08-2011/12)	%	Proposed Outlay for 12th Five-Year Plan (2012/13-2016/17)	%
I	**Agriculture and Allied Activities**	**954.0**	**884.3**	**15.8%**	**1,447.0**	**11.9%**
II	Rural Development	229.8	198.4	3.6%	483.0	4.0%
III	Special Area Programme	325.0	327.7	5.9%	387.9	3.2%
IV	**Irrigation and Flood Control**	**261.8**	**261.3**	**4.7%**	**594.6**	**4.9%**
	Other Sectors	5,084.2	4,450	79.5%	10,118.4	83.2%
	Total	6,300.0	5,595.6	100.0%	12,160.0	100.0%
	Total (I+IV)	**1,215.8**	**1,145.6**	**20.5%**	**2,041.6**	**16.8%**

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

Regarding the base figure of 2014, the sum of abovementioned agriculture-related sectors in the proposed outlay for 12th Five-Year Plan is used (Rs.2,041.6 crore for five years, and Rs.408.3 crore for one year). Based on the outlay of the 12th Five-Year Plan, total development budget is assumed as Rs.8,166 crore 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 be able to faithfully implement 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. DOA, which has 725 staff, is the biggest department with regard to human resources. Meanwhile, DOF is the smallest department with only 150 staff. The proportion of the headquarters and division offices are generally around 1:3. The handling budget per person is relatively high in AHVD at Rs.0.6 crore, MID at Rs.0.4 crore and DOA at Rs.0.3 crore per year. DOH and DOF handling budget per staff per annum are Rs.0.1 crore and Rs.0.2 crore, respectively.

7.3 Proposed Project

7.3.1 Composition and Outline of Development Project

Out of the 27 projects, eight projects are proposed under Approach 1 - Institutional Development for Effective Agricultural Development Planning and Implementation, ten projects are proposed under Approach 2 - Enhancement of Sustainable Agriculture Production through Proper Resource Utilisation and Management, and nine projects are proposed under Approach 3 - Establishment of Good Value Chain for Agriculture Products. The main implementing organisation and related supporting agencies, expected project duration, applicability of development zone (◎: high, ○: medium and – Low or not), target group, objectives and activities of each project are summarized in Table 7.3.1.

Table 7.3.1 Outline of Proposed Projects

No.	Name of Project	Implementing Organisation		Project Period (Yrs.)	Applicable Zone							Target Group	Objective	Activity
		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 of the agriculture-allied dept.	Establishment of "agriculture development committee (ADC)" to prepare vision policy and plans for the state agriculture development and to coordinate the programmes and projects for more effective and efficient implementation	(1) Establish preparatory committee (2) Preparation of roles and regulation of ADC with some trials (3) Capacity development of members of ADC through training and study tour
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 dept.	Establishment of agriculture data collection and management system for better planning and monitoring	(1) Data collection system development such as forms and database (2) Procurement of necessary equipment (3) Capacity development of officers concerned
1-3	Capacity Strengthening of Government Officers for Planning and Good Agriculture Extension	DOA, KVK, DOH, MID, DOF	DSWC, AHVD, DOS, RDD ATMA	5	-	-	-	-	-	-	-	Officers of agriculture-allied dept. and MID	Strengthening of the government officers' capacity and formulation of improved systems for promoting proper project planning and management and effective agricultural extension	(1) Preparation of TOT manual for agriculture development planning and monitoring, agriculture technologies extension, extension of marketing technologies, water management and infrastructure O&M. (2) Capacity development of officers concerned through classroom training or OJT.

No.	Name of Project	Implementing Organisation		Project Period (Yrs.)	Applicable Zone							Target Group	Objective	Activity
		Main	Sub		1	2	3	4	5	6	7			
1-4	Preparation of Regional Agriculture Development Plan	DOA, DOH, MID	SWCD, RDD, AHDV, DEF, DOF, DOS, ATMA, MIRSAC	6	○	○	○	○	○	○	○	VC, CBOs	Preparation of integrated plan including land use plan, resource management plan and agriculture action plan in each village to be the base for the agriculture development in Mizoram	(1) Preparation of land use and resources management plan for nearly 700 villages through participatory approach (2) Preparation of village-based agriculture development plan for 700 villages for the base of the agriculture development
1-5	Strengthening of Village-based Self-reliant Organisations for Taking on Key Roles for Agriculture Development	RDD	DOA, DOH, DOF, MID, RDD, AHVD, SD	5	○	○	○	○	○	○	○	Local NGO VC, CBOs,	Enhancement of village-based CBOs for making the agriculture development more effective	(1)Training of local NGOs (2) Identify the present capacity of CBOs and facilitate the formation of the federation of CBOs for agriculture development in each village (3) Awareness of role and responsibility of CBO in the development work and necessary training for self-sufficiency
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	Establishment of one stop service centre in each block for giving better agriculture support services	(1) Construction of 26 ASCs (2) Procurement or establishment of necessary equipment and facilities attached to ASCs (3) System design for effective utilization of ASC and capacity development of officers concerned
1-7	Production of Appropriate and Quality Paddy Seed	DOA, KVK	-	10	◎	○	○	○	○	○	○	Seed producer group	Selection of appropriate paddy seeds and establishment of practical system to produce and disseminate enough quantity of quality seeds	(1) Rehabilitation and enhancement of existing seed farm in KVK and DOA (2) Selection and verification of recommended seed for extension (3) Formation of seed farmers' group and capacity development (4) Support for distribution of quality paddy seeds to other farmers

