SUPPORTING REPORT I (MASTER PLAN)

PAPER VIII

Watershed Management

THE STUDY ON FLOOD AND DEBRIS FLOW IN THE CASPIAN COASTAL AREA FOCUSING ON THE FLOOD-HIT REGION IN GOLESTAN PROVINCE

SUPPORTING REPORT I (MASTER PLAN)

PAPER VIII WATERSHED MANAGEMENT

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CHAPTER 1 PRINCIPLE OF THE FORMULATION OF THE WATERSHED MANAGEMENT PLAN

1.1 Purpose of the Formulation of the Watershed Management Plan

The purpose of the formulation of the watershed management plan is to review and evaluate the Implementation Plan prepared by Ministry of jihad-e- agriculture (hereinafter referred to as MOJA),Golestan province in 2003. And it is to propose the improvement point to the Implementation Plan on the basis of the evaluation result.

1.2 Position of the Plan

The position of the watershed management plan is one of the components of master plan for flood and debris flow mitigation and management.

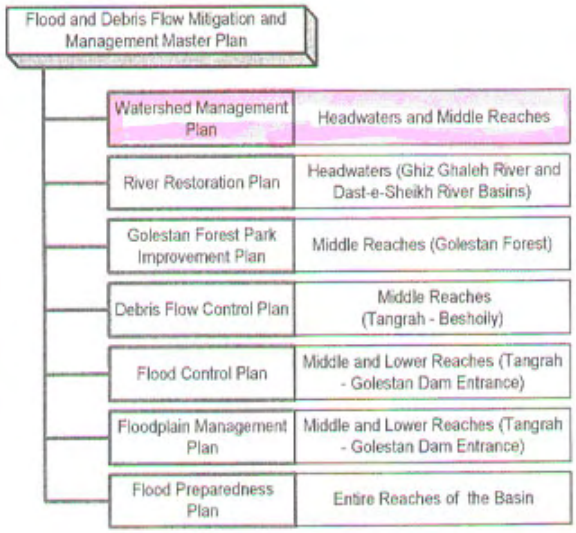


Figure 1.1 Basic framework of master plan

1.3 Method of the Evaluation

The Evaluation conducts focusing on biological engineering and related operations in the plan contents.

The evaluation of the plan contents is conducted by the five evaluation criteria (relevance, effectiveness, efficiency, impact, sustainability) from the viewpoint of the water, forest, villagers.

By making clarify the concrete problems in different area the total implementation plan is evaluated and proposed to improve the implementation plan

1.4 Target area of Implementation Plan

Implementation plan consists of the following 5 sub water basin (hereinafter referred to as 5 area).

(1) Dasht-e-sheik area (North Khorason province)

(2) Ghiz Ghale area (North Khorason province and Semnan province)

(3) Chesmae-khan area (North Khorason province)

(4) Tangrah area (Golestan province)

(5) Loveh area (Golestan province)

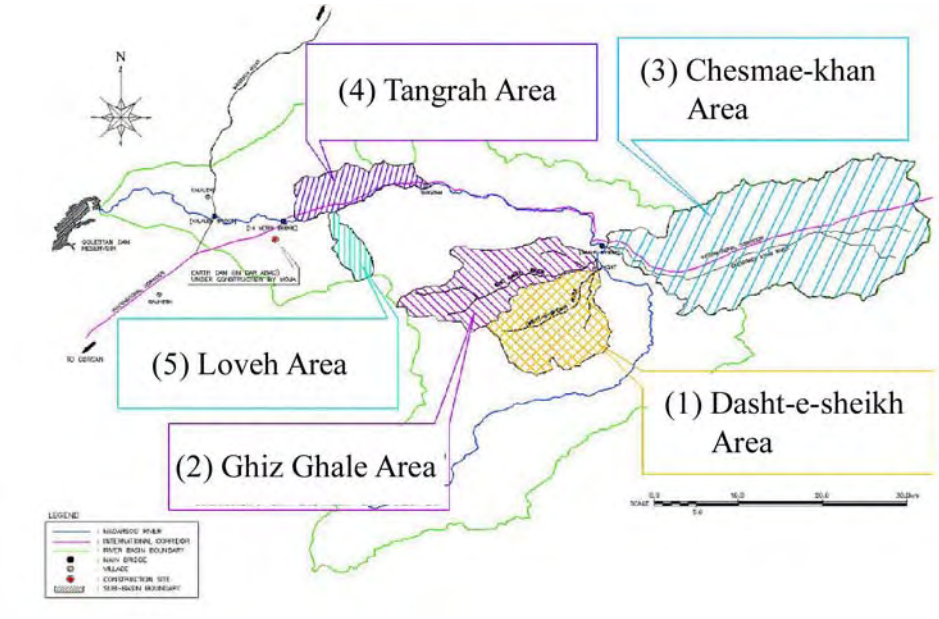


Figure 1.2 Location Map for Implementation Plan in Different Area

CHAPTER 2 PROCEDURE OF THE FORMULATION OF THE WATERSHED MANAGEMENT PLAN

Formulation of the watershed management plan conducts by the following procedure as a flow chart.

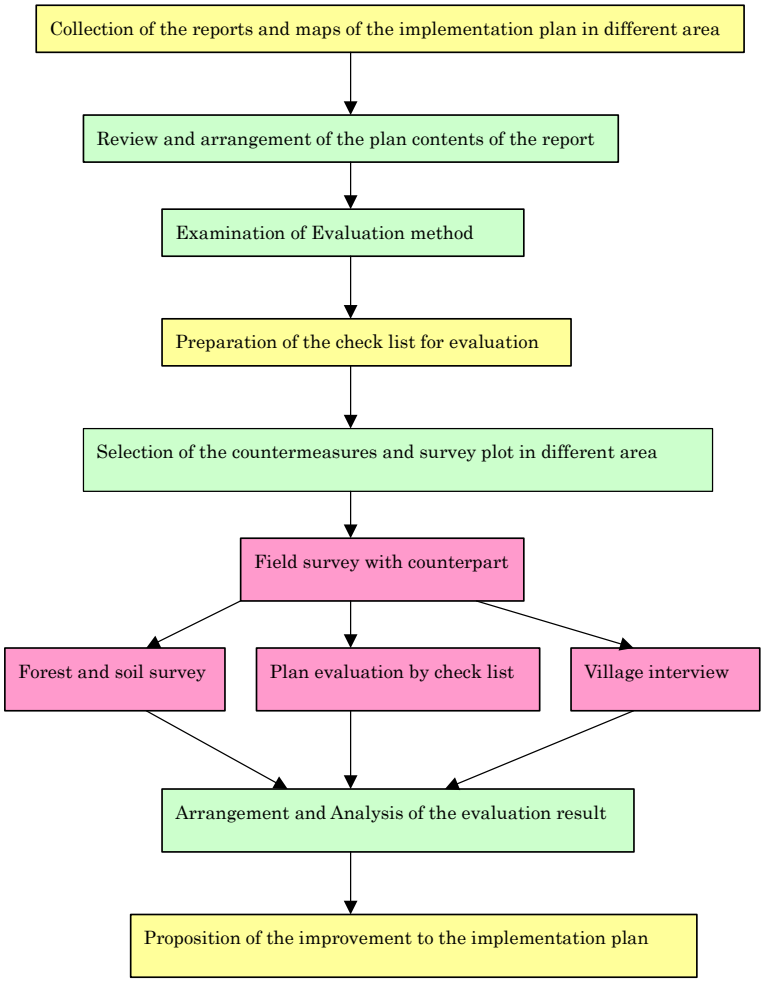


Figure 2.1 Flow Chart of the Formulation of the Watershed Management

2.1 Collection and Arrangement of Implementation Plan

Implementation plan was collected from the MOJA in Golestan province.

Implementation plan consist of 10 volumes in each different area as shown below.

Table 2.1 Contents of the Implementation Report

Volume	Title	Volume	Title
1	Physiography and topography	6	Pedology & Land capability
2	Meteorology & Climatology	7	Sediment & Erosion
3	Flooding & Hydrology	8	Animal husbandary, Agriculture & Socio – economy
4	Vegetation cover (Rangeland)	9	Synthesis & combination
5	Geomorphology & Geology	10	Study of proposals

Source: Report on implementation plan; MOJA, Golestan (2003)

2.2 Review of the Implementation Plan and Maps

Outline of the project area, plan contents, project cost and plan maps were reviewed on the implementation plan.

Interview was conducted to the local consultant to confirm the plan contents.

Confirmation of thematic maps such as Land use map and plan map was conducted in cooperation with GIS division, MOJA Golestan province.

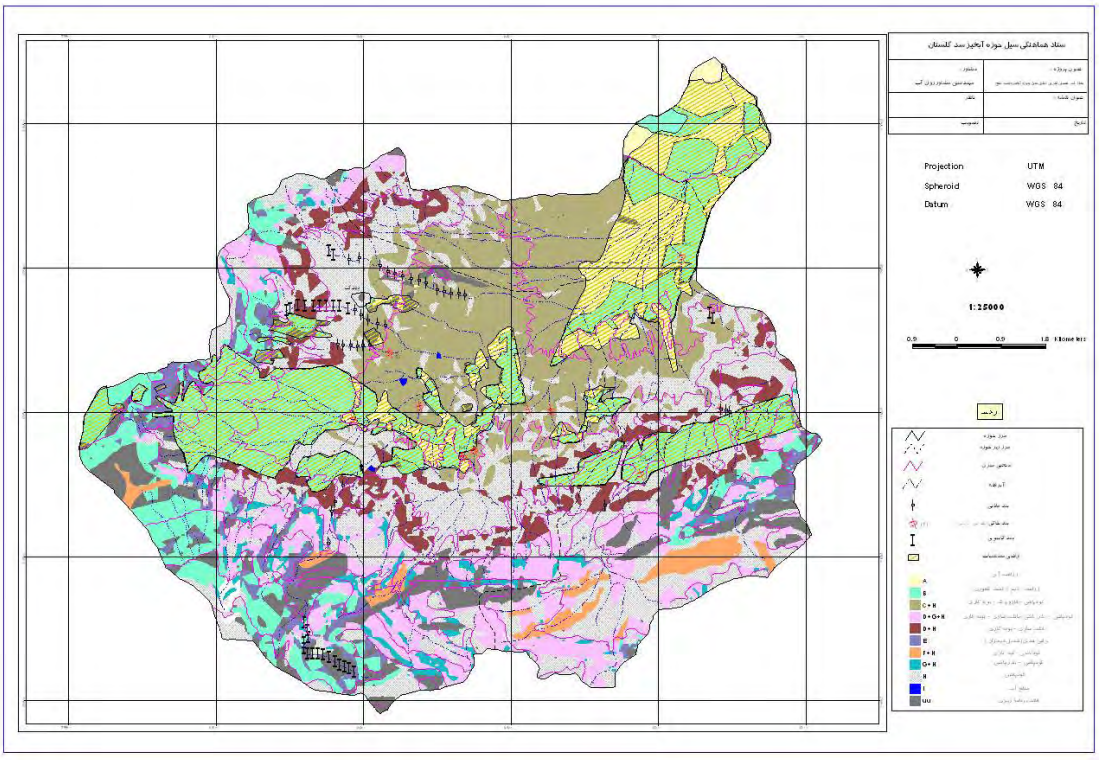


Figure 2.2 Sample of the Plan Map (Dasht-e-sheikh)

Plan maps in different area are shown as Appendix 1.

