DEPARTMENT OF AGRICULTURE,
THE STATE GOVERNMENT OF HIMACHAL PRADESH

THE STUDY
ON
DIVERSIFIED AGRICULTURE
FOR
ENHANCED FARM INCOME
IN
THE STATE OF HIMACHAL PRADESH

FINAL REPORT

VOLUME-I
MAIN REPORT

MARCH 2009

JAPAN INTERNATIONAL COOPERATION AGENCY

NIPPON KOEI CO., LTD.

THE STUDY ON DIVERSIFIED AGRICULTURE FOR ENHANCED FARM INCOME IN THE STATE OF HIMACHAL PRADESH

FINAL REPORT

LIST OF VOLUMES

PREFACE

In response to the request from the Government of India, the Government of Japan decided to conduct the Study on Diversified Agriculture for Enhanced Farm Income in the State of Himachal Pradesh and entrusted the Study to the Japan International Cooperation Agency (JICA).

JICA selected and dispatched a study team headed by Mr. Yutaka MATSUMOTO (from February 2007 to April 2008) and Mr. Takashi SEKI (from May 2008 to March 2009) of Nippon Koei Co., Ltd. during the period from February 2007 to March 2009.

The team conducted the Study with the counterpart agencies and held a series of discussions with the officials concerned of the Government of India and the State Government of Himachal Pradesh. Upon returning to Japan, the team conducted further studies and prepared this final report

I hope that this report will contribute to the promotion of the diversified agriculture for enhanced farm income in the State of Himachal Pradesh and to the enhancement of friendly relationship between our two countries

Finally, I wish to express my sincere appreciation to the officials concerned of the Government of India and the State Government of Himachal Pradesh for their close cooperation extended to the Study Team.

March 2009

Ariyuki MATSUMOTO
Vice President
Japan International Cooperation Agency

March 2009

Mr. Ariyuki MATSUMOTO
Vice President
Japan International Cooperation Agency
Tokyo, JAPAN

LETTER OF TRANSMITTAL

Dear Sir,

We are pleased to submit herewith the Final Report of the Study on Diversified Agriculture for Enhanced Farm Income in the State of Himachal Pradesh. The Final Report was prepared based on the results of the Study conducted during the period from February 2007 to March 2009.

The objectives of the Study are to: (i) to formulate a Master Plan (M/P) on rural development through diversified agriculture for enhanced farm income in the State of Himachal Pradesh; (ii) to formulate an Action Plan (A/P) in the priority programs to be established in the M/P; and (iii) to transfer relevant skills and technologies to the Indian counterpart personnel through on-the-job training in the course of the Study.

The M/P targets the agriculture diversification through conversion from food grains to diversified crops, especially to vegetables for enhanced farm income of small and marginal farmers, employing the strategies of (1) to maximize special agro-climatic advantage of the State for the diversification of food grain to value added produces, particularly off-season vegetables, to the growing domestic markets in large cities in India, (2) to improve food grain productivity to sustain food security of small & marginal farmers with infrastructure development to support the diversification, (3) to increase farm income based on the production of food grain and vegetables with post-harvest and market system improvement, integrating horticulture, animal husbandry or fishery and (4) institutional strengthening of organizations and stakeholders.