No.	Name of Project	Implementing Organisation		Project Period (Yrs.)	Applicable Zone							Target Group	Objective	Activity
		Main	Sub		1	2	3	4	5	6	7			
1-8	Rehabilitation and Upgrading of Existing Fish Farms for Sustained Fingerling Production	DOF	CIFE, CIFA, CIFRI	5	○	○	-	-	○	○	○	Staff in fish farms	Production of quality fingerlings in the state and dissemination to the farmers	(1) Rehabilitation and upgrading of 11 existing fish seed farms (2) Provision of facility and equipment for fish seed farms (3) Capacity development training for staff on fish seed farm for sustainable production
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	Improvement of productivity of *jhum* cultivation	(1) Awareness to VC for land use for *jhum* cultivation and preparation of regulation (2) Technology transfer for prolonging the *jhum* cycle to the farmers (3) Technology transfer for enhancement of forest production during fallow period
2-2	Enhancement of Environmentally-balanced Slope Area Cultivation	DOA	DOH, AHVD, DSWC, EFD	3	-	◎	◎	○	◎	-	○	Horticultural farmers' organisations and individual farmers	Improvement of productivity of slope area cultivation through enhancement of environmentally-balanced agriculture technologies	(1)Provide necessary technologies and equipment or facilities to the farmers to prevent soil erosion with agronomic, vegetative, and structural ways (2) Collection of necessary records for soil erosion to measure the effect of soil erosion on productivity through establishment of observation point
2-3	Enhancement of WRC and Promotion of Winter Crop	DOA	DOH, AHVD, DSWC, EFD	4	◎	-	-	-	-	○	◎	WUA	Increase of the production and productivity of wet rice cultivation and increase of winter crop production such as vegetables in WRC area	(1) Legislation of tenant farming system of WRC land owning system (2) Provision of appropriate technologies such as cultivation scheduling (including mix cropping), farm mechanisation and soil fertility management

No.	Name of Project	Implementing Organisation		Project Period (Yrs.)	Applicable Zone							Target Group	Objective	Activity
		Main	Sub		1	2	3	4	5	6	7			
2-4	Integration of Livestock Farming into Crop Cultivation	DOA, DOH, AHVD	-	3	-	○	◎	○	◎	○	-	SHG, individual farmers	Increase the agriculture production and income security through integration of livestock farming into crop cultivation	(1) Provision of the technologies for crop and livestock integration such as compost making, animal feed production and provision of necessary equipment (2) Skills development on farm household economy for diversification of income sources (3) Promotion of small-scale animal rearing and provision of necessary skills and facilities
2-5	Integration of Fish Farming into Crop Cultivation	DOF	DOA	6	◎	○	-	-	◎	◎	◎	WUA, individual farmers	Increase the fish production and income security through promotion of fish culture in the available water bodies	(1)Technology transfer on semi-intensive fish farming including paddy cum fish (2) Enhancement of fishery cooperative or WUA for joint shipping or marketing of the product (3) Provide necessary equipment or cost for small-scale fish pond construction on pilot basis
2-6	Irrigation and Command Area Development for WRC Potential Area	MID	DOA, DOH, DOF	20	◎	○	○	○	○	◎	○	WUA	Providing the irrigation and drainage facilities and development of irrigation command area in WRC potential area	(1) Construction of irrigation and drainage facilities for WRC potential area of 43,000 ha (2) Command area development of above scheme
2-7	Improvement of Water Resource Utilisation for Existing Irrigation Schemes	MID	DOA, DOH, DOF	10	◎	◎	○	○	○	○	◎	WUA	Increase in cropping intensity of the existing minor irrigation scheme through construction of ponds, rehabilitation of canals, and introduction of water saving irrigation	(1) Upgrading of existing irrigation schemes (300 schemes) through construction of ponds, diversion structures, agro well, lift irrigation facilities, and rehabilitation of canal system (2) Introduction of water saving irrigation system in existing and newly developed area through necessary data collection such as soil moisture and water losses and provision of micro irrigation facilities

No.	Name of Project	Implementing Organisation		Project Period (Yrs.)	Applicable Zone							Target Group	Objective	Activity
		Main	Sub		1	2	3	4	5	6	7			
2-8	Construction of Soil and Water Conservation Facilities	SWCD	MID, DEF	5	○	○	○	○	○	○	○	VC, CBOs	Construction of soil and water conservation facilities and empowering the community for resources management through employment of the community contract method	(1) Preparation of guidelines for construction of soil and water conservation facilities through community contract system (2) Construction of soil and water conservation structures such as check dams, water harvesting structures, and river or stream protection walls
2-9	Improvement of Farm Accessibility and Transportation	DOA, MID	PWD	20	◎	○	○	○	○	◎	○	WUA, VC	Providing necessary access from main road to farmland for better utilization of the potential land and transportation of the agriculture input and output	(1) Preparation of the guidelines for planning, design and construction of the work to be executed by DOA. (2) Upgrading of existing farm access road through provision of side drains and drainage culverts (3) Construction of new farm access road from main road to potential area
2-10	Capacity Development of O&M of Fundamental Infrastructure	MID, DOA	-	5	○	○	○	○	○	○	○	WUA, VC	Capacity development of WUA and VC for operation and maintenance of irrigation facilities and farm access road. The institutional body to support the stakeholders is also established.	(1) Establishment of O&M unit in MID and providing necessary training or study tour for PIM (2) Introduction of WUA registration system in MID (3) Formation of O&M guidelines for irrigation and drainage facilities and farm access road (4) Providing O&M training to WUA and VC to increase the technical, financial and management skills
Approach-3 Establishment of Good Value Chain for Agriculture Product														
3-1	Establishment of Market Information Provision System	TCD	Agricultur e allied dept.	2	○	○	○	○	○	○	○	Individual farmers, traders, processors and others private sector	Establishment of systematic market information collection and provision system to promote market-oriented agriculture	(1) Establishment of network system of market data collection (2) Provision of equipment such as computers and accessories (3) Capacity development training for the staff to make the system functional