2.3 Examination of the Evaluation Method

Evaluation viewpoint was designated for the evaluation of Implementation Plan.

Evaluation item and contents was decided on the basis of field reconnaissance and plan contents.

Framework of the check list for evaluation was prepared referred to five evaluation criteria.

2.4 Field survey for Evaluation

The countermeasure in different area was selected for the field survey and selected the survey plot by using plan maps and aerial photos.

The soil and vegetation survey was conducted in different area and village chief interview was done to confirm the comprehension to the implementation plan.

The countermeasure in different area was evaluated by check list

2.5 Data Analysis and Evaluation

On the basis of the field survey result the check list was arranged and the problem of the countermeasure was analyzed in different area

Moreover evaluation result was arranged and analyzed according to the five evaluation criteria.

2.6 Proposition for the Improvement

On the basis of evaluation result improvement point was proposed to technical and operational issues of the Implementation Plan.

CHAPTER 3 OUTLINE OF THE IMPLEMENTATION PLAN

3.1 Background of the Implementation Plan

Disaster of flood and debris flow was occurred in 2001, 2002 in the Golestan river basin and many villagers and visitors fell victim to the flood and debris flow.

After disaster of flood and debris flow flood control committee was organized to coordinate the rehabilitation and prevention activities among the organization concerned.

MOJA dispatched the experts to the Golestan river basin to investigate the disaster condition and arranged the issue of the rehabilitation and prevention of the Golestan river basin.

In response to this result MOJA formulated watershed management plan to the madroso river basin which was huge damaged among the Golestan river basin in 2003 under flood control committee.

In madroso river basin MOJA selected the 5 sub basin at the viewpoint of run off, soil erosion , damaged, etc. and MOJA formulated the implementation plan in 5 different sub basin (area).

3.2 Outline of the Project Area for Implementation Plan

3.2.1 General Condition

General condition of project area is shown as table 3-1

5 different area is 2,264ha to 45,400ha and Chesmeh khan area is the largest in different area.

Dasht-e-shek , Ghiz ghaleh and Chesmeh khan area locate at 1,304m, 1,430m, 1,440m respectively in average elevation. Tangrah and Loveh area locate at 647m and 1,198m respectively in average elevation.

One village in Ghiz ghaleh and Loveh area, two villages in Dasht-e-shek area and four villages in Tangrah and Chesmeh khan area locate respectively.

Population varies with area from 615 to 5333 persons and literacy rate is high in every area as 80 to 92%.

Table 3.1 General condition of the project area

Catchment area	Area (ha)	Height over the sea level (m)			length of main river (km)	Admiest-rative	villages	population person	population density	Literacy population
		Max	Min	Avarage		boundry.		person/km2)		
Dasht	12,096.66	1,824	980	1,304	16.32	N. khorasan	1. Dasht-e kalpush 2. Bidak	1,523	12.5	90.20%
Tangrah	5,582.27	1,350	250	647.01	18.20	Golesran	1. Terenjlely 2. Sadegh abad 3. beshoily 4. ag-ghamish	5,333	95.5	80.7
Ghizghaleh	13,404.26	2,160	980	1,430	25.08	N.khorasan (7,911ha) Semnan -5,493	1. Dasht-e shad	1,422	10.6	92.3
Loveh	2,264.58	1,850	250	1,198.23	10.96	Golesatn	1. Loveh	615	27.1	84.7
Chesmeh khan	45,400	2,480	980	1,440	46	N. khorasan	1.Robat-e Kareh bill 2. Armadlu 3. Cheshmeh khan 4. Spakhu	2,099	0.9	82.51

3.2.2 Climatic Condition

Climatic condition of the different area is shown as table 3-2.

Dasht-e-shek, Ghiz ghaleh and Chesmeh khan area belong to semi arid/arid and cold zone.

Annual mean temperature of those area is higher the above mentioned area10.68℃ to 11.2 ℃. Annual mean rain fall is 256.6mm to 305mm and rain fall distributes in spring season relatively.

Tangrah and Loveh area belong to humid and moderate zone.

Annual mean temperature of these area 15.1℃ to 16.6 ℃. Annual mean rain fall is from 513mm to 706mm and rain fall distributes in winter season relatively.

Table 3.2 Climatic Condition of the Project Area

Planning area	kind of climate	temperature (C^0)			annual evaporation (mm)	rainfall (mm)				
		annual mean	monthly max	monthly min		annual mean	distribution in seasons %			
							spring	summer	atumn	winter
Dasht	semi arid and cold	11.2	36.4	-6.2	671.2	256.6	31.46	18.58	22.2	27.76
Tengrah	humid and moderate	16.6	29.3	2.9	823.8	706	24.5	16.5	25	34
Ghizghaleh	semi arid cold	10.7	29.8	-6.7	679.3	305	31.33	22.7	21.48	24.49
Loveh	semi humid moderate	15.1	27.5	0.9	709.4	513.12	24	17	25	34
Chesmeh khan	arid	10.68	19.4	3.6	669	271	32	10	35	23

3.3 Outline of the Implementation Plan in Different Area

3.3.1 Purpose and strategy

From implementation plan in different area the purpose and strategy of implementation plan arranged was arranged and it is shown as follows.

Purpose of planning	Strategy of planning
- Increasing infiltration rate & decreasing run off - Increasing the vegetation cover in range land & forest areas - Decreasing critical discharge of exception flood - Soil conservation - Improvement of life condition of people & increasing their income	- Flood control and decreasing flood damage - Sediment and soil erosion control

3.3.2 Summary of the Mechanical and Biological and Protective Operations

The summary of mechanical, biological and protective operations are as follows.

(1) Mechanical engineering

Area / Counter Measure	Dasht-e-sheikh	Ghiz Ghaleh	Tangrah	Loveh	Cheshmae kahn
Earth dam	7N-Storage= 2.8x10^6 m3	18N-Storage= 2.8x10 m^3			5N-Sto 0.7^6
Gabion dam	36N-3,249M^3	49N2,213M^3	42N2,728M^3	21N954M^3	21N-1,330M^3
Masonry dam	35N-24,105M^3	25N38,659M^3	9N5,700M^3	6N2,595M^3	36N-1,276M^3
River engineer			900m		

(2) Biological engineering

Area / Counter Measure	Dasht-e-sheikh	Ghiz Ghaleh	Tangrah	Loveh	Cheshmae kahn
Terrancing	120 ha	125ha	200ha		
Banqet	1,360 ha	180 ha	1,740ha		101,793m
Furrow	2,850ha		2,650ha		
Changing by dry farming	140ha	500ha			300ha
Supporting drinking water for sheep	32 N	9 N			10 N
Fertilizing in range land	6,000ha	2,700ha			
Seeding in range land	4,200ha	2,700ha			
Mass seeding	240 ha	70ha	180ha		2,939ha
Planting	4,104ha	380ha	180ha		2,630ha

(3) Protective engineering

Area / Counter Measure	Dasht-e-sheikh	Ghiz Ghaleh	Tangrah	Loveh	Cheshmae kahn
Training and extension	Farmers, range-men	1,000person	1,200 person	1,250person	
Enforcemenet of closures and maintenance	Implementation project area	85 ha of forest	4, 350ha		9,418ha
Fence in forest		28 km	15 km		
Tending forest		60 ha	767 ha		
Cleaning (forest)		30 ha	42 ha		
Seeding (forest)		60 ha	35 ha		
Planting (forest)		25 ha	150 ha		
Making a channel		2 km	6 km		
Improving forest roads			28 km		
Exsiting sheep from forest area			6, 000 head		

CHAPTER 4 EXAMINATION OF THE EVALUATION METHOD

4.1 Evaluation Viewpoint

This evaluation rests on the premise that the study is flood and debris flow mitigation and management in the madroso water basin. Evaluation viewpoint is as follows.

The implementation plan takes into needs and incentive for the villagers consideration.

The implementation plan approaches the rehabilitation and conservation of the natural resource at the relationship between forest and the flood/debris flow.

The implementation plan includes not only flood control but also water resource for the villagers and livestock.

The evaluation will be conducted to the countermeasures in different area at the viewpoint mentioned above.

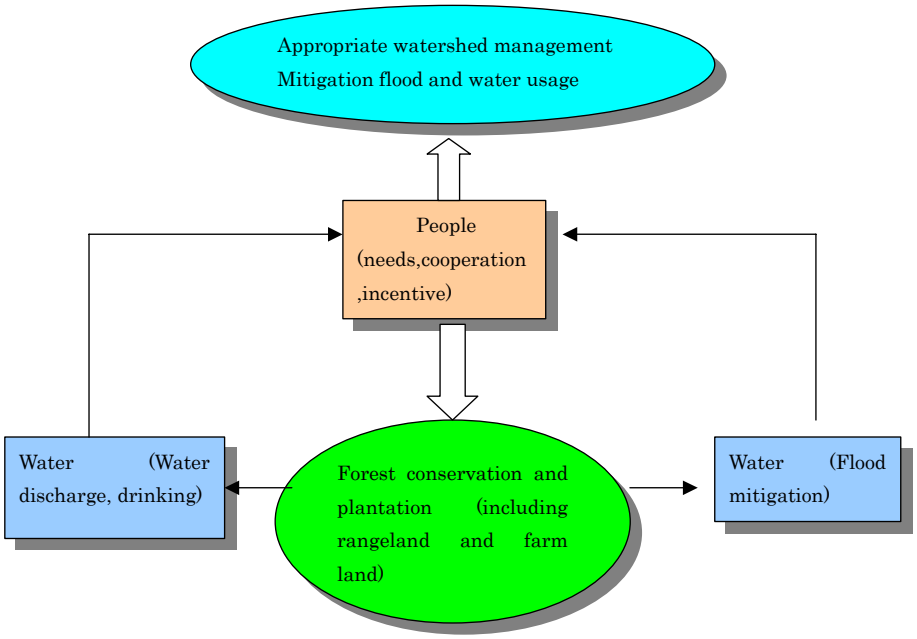


Figure 4.1 Evaluation Viewpoint

4.2 Evaluation Item

The evaluation of the implementation plan will be conducted referred to five evaluation criteria of DAC. The summary of the five evaluation criteria is as follows.

Table 4.1 Evaluation item

Item	Definition
Relevance	Project purpose and overall goal are consistent with country policy such as watershed management policy, needs of the target group.
Effectiveness	Effectiveness involve ascertainment of the extent to which Project purpose has been/is expected to be achieved by means of the outputs
Efficiency	Productivity of the implementation process. What ratio of Input was converted into outputs? Here is analyzed the quality, quantity and appropriateness to the means, methods, and timing of inputs.
Impact	Impacts include direct and indirect, positive and negative effects of the implementation of the project and influences and effects not foreseen at planning.
Sustainability	Whether or not the benefits from the implementation of project will continue after the project assistance ends in examined, centering on the self-reliance of the project.

Source:PCM Management tool for development assistance, monitoring & evaluation, FASID 2004, March

4.3 Evaluation Contents

Evaluation contents will be arranged more concretely to prepare the check list for the evaluation from the result of the review and the field reconnaissance and plan contents.

Evaluation contents in each evaluation item are as follows.