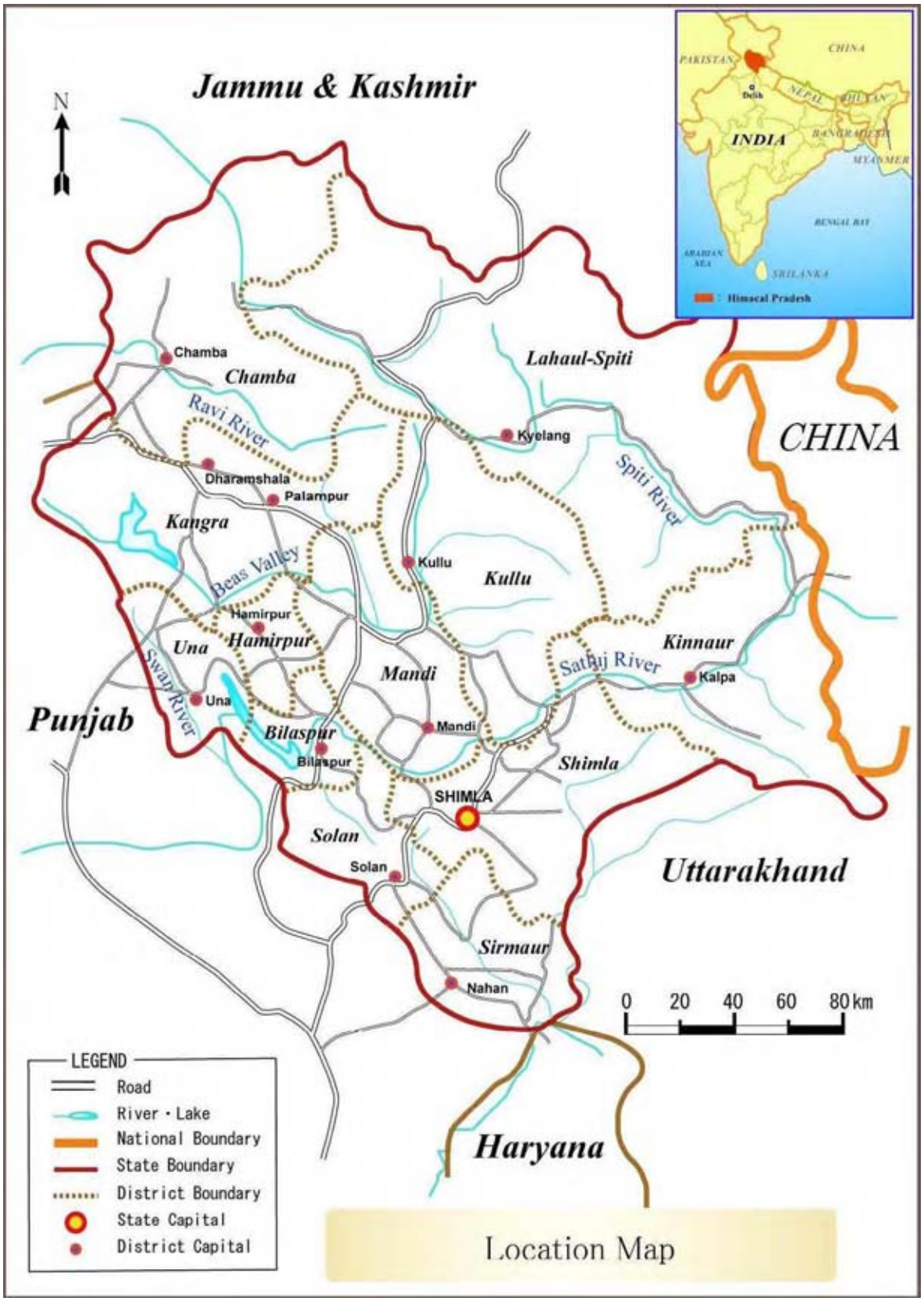
The Study was performed based on continual partnership of the Department of Agriculture, as well as the Departments of Horticulture, Animal Husbandry and Fisheries and other stakeholders. The workshops conducted 36 times in total in 12 all districts inviting officers-in-charge of 75 blocks in the State to formulate the M/P and A/P.

We hope that the report would contribute to the progress of diversified agriculture for enhanced farm income in the State of Himachal Pradesh.

We would like to express our deep appreciation a sincere gratitude to all the officials who extended their extensive assistance and cooperation to the JICA Study Team, in particular the Department of Agriculture and other allied departments, the State Government of Himachal Pradesh and Ministry of Agriculture of the Government of India. We also acknowledge the officials of your agency and Embassy of Japan in India for their support and valuable advices in the course of the Study.