No.	Name of Project	Implementing Organisation		Project Period (Yrs.)	Applicable Zone							Target Group	Objective	Activity
		Main	Sub		1	2	3	4	5	6	7			
3-2	Production of Import Substitution Crops Throughout the Year	DOH	DOA, KVK, ICAR	5	○	◎	-	○	○	○	◎	Horticultural farmers' organisations and individual farmers	Production of import substitution crops throughout the year and increase in productivity of those crops	(1) Selection of capable horticultural farmers' organisation to be supported (2) 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) Provision of necessary technologies, tool and facilities for production enhancement
3-3	Establishment of Safe and Traceable Crop Certification System	DOH	DOA, KVK, ICAR	5	-	○	-	○	-	-	◎	400 farmers belonging to horticultural farmers' organisations	Production and supply of safe and traceable horticultural crops and adding to the proper value of the products by introducing the certification systems	(1) Establishment of state certification system for Mizoram products and organic products (2) Provision of awareness and training on GAP and organic farming to the advanced producers' group.
3-4	Establishment of Direct Marketing System	TCD	ID	3	○	◎	-	◎	○	-	○	Farmers' group or any private enterprise	Establishment of direct marketing system in order for producers and consumers in Mizoram to obtain reasonable benefits	(1) Selection of the horticultural producers' group to be supported (2) Create direct sales model utilisation of the roadside shops and sales outlets in the urban area (3) Provide necessary facility and renovation of the building on pilot basis
3-5	Establishment of Direct Supply Chain for Reimported Products	TCD	ID	3	◎	◎	-	○	-	-	○	Farmers' group and/or any private enterprises	Establishment of direct supply chain of reimported products for obtaining reasonable profit and increasing job opportunities	(1) Selection of farmers' group to be supported (2) Provision of technical training on processing of betel nuts and oranges (3) Provision of necessary equipment and facilities to farmers' group on pilot basis

No.	Name of Project	Implementing Organisation		Project Period (Yrs.)	Applicable Zone							Target Group	Objective	Activity
		Main	Sub		1	2	3	4	5	6	7			
3-6	Development of State Brand and Establishment of Sales Outlets in Other States	TCD	ID	4	◎	◎	-	○	-	-	○	Producers, processors, traders and others	Development of state brand and establishment of sales outlets in other states for expanding sales of agricultural products	(1)Establishment of state brand strategy management and implementation committee (2) Survey for competitive Mizoram products to be supported by the state (3) Design the brand image and specifications of the product (4) Conduct sales campaign in other states (5) Establishment of sales outlets (attached to Mizoram house) in other states
3-7	Development of Horticulture Agro-industry	DOH	DOA , TCD, DOI, KVKs, ICAR, Mizoram University	5	-	-	-	◎	-	-	◎	All stakeholders involved in the horticultural agro-industry	Development of horticulture agro-industries for enhancing the production and for creating new employment	(1) Establishment of steering committee with ICAR, KVK, state departments, Mizoram University, food processor, distributors, producers' group. (2) Enhance the target product or industry such as grapes and wine and floricultural industry. (3) Developing new products such as high-class/high-quality fruits, essential oils, and food with health-giving benefits
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	Development of horticulture agro-industries for enhancing the production and for creating new employment	(1) Promote tree-borne oil production and processing such as Tung and Jatropha with the collaboration of private sector (2)Assess the present capacity of oil palm processing and enhance oil palm production
3-9	Development of Business-oriented Post-harvest Skills	KVK, DOA	DOH, DOF, DOAV, DCRZ	4	◎	◎	○	◎	○	○	◎	Farmers' group, youth group, or any private enterprises	Initiate agriculture-related business through skills development of unemployed youth group and subsistence farmers	(1) Identify capable youth group and/or any private enterprises to be supported (2) Provide business management training to selected group (3) Provide necessary technical training for their business activities (4) Provision of necessary tools, equipment and facilities to the target group on a pilot basis