Table 4.2 Evaluation Item and Contents

Item	Evaluation contents to be used in the check list
Relevance	1. Suitable for the purpose of the project (No.1) 2. Sufficient information from the MOJA to the village (No.13)
Effectiveness	1. Suitability site for the planting/seeding or bunket, furrow and terracing (No.6, 7) 2. Appropriate selection of the species for the water and soil conservation (No.8) 3. Appropriate plant density of the planting /seeding (No.9) 4. Possibility of the protection of the plantation (No.11)
Efficiency	1. Possibility of planting/seeding at viewpoint of manpower and material (No.3) 2. Possibility of procurement for seedlings/seeds (No.4) 3. Possibility of the implementation in proper period (No.5)
Impact	1. Environmental care for the environmental protection (No.15, 16)
Sustainability	1. Effective implementation by MOJA, NRGO (No.2) 2. Possibility of the maintenance of the planting/seeding site (No.12) 3. Benefit to the villagers from the project (No.14) 4. Sufficient implementation of training and extension activity (No.17) 5. Environmental aspect for the project implementation (No.15, 16)

( ): number of the evaluation item in check list
This survey did not evaluate cost estimation for countermeasure (No.10).

4.4 Framework of Check List

The check list for evaluation in the field survey was prepared taking into simple, easy and handy consideration. Framework of check list is shown as bellow and Format of the check list is shown as appendix 3.

Table 4.3 Framework of check list

Item	Contents
Evaluation item	This check list set 17 items as evaluation contents
Consideration point	Consideration point is prepared to understand more concretely in each items
Plan contents	Plan contents refer to the summary of the countermeasures in different area.
Class for evaluation	The class for evaluation divides 3 categories such as 1) possible, 2) moderate, 3) impossible to make easy for evaluation in the field.
Score	Score sum up the result of evaluation category. The difference between score and number of evaluation number show the situation of evaluation. That is, reminder is smaller and evaluation is better.
Reasons for evaluation	The problem or restricted factor for evaluation item will be noted.
Resource of evaluation	The resource of evaluation is not only implementation plan but also field survey, interview to the village chief,.

The summary of countermeasures in different area is shown as appendix 4.

CHAPTER 5 FIELD SURVEY

5.1 Preparation of the Field Survey

Before conducting the field survey the following issues were prepared.

(1) Selection of the countermeasure in different area from the summary of the implementation plan

(2) Selection of the survey plot from the implementation plan map

(3) Preparation of the check list for evaluation, field note for the soil and forest survey and format of the interview to the village chief.

5.2 Selection of Countermeasure in Different Area

The countermeasure in different area will be selected by the following view.

(1) Taking into survey period consideration one area will be selected 3 to 4 countermeasures.

(2) Selection does not concentrate the particular countermeasure as well as possible.

(3) Selected countermeasure make a point of locality from the general condition in different area

Selected countermeasures in different area are shown as follows.

Table 5.1 Outline of the selected countermeasures in different area

Area	1	2	3	4
Dasht-e sheikh	Banket 1,360 Ha	Furrow 2,850 Ha	Changing dry farming 140 Ha	Fertilizing in range land **6,000 Ha**
Ghiz-ghaleh	Terracing 125 Ha	Banket 180 Ha	Seeding in range land 2,700 Ha	**Tending forest** **60 Ha**
Cheshmae-khan	Banket 101,793 meters	Mass seeding 2,939 Ha	Planting 2,630 Ha	**Enforcement of closures and maintenance (Protected forest)** **9,418 Ha**
Tangrah	Terracing 200 Ha	Furrow 2,650 Ha	Enforcement of closures and maintenance (Protected forest) 4,350 Ha	**Tending forest** **767 Ha**
Loveh				

5.3 Selection of the Survey Plot

Survey plot was selected by using the topographic map, land use map , plan map and aerial photography to take into access and extent consideration.

Survey plots in different area are shown as follows.

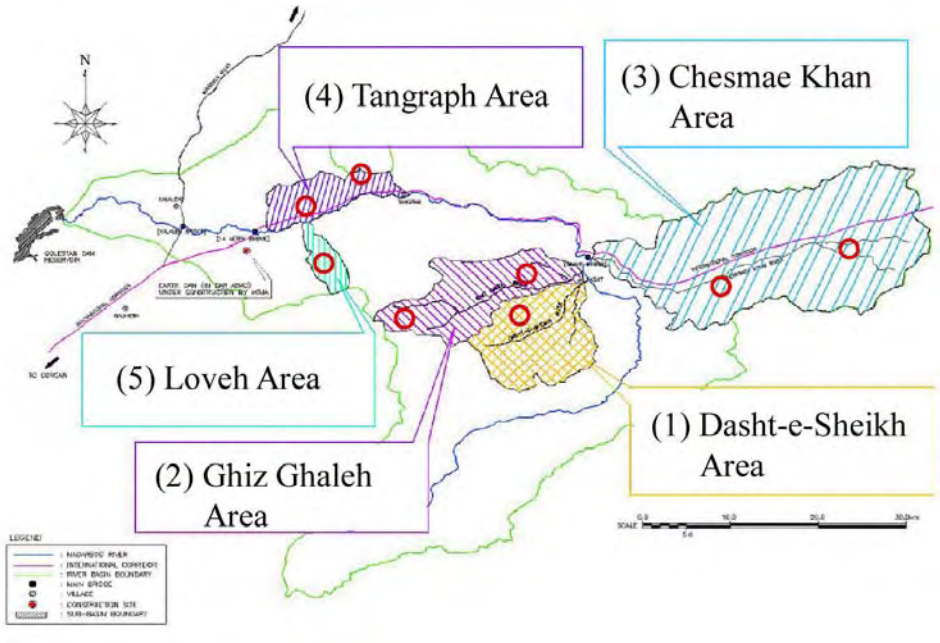


Figure 5.1 location map for selected survey plot

5.4 Site Condition Survey

Site condition survey was conducted about soil and forest condition to examine the plan contents surrounding the survey plot

5.4.1 Soil Profile Survey

Soil profile survey was conducted about soil depth, soil color, texture and hardness in different area (see Table 5.2).

The soil of rangeland is lack of A^0 layer because of the soil erosion. Texture of Soil consists of clay and silt clay affected by mother rock (limestone)and stimulated loess. On the other hand the soil of forest is A^0 layer and A layer including organic matter.

Table 5.2 Summary of the Soil Profile Survey

Area	Plot	Land use	A0	A Layer				B Layer				Vegetative cover
			Depth (cm)	Depth (cm)	Colour	Tex	Hardness (kg/mm2)	Depth (cm)	Colour	Tex	Hardness (kg/mm2)	%
DASHTE SHEIKH	1	rangeland		10	10YR 7-Jan	SC	12	15	10Y 6.6	SC	24	40
	2	rangeland		20	10YR 6.6	C	11	20	10YR 5.4	C	23	30
	3	dry farming		16	10YR 3.4	SC	26	21	10YR 4.6	SC	30	90
	4	rangeland		30	10YR 7.3	C	22	30	10YR 5.6	C	25	30
CHESHM-HKHAN	1	rangeland		15	10YR 6.4	SC	20	15	1.5YR 5.6	SC	27	25
	2	rangeland		30	10YR 7.4	S	20	10	6.6	SC	9	50
	3	rangeland		10	10YR 7.3	SC	16	20	10YR 8.4	C	32	25
	4	rangeland		15	10YR 7.6	SC	16	16	10YR 8.4	SC	32	25
GHIZ GHALEH	2	rangeland		20	10YR 6.4	SC	27	10	10YR 6.6	SC	26	65
	3	rangeland		30	10YR 6.4	S	26	10	10YR 5.3	SC	32	40
	4	forest	2	9	1.5YR 4.4	S	16	19	5YP 5.8	SC	27	60
Tengrah	3	forest	2	18	1.5YR 3.4	C	22	20	P.STR 4.6	C	29	100
	4	forest		8	1.5YR 2.2	C	15	20	5YR 2.2	SC	24	70
Loveh	1	forest	2	14	1.5YR 4.3	SCL	23	16	10YR 6.3	SC	25	50
	2	forest	5	14	5YR 5.3	SCL	22	25	5YR 4.4	SC	28	100
	3	forest	4	8	1.5YR 4.3	SC	21	17	5YR 4.3	SC	28	100

The relationship between vegetation cover and soil hardness is shown as follows.

The hardness of rangeland is harder than the hardness of forest. And vegetation cover is higher and hardness is smaller. It seems that the high vegetation cover shows to make the soil condition good such and to contribute low erosion and water reservoir.

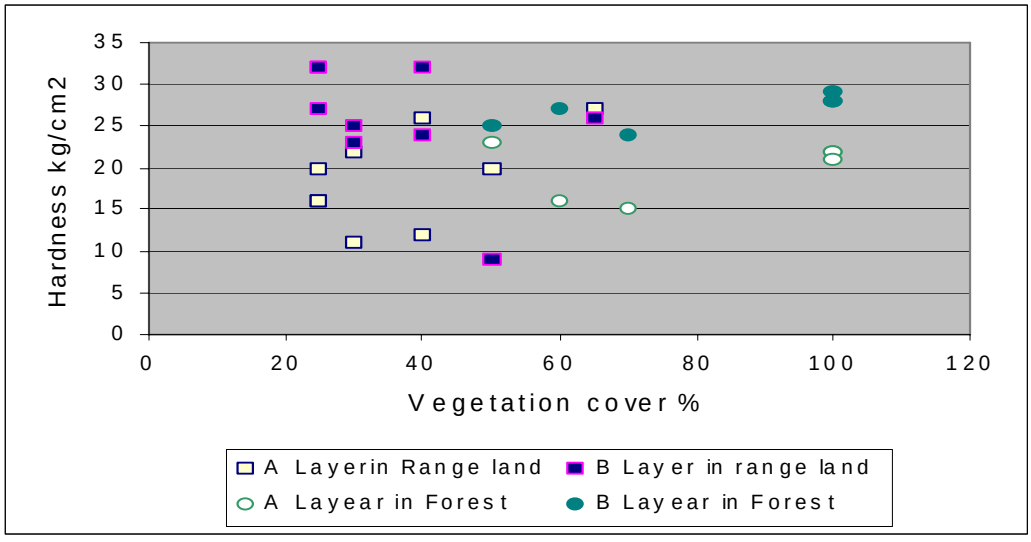


Figure 5.1 Relationship between hardness and vegetation cover

5.4.2 Forest Condition Survey

Forest condition survey was conducted by means of measurement of DBH (Diameter of Brest Height), height of tree and site condition in different area.

Forest type in different area was divided into old stand (40 years over), middle stand (20 to 40 years) and young stand (20 years below).

Oak (Quercus orientalis) dominated in every stand except manmade forest in Tangrah area.the result of survey is shown as follows.

Table 5.3 Summery of Forest Survey

Area	Plot No.	Type of forest	Age	Mean DBH (cm)	Mean Height (m)	Numbers/ha	Condition			Remarks
							Soil erosion	Natural regeneration	Grazing affect	
Ghiz-ghaleh	4	Quercus	Middle	21.0 (59)	3.8 (7.5)	1,000	Large	Small	Large	Production forest
Tangreh	3	Quercus	Old	24.6 (146)	11.0 (26)	625	Small	Middle	Small	Protection forest
	4	Cupress	Young	9.7 (15)	5.4 (7)	1,000	Small	Small	Large	Protection forest
Loveh	1	Quercus	Old	29.3 (60)	8.4 (15)	275	Large	Small	Large	Production forest
	2	Quercus	Old	16.5 (165)	9.5 (38)	800	Small	middle	Small	Production forest
	3	Quercus	Middle	21.4 (45)	17.2 (26)	900	Small	Large	Small	Production forest

Old stand near the village in Loveh (plot 1) is small number of trees and small size of DBH affected largely by overgrazing and was difficult to find the natural regeneration(see figure 5.2). But old stand well managed in Loveh (plot 2) is good condition for the natural regeneration so as to control the grazing.

Mean DBH of the old stand is 24.6cm(max 146cm) in Tangrah(plot 3), 29.3cm(max 60cm) in Loveh(plot 1) and 16.5cm(max 165cm) in Loveh(plot 2) respectively. And mean height is 11.0m(max 26m), 8.4m(max 15m) and 9.5m (max 38m) respectively.

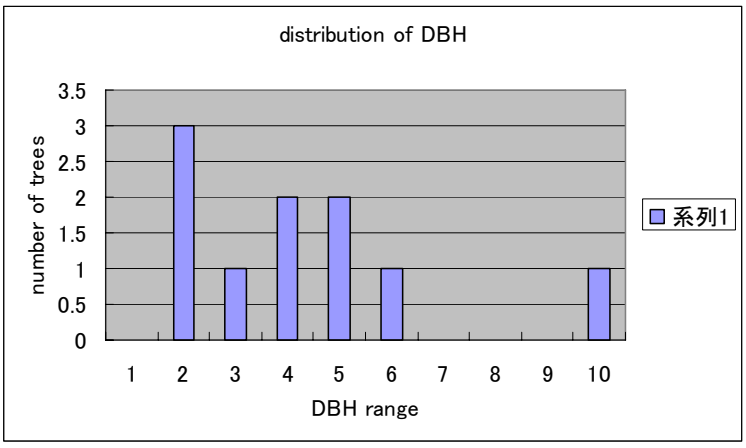


Figure 5.2 Distribution of DBH in Loveh (plot1) Old stand affected by grazing

Middle stand near the village in Ghiz ghareh area was affected largely by overgrazing same as old stand in Loveh area (plot1). But middle stand in Loveh area (plot3) well managed is good condition for the natural regeneration without overgrazing and this stand is well developing the under layer of vegetation in the forest(see fig 5-3).

Mean DBH of the old stand is 21cm (max 59cm) in Ghiz ghaleh(plot 4) to 21.4cm (max 45cm) in Loveh(plot 3) and Mean height largely differ as 3.8m (max 7.5m) in Ghiz ghaleh(plot 4)to 17.2m (max 26m) in Loveh(plot 3) depending on management condition.

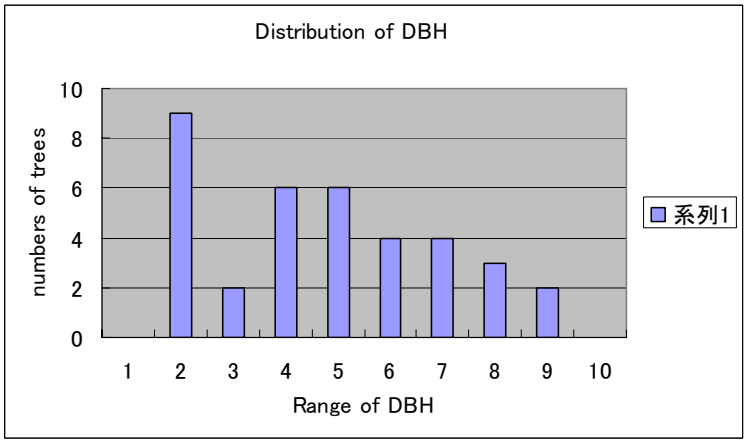


Figure 5.3 Distribution of DBH Middle stand well managed in Loveh (plot 3)

Young stand is cypress man-made forest and is affected by grazing in spite of the fencing surrounding the forest. It is necessary to patrol the forest or cooperate with villagers.

5.4.3 Interview to the Village Chief

Every village was suffered from disaster of the flood and debris flow on farmland and cattle in 2001and 2002.

On the formulation of Implementation plan MOJA visited the villages to meet the village chief to explain the contents of Implementation plan several times.

Village chief needs more to explain the concrete explanation about Implementation plan and require the incentive from the project not only labor wedge but also loan to improve their living condition.

Some village has participated MOJA training for watershed management. Village chief needs to more train villagers for watershed management from MOJA.

The village chief interview about actual condition is shown as appendix 5.

Table 5.4 Summary of the village chief interview

Area / Item	Dasht-e-sheikh	Ghiz Ghaleh	Tangrah	Cheshmae kahn
Receipt of the information	Receipt from the MOJA and Consultant company. They come village 2-3times	Receipt from the Consultant company.	Receipt from the Consultant company.	Receipt from the Consultant company.
Participation of the project	Villagers work the project as labour Bio engineering work will not start yet.	No explanation of concrete plan of this project from the MOJA	Villagers work the planting activities in the banqet of MOJA project	Needs to the investment cost. No explanation of concrete plan of this project
Training for the watershed management	Village request the MOJA training and finished the 20 days training.	They have had training about protected forest for 5 days		No experience of the training by MOJA
Others	Existing project like banqet, planting, and … in this area that are successful	Need to service from the MOJA Loan for living		10 years ago MOJA engineer came to teach the planting method of olive. But he came 1time. So olive plantation was not successful

5.4.4 Evaluation of the Implementation Plan by Using Check List

After the evaluation of countermeasure in different area by check list was conducted. Evaluation result was filled in the check list including the result of site condition survey, interview to the village chief and counterpart opinions.

CHAPTER 6 EVALUATION RESULT

6.1 Evaluation Result of the Countermeasures in Different Area

After finishing the field survey evaluation item was arranged and analyzed in addition to the existing project activities such as Semnan province and counterpart opinions.

6.1.1 Dasht-e-sheik

(1) Score

The evaluation score shows that countermeasures get generally high evaluation. But bunqet was evaluated a little bit low.

(2) Low evaluation item and its reasons

In the Dasht-e-sheik there are some problems such as site selection of bunqet, procurement of the seedling to the furrow, understanding of local people and using fertilizer in the range land.

Table 6.1 Evaluation result of the countermeasure in different sub basin

Sub basin	No.	Countermeasure	Score	Low evaluation item and its reason
Dasht-e-sheikh	1	Banqet	19 (16)	1. There is problem for the site selection of banket construction site because of stony area (No.7)
	2	Furrow	17 (16)	1. The procurement is a little difficult because of no existence of the nursery near the area for the seedlings (No.4)
	3	Changing by dry farming	14 (14)	1.This countermeasure is high evaluation. But the understanding of the village is necessary in implementation stage (No.13)
	4	Fertilizing in the range land	11 (9)	1. If the chemical fertilizer use in vast area there is negative impact on the surrounding area (No.15)

(16): total number of items in different countermeasure
(No.17): item number in the check list

6.1.2 Ghiz Ghale

(1) Score

The evaluation score shows that each countermeasures get high evaluation. But seeding in range land was evaluated a little bit low.

(2) Low evaluation item and its reasons

In the Ghiz Ghale there are some problems such as construction cost of terracing, maintenance of the bunqet and planting fruit trees, grazing control, chemical fertilizer using with mixed seed in range land and planting tree in the forest.

Table 6.2 Evaluation result of the countermeasure in different area

Sub basin	No.	Countermeasure	Score	Low evaluation item and its reason
Ghiz Ghaleh	1	Terracing	17 (16)	1. This countermeasure is high evaluation. But the understanding of the village is necessary because of the construction cost and restricted farmland for the villagers (No.12)
	2	Banqet	17 (16)	This countermeasure is high evaluation. But some of the construction work is difficult because of the steep slope on the upper part (No.7) Participation of villagers needs to maintain the banqet and planting fruit trees (No.12)
	3	Seeding in range land	18 (15)	This countermeasure is high evaluation. But the grazing control is necessary to protect the seeding area(No.11) If the chemical fertilizer use in vast area there is negative impact on the surrounding area (No.15)
	4	Plant tree in the forest	17 (15)	1. Understanding of the villagers is necessary because villagers have a little experience of training about forest management (No.17)

(16): total number of items in different countermeasure
(No.17): item number in the check list

6.1.3 Chesmae-khan

(1) Score

The evaluation score shows that countermeasures get generally high evaluation. But Mass seeding was evaluated a little bit low such as planting in the range land.

(2) Low evaluation item and its reasons

In the Chesmae-khan area there are some problems such as lack of the maintenance of banqet, grazing control, planting method.

Table 6.3 Evaluation result of the countermeasure in different area

Sub basin	No.	Countermeasure	Score	Low evaluation item and its reason
Chesimae khan	1	Banqet	17 (15)	1. This countermeasure is high evaluation. But luck of the maintenance is problem in this area (No.12)
	2	Mass seeding	18 (15)	1. This countermeasure is high evaluation. But the mitigation control is necessary from the grazing impact (No.11)
	3	Planting (range land)	19 (15)	1. Low planting density does not cover on the ground in the early stage (No.9)
	4	Enforcement of closures and maintenance	11 (9)	1. This countermeasure is high evaluation. But maintenance is problem because of lack of understanding and cooperation of the villagers (No.11- 14)

(16): total number of items in different countermeasure
(No.17): item number in the check list

6.1.4 Tangrah

(1) Score

The evaluation score shows that some countermeasures get high evaluation. But tending forest and terracing was evaluated low.

(2) Low evaluation item and its reasons

In the Tangrah area there are some problems such as lack of the training for terracing, the lack of incentive for strip cropping , selection of tree species and protection of the planting site.

Table 6.4 Evaluation result of the countermeasure in different area

Sub basin	No.	Countermeasure	Score	Low evaluation item and its reason
Tangrah	1	Terracing	18 (16)	This countermeasure is high evaluation. But the maintenance is necessary because of run off control (No.12) The understanding and cooperation of the village is necessary because of the lack of the training about technical and economical point (No.17)
	2	Strip cropping	17 (15)	1. This countermeasure needs the incentive like a loan to the villagers (No.14)
	3	Enforcement of closures and maintenance	11 (9)	1. The training for forest management to the villagers is necessary because of lack of knowledge for forest management in this area (No.17)
	4	Tending forest	24 (15)	The selection from the local species needs to protect planting trees from the insect and environmental aspect (No.8) The protection countermeasure like a fence surrounding the forest because the villagers graze the cattle into forest (No.11)

(16): total number of items in different countermeasure
(No.17): item number in the check list

6.1.5 Loveh

According to the implementation plan in Loveh the mechanical engineering was proposed without biological engineering. So the evaluation has not conducted the field survey by using the check list. But forest survey has been conducted in different forest type in Loveh sub-basin to examine the forest management system for the water and soil conservation.

6.2 Evaluation Result and Analysis at the Viewpoint of the Five Evaluation Criteria

According to the five evaluation criteria, implementation plan was evaluated. The result of the evaluation and analysis is shown as follows.