Source: JICA Study Team

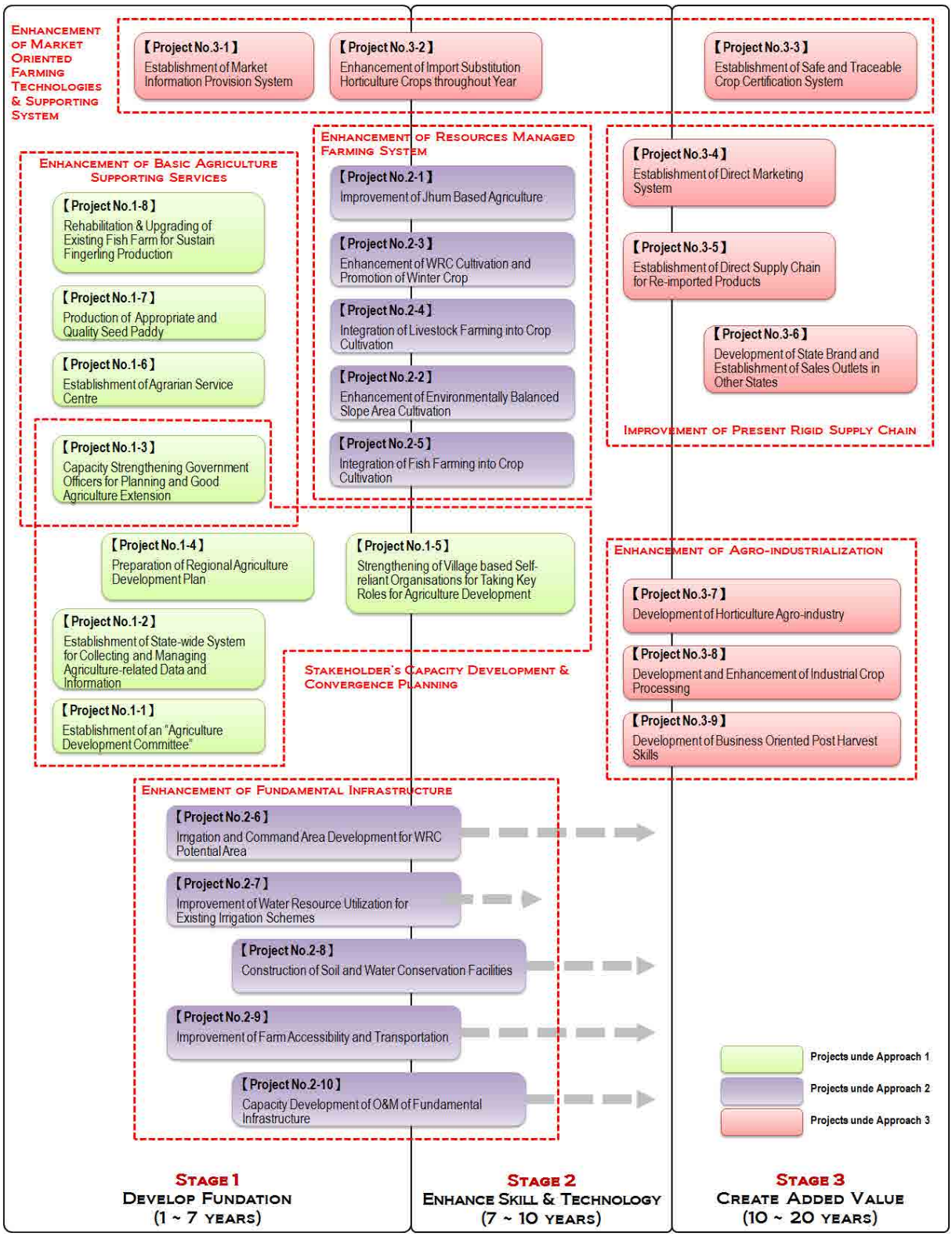
7.3.2 Project Implementation Plan

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

7.3.3 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 7.2.1. 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	AIBP	70.9	(2-6) Irrigation and Command Area Development for WRC

Resources			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 Issues of Management of the Environment

8.1.1 Environmental Clearance

Environmental clearance is the environmental impact assessment procedure under the provisions of the EIA Notification, 2006 (amended on 1st November, 2009). According to the Indian legislation, small scale irrigation, which is the main 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 threat 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 consideration of the potential impacts of each irrigation scheme project on the local environment and resources, together with their mitigation measures, and the selection of the most appropriate sites, is a condition of project implementation in an environment friendly and sustainable manner.

8.1.2 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 any type of forest land, either under jurisdiction of the Environment and Forest Department or not. Village forest reserves are subject to forestry clearance, although more tolerance is admitted in this case than for the government forest.

Within the scope of the master plan, development of minor irrigation will cover more than 43,000ha of land by 2035, which is possible only from the loss and conversion of some forest land. The strict application of the forestry clearance will compensate the loss by afforestation and maintain the forest coverage at its initial state. The compensatory afforestation of Jhum forest land for diversion of a forest land that is a government or village forest reserve, in agreement with the Environment and Forest Department, is an alternative to formal forestry clearance that should be considered as much as possible. 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, and compensatory afforestation of a Jhum land is a good alternative both for sustainable agriculture and protection of forest.

8.1.3 Protected Areas and Assets

A protected area is a National Park, a Wildlife Sanctuary, a Conservation Reserve, or a Community Reserve (Wildlife Protection Act 1972). At the exception of the planned extension of the Thorangtlang sanctuary and establishment of the eco-sensitive zones (buffer zones around the protected areas), 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, and the 14 community reserves. These community reserves have not been notified, but they constitute a patchwork of rich biodiversity pockets with a potential of conservation in the future. They individually cover 1.2 km^2 to 50 km^2, have objectives in the field of conservation of nature or environmental resources, and belong to the jurisdiction of the village authorities.

The location of an infrastructural project like an irrigation scheme should be strictly selected outside the boundaries of the protected areas, and outside the areas having a potential for nature conservation in the future. Similarly, site selection should be done away from the protected monuments or sites notified by the Arts and Culture Department.

8.2 Institutional Issues of Land Acquisition, Compensation, and Resettlement

8.2.1 Background

Given the specific pattern of human occupation of land for housing in Mizoram, with settlements grouped hilltop or hillside and along the crest lines, the infrastructural development projects like minor irrigation schemes in the lowland area should remain away from the housing settlements area, and not affect them, directly or indirectly. A case-by-case analysis of the local conditions is however necessary to identify exceptions and take the appropriate measures for land acquisition, compensation, and resettlement. Encroachment on settlements used for other purposes than housing, like for example the huts often established by the farmers in the cultivation fields, is more likely to occur, as a result of irrigation development.