Table 6.5 Evaluation result of the implementation plan by five evaluation criteria

Item	Result of evaluation
Relevance	1. Suitable for the purpose of the project (No.1) Project purpose is flood control, soil erosion control, run off control and living condition improvement The purpose of the countermeasure in different area is suitable for the project purpose. Implementation plan was formulated on the basis of the watershed management plan in 2002 prepared by MOJA, Golestan province. 2. Sufficient information from the MOJA to the village (No.13) According to the village chief interview, MOJA went to the village in different area to inform the project contents. The understanding of the some village (Dasht) is more necessary at implementation stage. 3. This implementation plan is high necessity to implement the project from the following reasons. The implementation plan is suitable for the watershed management policy and is necessity to control the flood and debris flow in Madoroso water basin. The countermeasures in different area are suitable for the purpose of the implementation plan. MOJA staff visited the village to explain the implementation plan and to receive the opinions from the villagers.
Effectiveness	1. Suitability site for the planting/seeding or bunqet, furrow and terracing (No.6, 7) (1) The stony area and the steep slope were selected for the site of banqet in some area. (2) At the viewpoint of stability of banqet it is necessary to select the non-stony area and gentle slope 2. Appropriate selection of the species for the water and soil conservation (No.8) (1) The selected species needs to select appropriate tree species for protection and environmental aspect. 3. Appropriate plant density of the planting /seeding (No.9) (1) Planting in the rangeland does not cover the ground in the early stage. (2) For the water and soil conservation planting density take into consideration growth of species at the planning stage consideration. 4. Possibility of the protection of the plantation (No.11) (1) Every countermeasure shows high evaluation result in the check list because MOJA and NRGO will be implemented. But at the field survey the grazing control seem to be necessary in different area to implement the project. 5. It seems that some countermeasure was not effective to control the run off and soil erosion and it needs to improve some countermeasure to achieve the project purpose from the following reasons. Suitable site for planting, bunqet and furrow need to examine at the viewpoint of the topographic feature. Selection of the tree species and density of planting for the rapid vegetation cover are not sufficient. Protection of the plantation depends on the understanding the villagers and the grazing control.
Efficiency	1. Possibility of planting/seeding at viewpoint of manpower and material (No.3) (1) It is enough to procure the manpower and material for planting and construction from the village and in the vicinity of the project site.

	2. Possibility of procurement for seedlings/seeds (No.4) (1) It is enough to procure seedlings/seeds. But in some area (Dasht-e-sheik) the procurement is a little difficult because of no existence of the nursery near the area for the seedlings 3. Possibility of the implementation in proper period (No.5) (1) Appropriate period for planting and seeding is selected in different area. Smooth procurement of manpower and material will be conducted efficiently for the project from the following reasons (1) The procurement of the manpower and material for the project will be conducted by MOJA or NRGO. (2) The villagers require the job to the implementation plan (3) The period of the planting and seeding is decided by MOJA or NRGO.
Impact	Environmental care for the environmental protection (No.15, 16) (1) Chemical fertilizer is planed to use for the vegetation cover on the range land (Dasht and Ghiz ghareh) If the chemical fertilizer use in vast area there is negative impact on the surrounding area. 2. The implementation plan has positive impact to external area by run off and soil erosion control except for the environmental aspect. The fertilizer usage should control to conduct take into the area, period and method consideration.
Sustainability	1. Effective implementation by MOJA, NRGO (No.2) (1) MOJA and NRGO can implement this project as the implementation body. 2. Possibility of the maintenance of the planting/seeding site (No.12) The countermeasures in different area are high evaluation. After completion of the project it is necessary to understand and cooperate from the village. The lack of the maintenance is problem in this area to control the run off and soil erosion 3. Benefit to the villagers from the project (No.14) (1) The incentive from the project needs to examine from the opinion of the villagers. (2) The villagers are difficult to accept introducing the terracing because of the construction cost and restricted farmland for the villagers 4. Sufficient implementation of training and extension activity (No.17) Villagers have a little experience of training about forest management and villagers are lack of the training about technical and economical point. The understanding and cooperation of the village is necessary through the training and extension. 5. There is no problem to implement the project because of responsibility of the work belong to the MOJA and NRGO. But project sustainability seems to be restricted by the following reasons after finishing the project. Comprehension of the villagers to the project does not seem to be sufficient. Extension and training to the villagers for understanding the watershed management has not been conducted sufficiently.

CHAPTER 7 THE PROPOSITION FOR THE IMPROVEMENT TO THE IMPLEMENTATION PLAN

On the basis of the above evaluation result the following improvement point will be proposed about main biological and operational activities in the implementation plan.

7.1 Terracing

(1) Actual condition

Terracing is the countermeasure to protect the soil erosion and to maintain the agricultural product. The dry farming in Tangrah area has been cultivated in a parallel direction with slope by using tractor for a long time. Soil erosion is the most important issue for the agricultural productivity and watershed management. But actually there is a few terracing in the area.

(2) Problem

The terracing in the dry farming does not seem to be popular. The reasons are as follows.

(a) Lack of the knowledge

Villagers did not know that terracing mitigate the run off and soil erosion. They seem that terracing make their cultivated land small and terracing is high cost for construction.

(b) Lack of the visit to the village by the extension worker

Ten years ago agriculture extension worker from the MOJA come to construct the terracing on the farmland with villagers. After that agriculture extension worker did not come to the village for extension and maintenance.

(c) Conservative mind and respect of experience

Villagers don’t want to change the cultivation method. They believe that conventional method is cheaper than terracing method.

(3) Improvement

(a) Planting on the slope

Perennial crop like a fodder tree will be planted on the slope between each terracing for the agriculture income and protection of the run off and soil erosion intensively.

(b) Coordination with agriculture extension worker

To introduce the terracing to the villagers MOJA needs to coordinate the agriculture extension worker and to strengthen the agriculture extension worker through the training of soil conservation and economical aspect.

7.2 Banqet

(1) Actual condition

The banqet is the countermeasure contracted the 15-40% slope to control the run off and soil erosion in the rangeland. We can find the banqet in the Dasht-e-sheh and Cheshime khan area. Most of the bunqet combinate the plating and seeding activity. Recently the tree species come from Australia is common for the planting species.

(2) Problem

Gully erosion in the banquet occurred in the Dasht-e-sheh area . The gully erosion seems to be caused by following reasons.

(a) Design problem

So as to construct the length of the each one line of banqet too long the water concentrate to weak point of the structure and the gully occurred.

(b) Need of the maintenance

The mouses dig the hole to construct the nest in the banqet. Once the heavy rain comes, water concentrates to the nest and destroy the nest.

(3) Improvement

(a) Coordination of capacity of the pocket

The rain fall shall be estimated before design and the bunqet shall be divided into several part along the contour line to avoid the water concentration.

(b) Appropriate density of banqet

The banqet will be constructed according to the topography and inclination. But luck of the banqet was found in the upper part of the slope in the Dasht-e-sheh area and the gully occurred from the top of the slope. For this reason it is important to care the topographic condition for design of the bunqet on the upper part of the slope.

(c) Site selection for the maintenance

The banqet is the more effective countermeasure for run off and soil erosion. But there is the problem of maintenance for the pocket and planting materials in the vast area. Before designing the location from the village and needs of the villagers shall be examined to maintain the bunqet and planting trees easily.

7.3 Encouragement of the Closure and Maintenance

(1) Actual condition

Encouragement of the closure and maintenance (hereinafter designated as ECM) is to protect and maintain the forest from the grazing, farming and illegal cutting by closure of the forest.

The forest remains upper part of the project area. But the grazing expands widely in to forest area and beats the soil surface in some part of the forest in the Tangrah and Ghiz galeh area.

Natural Resource General Office (hereinafter designated as NRGO) prohibit the grazing in the forest and construct the fence surrounding the forest to protect the natural regeneration.

(2) Problem

(a) Poor vegetation cover and soil erosion

Poor vegetation cover and soil erosion occurred by the grazing, farming and illegal cutting in the forest area..

(b) Difficulty of the regeneration

In the north west region of Iran the natural regeneration is the element of forest management. But it is difficult to regenerate and to maintain the forest by the grazing, farming and illegal cutting.

(c) Social aspect

It is difficult for the NRGO to control the grazing and farming in the forest area at the viewpoint of social aspect.

(3) Improvement

(a) Delegation of forest maintenance

The delegation to be concluded between NRGO and villagers needs to maintain the forest such as patrol in the surrounding the forest, tending the forest (weeding, pruning). It is considered that NRGO gives the villagers land use right to get the incentive like a fuel woods in the forest.

(b) Cooperation with the villagers

Through the extension and training activities. It needs to understand the forest function, especially water discharge and run off. It is important to show the management system to the villagers.

7.4 Sustainable Forest Management

(1) Actual condition

Loveh forest management unit well has been managed and contribute the forest products since 1964.

(2) Problem

(a) Decrease of the production from the forest

From the recent trend of forest production in Iran forest production has been decreasing to protect the forest as the natural resources, biodiversity, water conservation etc.,

(b) Needs to water and soil conservation

The flood and debris flow have been occurred recently by insufficient land use, deforestation by bad maintenance and heavy rain in summer season.

(c) Introduction of new cutting system

Loveh forest management unit will change from the shelter wood cutting system to the selecting cutting system. There is some problem such as logging method, protecting the seedling and soil surface.

(3) Improvement

(a) Establishment of the goal for sustainable use

The goal of the forest management needs to shift from the forest product to the water and soil conservation by appropriate zoning.

(b) Density control for selecting cutting

NRGO try to introduce selective cutting system as new forest management system in Loveh forest management unit. The model project needs to establish

the regeneration method, the logging method and cutting method for density control at the viewpoint of water and soil conservation.

7.5 Effective Combination Work

(1) Actual condition

Some check dams are under construction by MOJA North Khorason on the basis of implementation plan in the Dasht-e-sheh area

(2) Problem

(a) Precedence of mechanical engineering (hereinafter referred to as ME)

ME in different area will start at the beginning of the project to rehabilitate and mitigate the flood and debris flow. Taking care the upper part consideration.

(b) Delay of the biological engineering (hereinafter referred to as BE)

BE needs the consensus with villagers to relate closely to their living condition. So it needs to time to start.

(c) Acceleration of the sedimentation to ME

In the case of the heavy rain, run off reaches the ME site immediately from the upper part. If the upper part belongs to the degraded rangeland the soil erosion and sedimentation occurred (hereinafter designated as NRGO) to the ME

(3) Improvement

(a) Combination BE with ME in sub basin

Before starting the ME it need to take into the site condition of the upper part consideration. If necessary the construction of ME will conduct parallel with BE on the basis of the consensus of the villagers..

7.6 Extension and Training

(1) Actual condition

According to the village chief interview some villagers attended the training course by MOJA

(2) Problem

(a) Few experience of attendance of training

Villagers still have not understood the watershed management. MOJA has not conducted the training seminar several times

(b) Lack of the locality of the training

The implementation plan enhances the importance of the training. But the training contents in different area at the viewpoint of locality was not described in the implementation plan

(3) Improvement

(a) Problem analysis in different area

Problem analysis is one of the methods to clarify the problem of the villagers about water resources, soil conservation and living condition by using PRA RRA methods. At the same time training needs from the villagers will be received.

(b) Cooperation with agriculture extension workers

It is not yet clear which office prepare the training course. Agriculture extension workers always contact the villagers to improve their living condition. They have know and how.

So watershed management office needs to establish the good relationship with agriculture extension workers

7.7 Coordination with Other Agency

(1) Actual condition

The implementation plan belongs to the three provinces, Golestan, North Khorason and Semnan province. Some countermeasures are planed to conduct in the Golestan National Park.

(2) Problem

(a) Overlap of the boundary in the project area

MOJA staff in different province does not know other MOJA's activities of the watershed management in the same sub water basin

(b) Some countermeasures in the Golestan National Park

In Ghize Galeh area and Chesimea khan area some countermeasures will be planed for water and soil conservation in Golestan National Park. MOJA Northern Khorason province is waiting for the permission of construction from the DOE.

(3) Improvement

(a) Solution by Flood Control Committee

Flood Control Committee has been established after the flood disaster in 2001,2002. This committee member consists of MOJA, NRGO, DOE, MORT, MOE, etc in provincial level. The chairman of this committee is from MOJA in Golestan.

Flood Control Committee should coordinate other agency about implementation plan, monitor and evaluate the procedure of the project.

(b) Good communication for conservation activities

MOJA discuss DOE in Semnan province to construct check dam in the protected area and MOJA takes time to receive the permission. But the check dam has controlled the sedimentation from the upper part of protected area. So DOE request MOJA to construct the check dam to the other water basin in the protected area.

CHAPTER 8 CONCLUSION

The formulation of the watershed management plan was to review and evaluate the Implementation Plan by MOJA, Golestan province and to propose the improvement point to the Implementation Plan.

The review and evaluation was conducted to countermeasures in different area, Dasht-e-sheik, Ghiz Ghale, Chesmae-khan, Tangrah, Loveh .

This evaluation focuses on the biological engineering and related operation.

The evaluation was conducted by using the evaluation checklist which refers to five evaluation criteria taking into the viewpoint of the people, water and forest consideration.

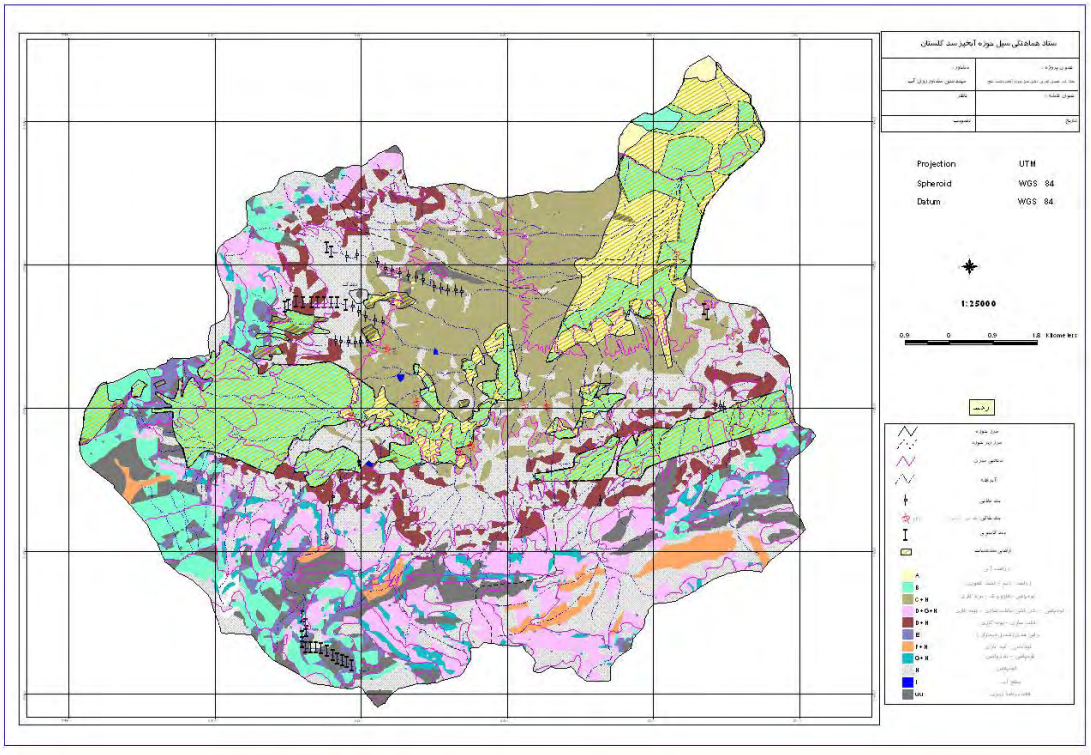
According to the field survey and the evaluation result Implementation plan has high relevance, efficiency and impact.

Effectiveness and sustainability of implementation plan will be more improved by this proposition

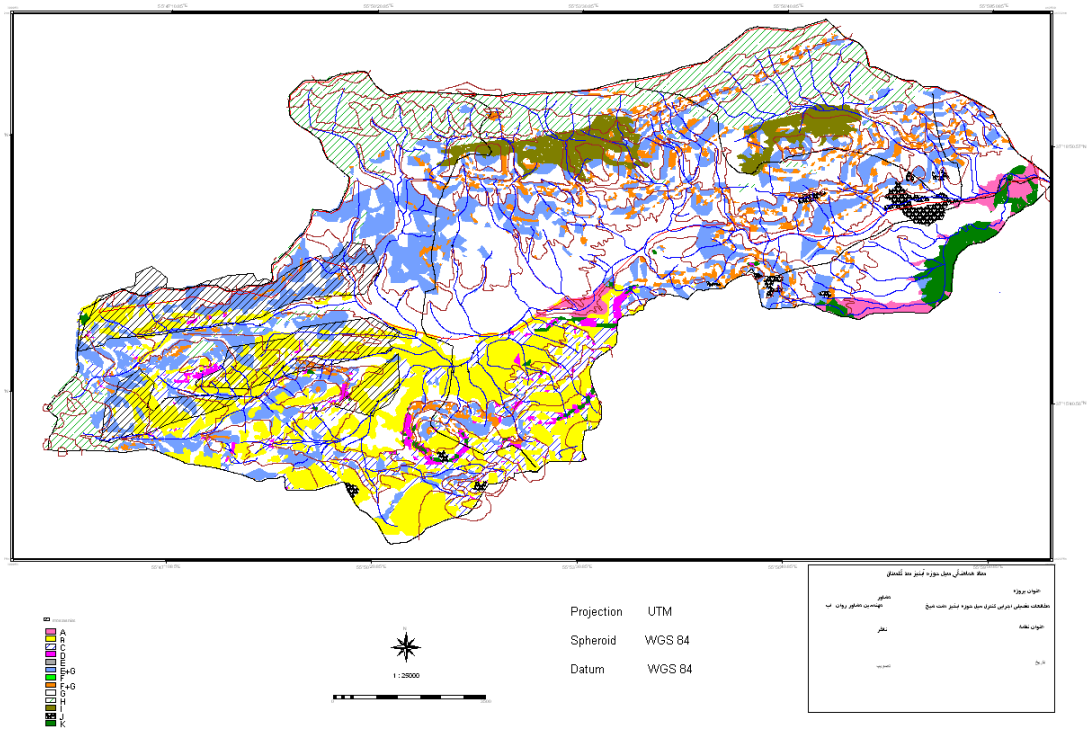
Implementation plan will contribute to master plan as watershed management plan in this study area for the control of the flood and debris flow in Madarsoo water basin.

The remaining sub basin in Madarsoo river basin should be covered and planned to implement the watershed management as soon as possible.