8.2.2 Land Acquisition and Compensation

The Government of Mizoram is not going to adopt the new Central Government law, the Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act, 2013, which is a comprehensive law intended to integrate compensation, rehabilitation and resettlement measures with land acquisition. In Mizoram, land acquisition and compensation still remain dictated by the provisions of the Land Acquisition Act, 1894, amended in 1984, and the Mizoram Land Acquisition Rules, 2010. While the provisions of the new Central Government law and national policy fit with the requirements of the JICA guidelines for acquisition, compensation, and resettlement, those under the Mizoram legislation show severe gaps for rehabilitation and resettlement.

8.2.3 Rehabilitation and Resettlement

There are very few examples of planned involuntary resettlement in Mizoram. Resettlement has been done in urgency cases after landslide disasters, and by the Environment and Forest Department for management of the Thorangtlang Wildlife Sanctuary. As for the later case, a village has been relocated, and there is a new relocation plan regarding two villages lying in the extension area of the sanctuary. The Environment and Forest Department has its own relocation guidelines, based on the principles of the National Rehabilitation and Resettlement Policy, 2007. The scope of the national policy and its provisions are perfectly consistent with the requirements of the JICA guidelines. In the absence of legal provisions specific to Mizoram, rehabilitation or resettlement of people in a village community should be conducted in accordance with the rules given by the National Rehabilitation and Resettlement Policy, 2007.

8.3 Assessment of Impacts and Mitigation Measures

8.3.1 Master Plan Programmes Likely to Have an Impact on the Environment

Within the set of programmes of the master plan, three do not involve any environmental issue in their implementation or objectives, and are consequently not retained for assessing the impacts. The programmes and actions or strategies 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)
- Development of new irrigation schemes and improvement of agri-link accessibility and farm transportation (Programme 2-2)
- marketing of products, and development of exportation (Programme 3-1)

- Development of agro-industry (Programme 3-3)

8.3.2 Consistency of Programmes with Environmental Objectives

Consistency of the strategies and objectives of the master plan programmes with strategies and objectives of the management policies of environment is regarded as an indicator and as a condition of environmental sustainability of the former programmes. 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, have been taken into consideration, with actualization from the recent trends, when necessary. The master plan programmes have been found to be consistent with the orientations of the State Forestry Action Programme and State Action Plan on Climate Change.

8.3.3 Overview of the Impacts

The assessment of impacts of the master plan is based on the evaluation of the strategic directions and objectives of the programmes. Impacts may be negative or positive. 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 indigeneous people. The negative impacts concern only water quality, water use, and rivers habitats. They are ranked as small to moderate. The impacts of the master plan and its programmes are summarized in Table 8.3.1.

Table 8.3.1 Summary of Impacts of 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

(1) Main Positive Impacts of the Master Plan

The main positive impacts of the master plan (ranked moderate to important), are explained below, according to the relevant JICA criteria

(a) 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. The major issue about air quality is the emission of greeenhouse gases from Jhum shifting cultivation, and their contribution to global warming.

None of the programmes of the master plan 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, the master plan should positively contribute to the reduction of greenhouse gas emissions, and to the increase of sequestration capacity of carbon in forest.

(b) Soil and Erosion

High precipitations and low water retention hillside contribute to flash floods and soil erosion. Field surveys of the Department of Agriculture have shown the variability of erosion in Kolasib, according to land use and slope conditions. The highest erosion rate occurs in Jhum paddy cultivation land with slopes of 40%, and the lowest in dense forest with slopes of 50%. Shifting cultivation is a factor of intensification of vulnerability of soil to erosion, particularly along the streams and rivers.

Soil and water conservation is the objective of programme 2-1, 2-2. 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 watersheds. 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. These programmes have positive impacts on the conservation of soil.

(c) Forest and Jhum Land

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. About 70% of the forest land is open forest (61%) and non forest (9.3%). Jhum land is an unclassed forest extending over an area of 24000ha, and is at the same time a farming system based on shifting slash and burn cultivation. Jhum land is an open degraded forest.

Afforestion, improved Jhum agriculture and agroforestry development in programme 2-1, and compensatory afforestation inherent to programme 2-2 are all contributing to the replacement of shifting cultivation by settled farming and conservation of forest. Afforestation of steep slopes within the scope of soil and water conservation under programme 2-2, and agroforestry development under programme 2-1, are directly positive for the extension of the forest cover and for the creation of pockets with rich agroforestry ecosystems.

(d) Protected Areas

Protected areas are part of the forest land and represent about 8% of the state territory. The Environment and Forestry Department is planning the notification of Eco-sensitive zones having a function of buffer zones around the protected areas. The Thorangtlang wildlife sanctuary is going to be significantly extended.

All the programmes should contribute to the alleviation of human pressure on forest land, and consequently on the protected areas. They are positive for preserving the integrity of the protected areas. Programmes 3-1 and 2-2 are however likely to affect the protected areas in case of misallocation. The selection of the proper location of the irrigation schemes or horticultural development projects at the planning stage is a preliminary condition for avoiding direct or indirect impacts on the protected areas and similar areas (as defined in section 8.1.3 above). Moreover, the development of minor irrigation schemes (programme 2-2) in the upstream catchment of a protected area is likely to affect the flow of the stream during the dry season, and then the water source for wildlife. The upstream catchment of a protected area is sensitive to the impacts of water diversion on wildlife and should not be retained for development of irrigation.

(e) Biological Diversity

The biological diversity resources are concentrated within the boundaries of the protected areas, and more secondarily in the areas having still a potential for nature conservation. The master plan programmes will be implemented outside such areas, and accordingly not affect the biological diversity. There are however additional sensitive locations that need consideration in order to avoid any detrimental loss in biological diversity outside the protected areas or potential areas for nature conservation. They could be for example the small pockets of forest with dense canopy, the sacred grooves, if any, and the old community ponds that are possible refuges of specific aquatic species. On the other hand, the long term reconstitution of forest cover in Jhum land, through improvement of agriculture and afforestation in programmes 2-1, and the agroforestry development in programme 2-1 may all together contribute to the reconstitution of a biological diversity. Provided that the location constraints have been taken into consideration at the planning stage, the impact of the master plan on biological diversity appear to be positive.