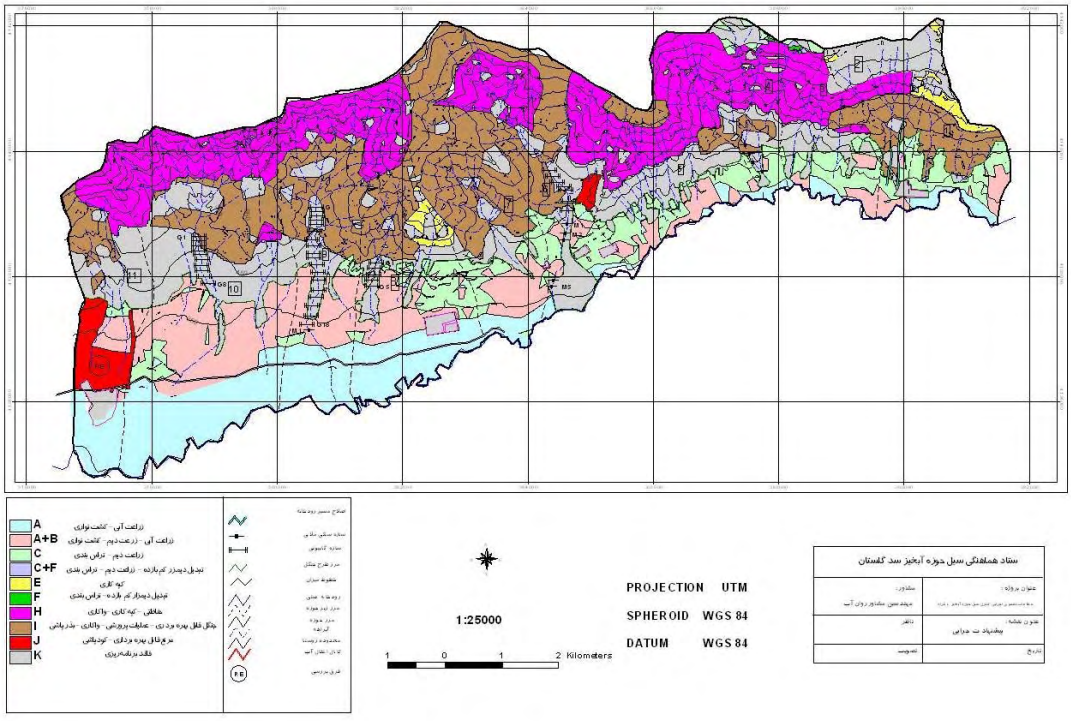
ANNEX 1 MAP FOR IMPLEMENTATION PLAN



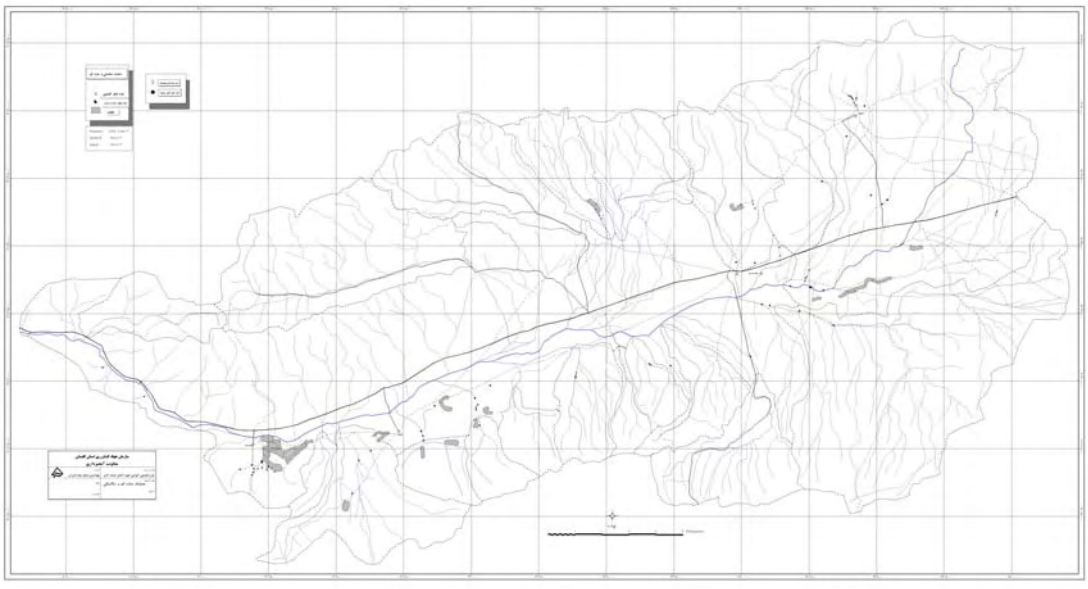
Dasht-e-Shik PLAN MAP



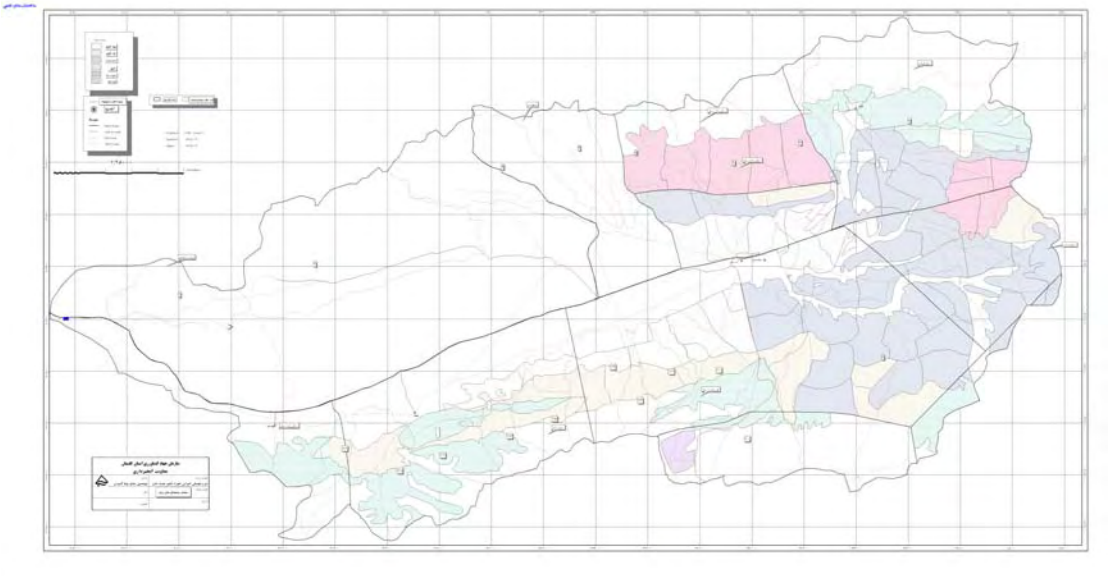
Ghiz galeh PLAN MAP



Tanglah PLAN MAP



Cheshmae Khan Structure Map



Cheshmae Khan Proposed Map

ANNEX 2 COST OF COUNTERMEASURE IN DIFFERENT AREA

1 Dashte- sheikh

operation year	terracing ha	Banket ha	Furrow ha	Changing dryfarming	Fertilizing ha	Earth dam	Gabion m3	masonry m3	Seeding ha	Mass seeding	Planting ha	Derinking water
1	20	220	200	40ha	200	7 N	3200	8536	200	80	400	11
2	20	330	500	20	800			2547	700	80	800	10
3	20	330	500	20	500			1624	700	80	800	7
4	25	340	500	25	500			3313	700		800	4
5	35	520	500	35	1000			4784	700		960	
6			650		1000			3302	1200		950	
7					1000							
8					1000							
total	120	1740	2850	140	6000	7N	3200	24105	4200	240	4410	32

2 Tangraph

operation year	terracing	Banket ha	Furrow ha	Changing dryfarming	Fertilizing	Earth dam	Gabion	masonry	Seeding	Mass seeding	Planting ha	Making channel
1		200	200							20	150	6km
2		300	500							20		
3		300	500							20		
4		300	500							30		
5		460	500							30		
6			650							30		
7										30		
8												
total		1560	2850							180	150	6km

3 Loveh

operation year	terracing	Banket	Furrow	Changing dryfarming	Fertilizing	Earth dam	Gabion m3	Training & Extension
1							955	250
2								250
3								250
4								250
5								250
6								
7								
8								
total							956	1250

4 Cheshmeh khan

operation year	terracing	Banket m	Furrow	Changing dryfarming	Fertilizing	Earth dam	Gabion	masonry	Seeding	Mass seeding	Planting
1		32739					455	232		266	
2		8520					821	1099		673	
3										260	225
4										475	524
5										329	336
6										325	202
7										443	241
8										168	211
9											151
total										2939	1890

operation year	Derinking water	Training & Extension	Enforcem-ement	Fence in forest	Tending in forest	Cleaning forest	Seeding forest	Planting forest	Making channel
1			599						
2			973						
3			1011						
4			349						
5			558						
6			175						
7			269						
8									
9									
total			3934						

5 Ghiz ghaleh

operation year	terracing ha	Banket ha	Furrow	Changing dryfarming	Fertilizing ha	Earth dam	Gabion m3	masonry	Seeding ha	Mass seeding	Planting
1	20	20		100	800		316		800	35	
2	20	30		100	800		1898.8		800	35	
3	25	30		100	800				800		
4	25	40		100	300				300		
5	35	60		100							
6											
7											
8											
total	125	180		500	2700		2214.8		2700	70	

operation year	Derinking water	Training & Extension	Enforcem-ement	Fence in forest	Tending in forest	Cleaning forest	Seeding forest	Planting forest	Making channel
1	3N	200	55	6	30	15	30	25	1km
2	6	200	30	6	30	15	30		1km
3		200		6					
4		200		6					
5		200		4					
6									
7									
8									
total	9N	1000	85	28	60	30	60	25	2

ANNEX 3 CHECK LIST FOR THE EVALUATION OF THE IMPLEMENTATION PLAN

Check List for the evaluation of the implementation plan in each area for the flood and erosion control (draft)

Person in charge: Mr.Mohamadi, Mr. Milzai, Mr. Saadat, Mr.Hisamichi

Sub –watershed; Dasht-e –shaikh (Map No1) Countermeasure; Banquet project

	Item	Consideration point	Plan contents	Evaluation	Score	Reason for the evaluation	Resources
1	Is this countermeasure suitable for the purpose in this area?	1.Flood control 2.Soil erosion control 3.Run off control 3.Living condition improvement		1.Suitable 2.Moderate 3.Unsuitable			1.Implementationplan report by MOJA
2	Is this countermeasure implemented effectively by implementation body?	1.Who is responsible? 2.Number and work of implementation structure? 3.Relation with the village for the project (establishing the farmer group)		1.effective 2.Moderate 3.Ineffective			1.Implementationplan report by MOJA 2.Interview to the MOJA staff
3	Is it possible to plant /seed in this Area (size ,volume)	1.The procurement of man power and material 2. The comprehension from the land owner		1.Possible 2. Moderate 3.Impossible			1.Implementationplan report by MOJA, 2.Interview to the village chief and MOJA Stuff
4	Is it possible to procure the numbers of the seedlings/seeds?	1..Condition of the nursery 2. .Condition of the market		1.Possible 2. Moderate 3.Impossible			1.Implementationplan report by MOJA
5	Is it possible to implement the planting/seeding on schedule?	1.Proper period for planting/ seeding 2.Consideration of grazing activity, rain fall		1.Possible 2. Moderate 3.Impossible			1.Implementationplan report by MOJA
6	Is it suitable for selecting the planting/seeding site	1.Land degradation, 2.Inclination, soil depth, precipitation, vegetation cover 3. transportation, market		1.Suitable 2. Moderate 3.Unsuitable			1.Implementationplan report by MOJA 2.Field survey
7	Is it suitable for selecting the terracing, banqet, and fallowing	Land degradation, 2. Inclination, soil erosion		1.Suitable 2. Moderate 3.Unsuitable			1.Implementationplan report by MOJA 2.Field survey
8	Is it appropriate select the species for planting/ seeding	1.Good increment of the root 2.First coverage on the ground 3.Function of the flood and erosion control 4.Function of the economic benefit like a Fodder for cattle, firewood, fruit		1.Appropriate 2. Moderate 3.Inappropriate			1.Implementationplan report by MOJA 2.Field survey
9	Is it appropriate to plant/seed by density	1.Ground cover in the early stage 2.competition of other vegetation		1.Appropriate 2. Moderate 3.Inappropriate			1.Implementationplan report by MOJA 2.Field survey
10	Is it appropriate to estimate the cost for planting/seedingand terracing, banqet, fallowing	1.Land condition (hardness, dry, inclination) 2.Transportation condition 3.Easy procurement for Material (nursery)		1.Appropriate 2. Moderate 3.inappropriate			1.Implementationplan report by MOJA .2. Interview to the MOJA stuff

	Item	Consideration point	Plan contents	Evaluation	Score	Reason for the evaluation	Resources
11	Is it possible to protect the Plantation	1.Who is responsible? 2.Protection from the grazing, insect, fire, farming 3.protection measures		1.Possible 2.Moderate 3.Impossible			1.Implementationplan report by MOJA 2. Interview to the MOJA stuff 3. Field survey
12	Is it possible to maintain effectively to planting/seeding site?	1.Who is responsible? 2.Watching the grazing 3.Irrigation to the plant/seed 4.Cooperation of the villagers 5.repair of the wall of the terrace/banquet/fallow		1.Possible 2. Moderate 3.Impossible			1.Implementationplan report by MOJA 2. Interview to the MOJA stuff 3.Field survey
13	Does the local people understand the project?	1.Receive the information of this project to the village from the MOJA 2.Suitable countermeasure to the village 3.Village knows what kind of benefit for the people 4.Village have intention of participating this project		1.Sufficient 2. Moderate 3.Insufficient			1.Implementationplan report by MOJA 2.Interview to the village chief
14	Does people receive the benefit from the countermeasure?	1.Labor cost 2.Loan or credit 3.Flood control and soil erosion conservation		1.Possible 2. Moderate 3.Impossible			1.Implementationplan report by MOJA 2.Interview to the village chief
15	Does the countermeasure take natural environment into consideration?	1.Exotic species use 2.Mono-culture 3.Chemical fertilizer 4.Soil erosion 5.protected area		1.Sufficient 2. Moderate 3.Insufficient			1.Implementation plan report by MOJA 2.Field survey
16	Does the countermeasure take socio-economic environment into consideration?	1.local needs 2.Land tenure problem		1.Sufficient 2. Moderate 3.Insufficient			1.Implementation plan report by MOJA 2. Interview to the village chief
17	Is there any training and extension activities for the countermeasure?	1.Capacity building for the MOJA stuff and villagers 2.What kind of subject and purpose? 3.Where will the training be conducted?		1.Sufficient 2. Moderate 3.Insufficient			1.Implementationplan report by MOJA 2.Interview to the village chief and MOJA stuff

ANNEX 4 THE SELECTED COUNTERMEASURES IN DIFFERENT AREA

1 The Selected Countermeasures in Dasht-e-sheik

	Banqet	Furrow	Changing Dry Farming	Fertilizing in Range land
1. Purpose	-precipitation storage -run off control - Soil erosion control -increasing vegetation cover	-precipitation storage - run off control -Soil erosion control -increasing vegetation cover	Increasing infiltration rate & decreasing run off -Soil erosion control	-Increasing cover vegetation -soil erosion control
2. Location, natural condition	Slope > 12% Slope < 45%	Slope < 12 %	Slope > 10 % Slope < 60 %	Seeding areas, precipitation storage areas (Banket, Furrow), Poor range land
3. Area (size, volume)	1,360 ha	2,850 ha	140 ha	6,000 ha
4. Species for planting	Atriplex	Atriplex	Olive, walnut, Corylus, Peach, Apple	-------
5. Number of planting/ seeding	--	5 – 10 kg/ha	Olive, walnut, Peach, Apple (200/ha), Corylus (1000/ha),)	50 kg/ha (Fertilizer)
6. Species for seeding	--	Agropyron elengatum, Artemisa siberica		------
7. Planting/ seeding schedule	March	March	March	end of September
8. Unit cost	750,000 Riyals/ha	250,000 Riyals/ha	20,000,000 Riyals/ha	90,000 Riyals/ha