(f) 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. Forest fires essentially result from the uncontrolled slash and burn practice in Jhum farming.

The beneficial effects of the programmes for soil and water conservation (programme 2-2) will directly contribute to minimize the risk of landslide. The improved practice of Jhum or the substitution of Jhum land with afforested land (programme 2-1) will contribute to minimize the risk of forest fires. Irrigation schemes (programme 2-2) may reduce the risk of floods downstream, through increased water retention. The programmes have a positive impact due to the improvement of conditions reducing the occurrence of landslides and fires in the long term, while the context of climate change is expected to have opposite effects due to the increase of extreme weather events.

(g) 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 main sources of change in land use from implementation of the master plan programmes are the conservation of soil and water (programme 2-2), and the development of irrigation in flat land (programme 2-2). The former puts the conditions for an intensification of farming on slopes. The later 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 (programmes 1-1), 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 to the improvement of its conservation, in the long term, which is positive.

(h) Forest Products

Non-timber forest products are generally considered as an important source of food and livelihood, particularly in remote areas. The main non-timber forest product used by villagers is fuelwood. The demand of fuelwood is in excess of the capacity of sustainable supply, contributing to the degradation of forest. Bamboo is widely used as a housing material, but is a specific forest product (Bamboo plantations, Bamboo Development Agency), no more considered in this chapter.

The intensification of agriculture from implementation of programmes 2-1, 2-2 and 3-1 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 programme 2-1, and environmental oriented cultivation of slopes in programme 2-1 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.

(i) Livelihood

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 the Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006.

All the programmes aim at the improvement of income and livelihood. Programme 2-2 will provide the conditions of enhanced livelihood through the better availability of water resources for domestic use and cultivation. Programmes 2-1, 2-2 and 3-1 will improve livelihood through improvement of farming practices or intensification of agriculture. Programme 3-3 will provide employment opportunities. Programmes 3-3 will boost the local economy through enhanced production, marketing, and food processing. The impact of the programmes is positive.

(j) 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 in Mizoram (0.1%) is largely below the average in India (16.2%).

All the programmes are positive for the vulnerable farmers, through the improvement of farming and income of a target population whose livelihood is strongly or completely dependent on the steep slopes farming (mountain agriculture). Programme 2-1 is however more specifically dealing with subsistence farming and most vulnerable farmers. The impact on poverty and vulnerability alleviation is positive.

(k) 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. 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 them more equitably in consultative committees like the Forest Rights Committees and the Biodiversity Management Committees.

Through implementation of programmes 2-1, 2-2, and 3-1, the 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 programmes 2-1 and 3-1. Planning of programme 2-2 projects 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.

(l) Indigeneous People, Ethnic Minorities

Nearly all the population of Mizoram (94.4% compared to the 8.2% average in India) was categorised as Scheduled Tribes in 2011. As a consequence, the programmes of the master plan do benefit to the indigeneous people.

(2) Main Potential Negative Impacts of the Master Plan

The main potential negative impacts that are likely to result from implementation of the master plan are those of programme 2-2 (minor irrigation schemes). These impacts can however easily be mitigated at the planning or operation phase, which justifies their ranking from low to moderate. These impacts and their mitigation measures are reviewed below. Impacts during the construction phase are minor and not considered in this review.

(a) Water Quality

The main source of water pollution in Mizoram is urban and domestic sewage, causing a wide spread bacteriological pollution of water sources. Open waste dumping sites are also a major cause of water

pollution. Farmers make a low use of fertilizers and pesticides in Mizoram, and agriculture is not considered as a source of pollution for surface water.

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. Programme 3-1 for horticulture and programme 2-2 for paddy will promote an organic farming system, as much as possible. On a whole, the resulting negative impact of the master plan on water quality should be minimal, and rather positive if compared with the no project alternative. It is however probable that within this context, few farmers will want to increase their crops from agrochemicals use, inducing a risk of surface water pollution. The way to mitigate the impacts on water quality is to organize awareness heightening and training campaigns for the proper selection of pesticide products, proper handling and use of fertilizers and pesticides, and proper elimination of the pesticides waste packaging. In the long term, monitoring the use of agrochemicals and the quality of surface water should be undertaken.

The master plan establishes the conditions for facilitating the development of the agro-industry sector in Mizoram at the horizon 2035 (programme 3-3). 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 (SPCB), 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) Rivers Habitat

There are 14 major perennial rivers and 3 small wetlands (Tamdil, Palak, and Rengdil lakes) in Mizoram. 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 surveyed, are potentially affected by siltation and erosion of the river banks.

Surface water diversion for irrigation in programme 2-2 will mainly concern small streams, which are less dependent on minimum flows than major rivers for the preservation of aquatic habitats. Minor irrigation schemes are more likely to affect rivers habitats in case of development along the perennial rivers, during the dry season, if the minimum ecological flow is not respected. Conservation of water in programme 2-2 has however an opposite positive effect, since it will contribute to replenishment of the sustainable flow in rivers downstream. 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 programmes should not significantly affect the rivers habitat.

(c) Water Use

The main sources of water in Mizoram are springs and streams. The surface water sources are sensitive to pollution and drought. Given the conditions of water scarcity during the dry season, water use is particularly sensitive to any upstream change in quality or quantity. Programme 2-2 (soil and water conservation facility) has a positive impact on water conservation and water resources, at the benefit of programmes 2-1 and 3-1. In case of development of irrigation schemes in chain along the same catchment area, the potential for conflictual use of scarce water is however high.

Programme 2-2 (WRC development) has a potential of negative impacts on water use. Each irrigation scheme will be designed in order to guarantee that the river flow downstream will be sufficient to cover the needs at all times. The use of groundwater as a supplementary source of irrigation should be minimal, with full capacity of natural replenishment, and absence of domestic use of groundwater in the same hydro-geological unit. During operation, logging of canals due to the infestation of aquatic weeds could contribute to reduce the flood flow downstream, and then to affect the availability of water supply, particularly during critical drought periods when water becomes scarce. Maintenance of the canals

against clogging will help to sustain the normal water flow. The resulting negative impact of the master plan on water use should be minimal to moderate.

(d) Involuntary Resettlement

Villages are clustered hilltop or hillside. 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 cultivation fields is 4km or more, whatever the category of farming (shifting cultivation, settled rainfed cultivation, settled irrigated cultivation).

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. According to the local conditions, the loss of housing settlements is however possible, in isolated cases. Human settlements other than housing settlements are more likely to be affected by the projects, especially the huts established by farmers for facilitating the agricultural works. Induced damages on or loss of such settlements need to be compensated at least according to the Mizoram Land Acquisition Rules 2010. In case of rehabilitation or resettlement of people in a village community, the conditions of compensation and resettlement should be planned in accordance with the rules given by the National Rehabilitation and Resettlement Policy, 2007. Programmes 2-1, 2-2, and 3-1 have no impact on human settlements.

8.3.4 Mitigation Measures at Planning and Operation Stages

The mitigation measures at planning and operation stages are summarized in Table 8.3.2. Their strict application will minimize the negative impacts and maximize the positive impacts.

Table 8.3.2 Summary of Mitigation Measures at Planning and Operation Stages

Category of measure	Measures	Issues and main programmes of concern
Engineering design	Proper hydraulic design of each irrigation scheme in order to guarantee that the river flow downstream will be sufficient to cover the needs at all times	WATER USE / Programme 2-2
	Proper hydraulic design for sustainable use of groundwater within the capacity of natural replenishment *The use of groundwater as a supplementary source of irrigation should be restricted to minimal use*	WATER USE / Programme 2-2
Awareness heightening	Promotion of the organic farming system *Action inherent to the implementation of programmes*	WATER QUALITY / Programmes 2-1,3-1
	Awareness heightening campaigns and training for the proper handling and use of fertilizers and pesticides	WATER QUALITY / Programmes 2-1, 3-1
Monitoring	Monitoring the use of agrochemicals and the quality of surface water *In case of use of agrochemicals*	WATER QUALITY / Programmes 2-1, 3-1
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 / Programmes 2-2, 3-1
Implication of stakeholders	Coordination with water users associations *To identify potential conflicts in water use*	WATER USE / Programme 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 preserve the minimum flow in rivers*	RIVER HABITATS / Programme 2-2
	Coordination with the wildlife management authorities	RIVER HABITATS /

Category of measure	Measures	Issues and main programmes of concern
	Proper selection of sites for the irrigation schemes and horticultural development projects to avoid impacts on the protected areas and on areas with potential for nature conservation	Programmes 2-2, 3-1
	Coordination with the village Biodiversity Management Committees *To identify the nature conservation needs and find the most appropriate location of the development projects*	BIOLOGICAL DIVERSITY / Programmes 2-2, 3-1
	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 / Programmes 2-2, 3-1
	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 / Programmes 2-2 BIOLOGICAL DIVERSITY / Programmes 2-2, 3-1

Source: JICA Study Team

8.3.5 No Project Alternative

There is no alternative to the proposed programmes within the scope of the master plan. The only alternative is the no-project alternative, which means not implementing a programme. Table 8.3.3 provides a summary of the compared direct and indirect impacts of the master plan in case of implementation / no implementation of programmes. The table shows 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 8.3.3 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, erosion • Increased air and noise pollution from transport • Increased greenhouse gas emissions from transportation and Jhum farming.
Natural environment	• Creation of rich agroforestry systems • Lower human pressure on existing or potential protected	• Degradation of river habitats (low)	None	• Encroachment on forest land and protected areas • Increased loss of forest cover • Degradation of river banks and

Criteria	WITH MASTER PLAN		WITHOUT MASTER PLAN	
	+	-	+	-
	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			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

+ positive – negative
Source: JICA Study Team

Chapter 9 DPR Preparation Guideline

9.1 General

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.

9.1.1 Present DPR Preparation Procedure and Points to be Improved

There are some points to be improved in each stage of preparation of present DPR as shown in Table 9.1.1. The JICA Study Team and MID figure out nearly 13 points in the 4 categories namely project selection, agriculture planning, irrigation planning, facility design and construction planning and O&M planning.

Table 9.1.1 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

9.1.2 Proposed Improved Procedure for Verification

Considering the above points, 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 (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. The proposed procedure has 12 steps as mentioned in Table 9.1.2.