2 The Selected Countermeasures in Ghiz Ghaleh

	Terracing	Banket	Seeding in range land	planting tree in the forest
1. Purpose	-Increasing infiltration rate & decreasing run off -Soil erosion control	-precipitation storage - run off control -Soil erosion control -increasing vegetation cover	- increasing vegetation cover, decreasing run off, Soil erosion control	Increasing the number of appropriate forest species in the area that the forest were destroyed (cutting or removing the inappropriate forest species)
2. Location, natural condition	Slope > 10% Slope < 30%	Slope > 12% Slope < 45%	Fertilizing area, 70 % in Semnan province and 30% in N-Khorasan province	---
3. Area (size, volume)	125 ha	180 Ha	2,700 Ha	25 ha
4. Species for planting	Olive, walnut, Corylus, Peach, Apple,	Olive, walnut, Corylus, Peach, Apple, Atriplex		Quercus,
5. Number of planting/ seeding	140 – 200 / ha	140 – 200 / ha	5 – 10 kg/Ha (mix)	1,500-4,000 / ha
6. Species for seeding	--	----	Artemisia siberica, Astragalus tribuloides, Kochia Sp.,	------
7. Planting/ seeding schedule	March	March	November	November, December
8. Unit cost	28,107,299 Riyals/Ha	750,000 Riyals/ha	150,000 Riyals/ha	5,000,000 Riyals/ha

3 The Selected Countermeasures in Cheshmae khan

	Banqet	Mass seeding	Planting	Enforcement of closures and maintenance
1. Purpose	-precipitation storage -run off control - Soil erosion control -increasing vegetation cover	- increasing vegetation cover -decreasing run off -Soil erosion control	-precipitation storage -run off control - Soil erosion control -increasing vegetation cover	-Protection range land
2. Location, natural condition	Slope > 12% Slope < 45%	We are not able to use machines in this area (steep, rock,..)	---	---
3. Area (size, volume)	101,793 meters	2,939 ha	2,630ha	9,418 ha
4. Species for planting	Atriplex	-----	Atriplex	----
5. Number of planting/ seeding	--	1 -3 kg/ha	225 – 335 / ha	-----
6. Species for seeding	--	Grasses, Medicago, Agropyron,	-----	-----
7. Planting/ seeding schedule	March	November or March	March	-----
8. Unit cost	750,000 Riyals/ha	300,000 Riyals/ha	1,250,000 Riyals/ha	80,000 Riyals/ha

4 The selected countermeasures in Tengrah

	Dry farming, Terracing	Irrigated farm land, dry farming, strip cropping	Enforcement of closures and maintenance, mass seeding, replanting	Tending forest, seeding, planting
1. Purpose	-Increasing infiltration rate & decreasing run off -Soil erosion control	-Increasing infiltration rate & decreasing run off -Soil erosion control	-Protection forest areas,	-Protection forest areas, Increasing the number of appropriate forest species in the area that the forest were destroyed
2. Location, natural condition	Slope > 10% Slope < 30%	Slope < 10%	----	----
3. Area (size, volume)	200 ha	-----	4,350 ha	767 ha
4. Species for planting	Olive, walnut, Corylus, Peach, Apple,	Buffer crop like Alfalfa	-----	Quercus
5. Number of planting/ seeding	140 – 200 / ha	--------	-------	800 / ha
6. Species for seeding	--	---	----	Acer,
7. Planting/ seeding schedule	March	March	----	Cutting and removing on April and August
8. Unit cost	28,107,299 Riyals/ha	----	---	1000,000 Riyals/ha

ANNEX 5 VILLAGE CHIEF INTERVIEW

Village chief interview (Forest condition)

Item		Dasht-e sheikh	Ghiz-ghaleh	Cheshmae-khan	Tangrah
Forest condition	General	-Destroyed by flood and debris flow -Many species of plant were destroyed and numerous stone deposit -The forest decreasing in recent years, especially after drought and fire in 1995	-About 130 sheep were died in forest area - The forest decreasing in recent years, perhaps 100 years ago these area were covered by forest	-No damage by flood -Forest damage by villagers as fuel wood, and utilization fodder trees -The forest decreasing in recent years	--The damages were very severe and including soil erosion, accumulation of sediment -- The forest decreasing in recent years
	Forest utilization and reforestation	-Various activities like hunting and cutting trees are forbidden in the Golestan National Park -People in the village eager to conduct reforestation if the government give credit or loan to the people	-Various activities like hunting and cutting trees are forbidden in the Golestan National Park -They worked for reforestation work as a worker	- Fodder trees -They worked for reforestation work as a worker	--In the past they used as timber, fuel wood, fodder trees and hunting, but now various activities like hunting and cutting trees are forbidden --They worked for reforestation work as a worker

Village chief interview (Livestock and grazing)

Item		Dasht-e sheikh	Ghiz-ghaleh	Cheshmae-khan	Tangrah
Livestock and grazing	**General**	**-The damages were very severe and including soil erosion, accumulation of sediment**	**-Their range land is far away from village**	**-some medicine species completely destroyed**	
	Livestock and grazing	**-Villager send their livestock to rangeland -Villagers use the straw and farm residue (5 month in year) -Villagers move in 1 km to 8 km for grazing -A person and many dogs are necessary for controlling the livestock**	**--Villagers move in 5 km for grazing -Villager send their livestock to rangeland -They have a range land near the Kalaleh for winter - Livestock also use the straw and farm in winter**	**-Villager send their livestock to rangeland and forest - Livestock also use the straw and farm -Villagers move in 5 km for grazing -A person and many dogs are necessary for controlling the livestock**	**-Villager send their livestock to forest - Livestock also use the straw and farm -Villagers move in 2km for grazing -A person and many dogs are necessary for controlling the livestock**

Village chief interview (Agricultural condition)

Item		Dasht-e sheikh	Ghiz-ghaleh	Cheshmae-khan	Tangrah
Agricultural condition	General	-The damages were very severe and including soil erosion, accumulation of sediment -Floods and debris flow destroyed 21 ha of agricultural land	-Floods and debris flow destroyed all the agricultural land that located beside the river	- No damage -The main crop is barley, wheat and shuge bee	-The damages were very severe and including soil erosion, accumulation of sediment --Floods and debris flow completely destroyed agricultural land that was located beside the river
	Agricultural condition	-After flood new weeds grew and most of the pesticide can't effect -Villagers sell the wheat and barley to cooperative shop and sunflowers to oil company, and other crops consumed by themselves	-Villagers sell the wheat and other crop -Villagers use chemical and manure fertilizer for their farmland	-Villagers use chemical and manure fertilizer for their farmland -Villagers sell the wheat and barley, and some part of them consumed by themselves	-Villagers sell the wheat, cotton, soya been to market by cooperative, and some part of them consumed by themselves

Village chief interview (Request to MOJA)

Item		Dasht-e sheikh	Ghiz-ghaleh	Cheshmae-khan	Tangrah
Request to MOJA		**Establishment of facilities for fish, honey bee, flower culture -Providing job opportunity for people, especially juvenile generation -Introduction of sprinkler irrigation system for efficient irrigation and saving the additional water**	**-needed training**	**Their farm land is salty and they can not use water for irrigation**	**- Reforestation work, training, subsidy and they need financial support**

ANNEX 6 PHOTOGRAPHIC COLLECTION

1 Dasht-e-sheikh

<table>
<tr><td>  </td><td>  </td></tr>
<tr><td>Overview of project site</td><td>Experimental plot by MOJA</td></tr>
<tr><td>  </td><td>  </td></tr>
<tr><td>Plot1 (Banqet) :Soil Profile</td><td>Plot1 (Banqet) : Vegetation</td></tr>
<tr><td>  </td><td>  </td></tr>
<tr><td>Village chief interview</td><td>Dry farming</td></tr>
</table>

2 Ghiz Ghaleh

	
Overview of project site(middle part)	Overview of project site(upper part)
	
Plot3 (Seeding): Soil Profile	Plot3 (Seeding): Vegetation
	
Village chief interview	Forest (Upper part)

3 Chesmae-khan

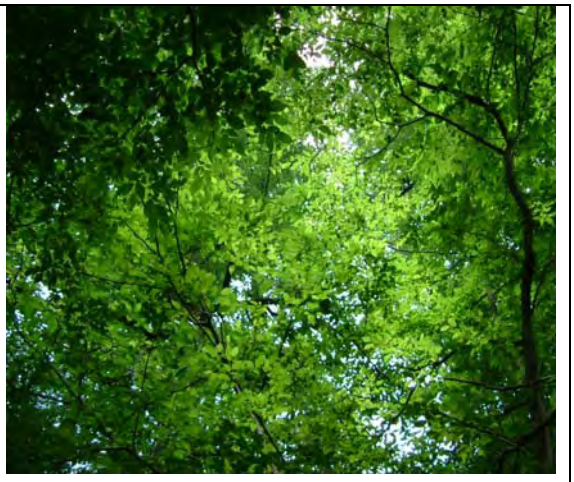
	
Overview of project site(upper part)	Overview of project site(dry farming)
	
Plot3 (planting): Soil Profile	Plot3 (planting): Vegetation
	
Chesimae Khan Village	Bunqet + Planting

4 Tangrah

	
Overview of project site(lower part)	Overview of project site(upper part)
	
Plot1 (terracing): Soil Profile	Plot1 (terracing): Vegetation cover
	
Village chief interview	Forest (Upper part)

5 Loveh

Overview of project site



Overview of forest crown(Old age)

Plot1 (ECM): Soil Profile

Plot1 (ECM): Vegetation

Natural regeneration

Forest (Middle age)

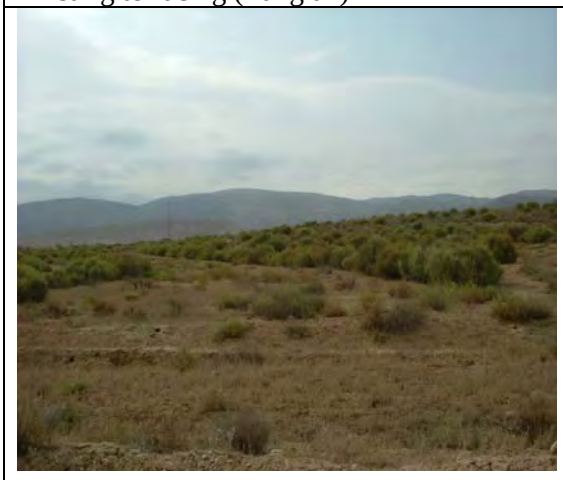
6 Case study in Semnan province

	
Small check dam by Gabion	Overview of fallow + planting
	
Check dam + planting	Degraded range land by over grazing
	
Earth dam and vegetation	Check dam inside the protected area

7 The proposition of the improvement

Existing terracing (Tanglah)

Gully in the banqet(Dasht)



Improvement of range land (Dasht)

Sustainable forest management(Loveh)

Effective Combination work(Dasht)

Coordination with other agency(Gorgan)

8 Soil Survey Process

	
1.Selection of the plot	2.Preparation of profile
	
3.Measurement of soil depth	4.Survey of the soil color
	
5. Survey of the soil texture	6.Measurement of soil hardness