Table 9.1.2 Proposed Procedure for DPR Preparation

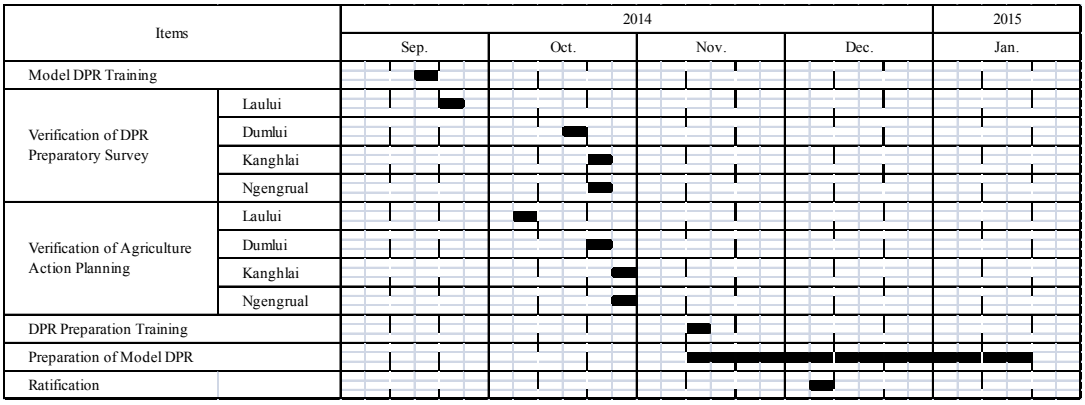
Step	Contents of Each Step	Responsibility	
		Main	Sub
Step 1	Publication of MI Scheme Selection and Implementation Procedure and Reception of Application	MID	-
Step 2	Preliminary Technical Site Survey for Scheme Selection	MID	-
Step 3	Preparatory Meeting among Relevant Departments in Division Level	MID,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

9.2 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 9.2.1



Source JICA Study Team

Figure 9.2.1 Work Schedule for Preparation of the Model DPR

9.3 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.

9.4 Necessary Training before Verification

9.4.1 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 9.4.1.

Table 9.4.1 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	61 officers from MID, DOA, DOH, DOF and DSWC
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
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.

9.4.2 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 model DPR. The contents and outlines of these trainings are summarized in Table 9.4.2 below.

Table 9.4.2 Outline of Technical Training for Irrigation

	Preparatory Technical Training	Site Survey Training	Training for the Preparation of the Model DPR
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	・ 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	・ 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	2 days (18, 19/Sep./2014)	Laului 2 days (23, 24/Sep./2014) Dumlui 3 days (14,15,16/Oct./2014) Kanghai 1 day (28/10/2014) Ngenrual 1 day (28/10/2014)	5 days (10~14 /Nov./2014)

Venue	ATI	4 project Sites	MID Head Office
Participant	35 MID engineers from head and division offices (SE, EE, SDO, JE, etc.)	30 Engineer in total 22 Beneficiaries in total	15 Engineers from MID
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	・ Site survey and confirmation of existing facilities conditions. ・ Soil test training. ・ Training of discharge water measurement. ・ Collection and confirmation of existing fishery conditions. ・ Training on the preparation of facility layout map.	・ 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.

Source : JICA Study Team

9.5 Activities and Major Findings during Verification for Each Step

9.5.1 General

The verification of the proposed procedure is conducted from step 5 to 12 as shown in Table 9.1.2. The contents and major findings of each step are described below.

9.5.2 Step 5 Awareness and Preparation of WUA Rules and Regulations

(1) Major Activity

- 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.

(2) Major Findings

- 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.
- 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.
- 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.
- 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.

9.5.3 Step 6 : DPR Preparatory Survey

(1) Major Activity

- Assessment of the water resources availability
- Preparation of base map for planning
- Conduct topographic survey
- Conduct soil classification test
- Conduct disaster risk survey (landslide, flooding, and erosion)

(2) Major Finding

- 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. 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. 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.
- 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.
- 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.
- Although soil survey is important for irrigation planning and one of the checklist items of the AIBP 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.

9.5.4 Step 7 : Agriculture Action Planning

(1) Major Activity

- 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.

(2) Major Finding

- 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. The quality/quantity of training and extension works for farmers are insufficient in general though some officer have the enough knowledge. Moreover some officers of DOA and DOH cannot provide proper suggestions or guidance to farmers considering their current situation.
- 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 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.
- 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.
- 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
- 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.
- 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.

9.5.5 Step 8 & 9 : Irrigation Planning, Facility Design and Preparation of O/M Plan

(1) Major Activity

- Study on water balance based on water resources availability and requirement
- Conduct irrigation system design and irrigation facility design
- Preparation of operation and maintenance plan for above facilities
- Preparation of construction plan

(2) Major Finding

- 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
- 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.
- 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.
- 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.
- 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. 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.

9.5.6 Step 10 & 11: Preparation of Construction Plan, Cost Estimation and Benefit Assessment

(1) Major Activity

- Preparation of construction plan
- Estimate project cost

- Estimation of benefit and calculation of B/C ratio

(2) Major Finding

- 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.
- 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.
- 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.

9.5.7 Step 12 : Consensus Building among Stakeholders

(1) Major Activity

- Sharing the contents of DPR
- Clear the mandate and responsibility in the project management and signing the minute of meeting
- Making necessary modification in the plan, if needed

(2) Major Finding

- The prepared facility layout map and project summary were effective to share the DPR contents with stakeholder.
- The reminding the roles and responsibility of the stakeholders with signing the meeting minutes was seems to be effective. The discussion on project implementation was more accelerated at this time.

9.6 Summary of Prepared Model DPR

The summary of the four DPRs for MI schemes is shown in Table 9.6.1. The table summarises the location, farmland, irrigation, and farmers. Characteristics of the schemes are shown below.

9.6.1 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.

9.6.2 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.

9.6.3 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.

9.6.4 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 9.6.1 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

9.7 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 finalised in February 2015.

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. On the other hand, the main implementing organization based on the project budget is also assessed with 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.

- 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