Very truly yours,

Takashi SEKI
Team Leader of the JICA Study Team
of the Study on Diversified Agriculture
for Enhanced Farm Income
in the State of Himachal Pradesh


Jammu & Kashmir
N
CHINA
PAKISTAN
NEPAL
INDIA
BANGLADESH
MYANMER
BENGAL BAY
ARABIAN SEA
SRILANKA
Himacal Pradesh
Chamba
Chamba
Ravi River
Lahaul-Spiti
Kyelang
Spiti River
CHINA
Dharamshala
Palampur
Kangra
Beas Valley
Kullu
Kullu
Hamirpur
Hamirpur
Una
Swan River
Mandi
Satluj River
Kinnaur
Kalpa
Una
Punjab
Bilaspur
Bilaspur
Mandi
Shimla
SHIMLA
Solan
Solan
Uttarakhand
Sirmaur
Nahan
0 20 40 60 80 km
LEGEND
Road
River・Lake
National Boundary
State Boundary
District Boundary
State Capital
District Capital
Haryana
Location Map

- Photographs -

Vegetables in Himachal Pradesh

Peas

Tomato

Cauliflower

Potato

Cabbage

Capsicum

Okra

Onion

Cucumber

Egg Plant (Brinjal)

Sunday Market in Shimla

Kullu Market Yard

I. BACKGROUND

Authority

01. This report was prepared in accordance with the Scope of Work for "The Study on Diversified Agriculture for Enhanced Farm Income in the State of Himachal Pradesh (the Study)" agreed between the Department of Agriculture (DOA) of the State Government of Himachal Pradesh and the Japan International Cooperation Agency (JICA) on July 18th, 2006. ***(1.1)***

Background of the Study

02. Himachal Pradesh, located at the foot of the Western Himalayas, occupies an area of 56,000 km^2 with a population of about 6.08 million. About 70% of the working population is engaged in agriculture, which is the main income source of the rural population. In order to enhance farm income as well as to improve their living conditions, it is essential to increase the productivity of existing cultivated areas by shifting from self-subsistence agriculture to diversified one. ***(1.2)***

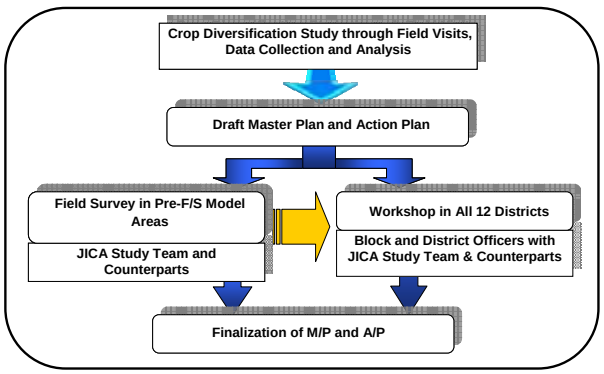
03. Based on the Tenth Five Year Plan (2002/03-2006/07), the State Government of Himachal Pradesh has identified 13 focal points as the main thrust areas in agriculture development. In order to accelerate the agriculture and rural development in the State more effectively and efficiently, the State needed to urgently formulate a Master Plan (M/P) on agriculture and rural development. ***(1.2)***

Objective of the Study

04. The objectives of the Study are: (i) to formulate a M/P on rural development through diversified agriculture for enhanced farm income in the State of Himachal Pradesh; (ii) to formulate an Action Plan (A/P); and (iii) to transfer relevant skills and technologies to the Indian counterpart personnel through on-the-job training in the course of the Study. ***(1.2)***

Study Area and Study Period

05. The Study covers the entire area of the State of Himachal Pradesh in the formulation of the M/P and A/P. The Study was carried out for about 2 years, from February 2007 to March 2009, and the conceptual flow of the Study is illustrated in Fig. S-1 on the right. ***(1.3)***



Prepared by JICA Study Team

Fig. S-1 Conceptual Flow of Study

II. NATIONAL AND STATE POLICIES ON AGRICULTURE

National Policy on Agriculture

06. In the Eleventh Five-Year Plan, increasing agriculture output is an essential part of the macro-economic target (2007/08-2011/12). One of the focal points is to diversify into high-value outputs such as vegetables and fruits, but with adequate measures to ensure food security. This principle is based on Vision 2020, which implies that India needs to sustain an agricultural growth rate of 4.0 to 4.5% in order to ensure food security. With keeping this growth rate, agricultural development could more rapidly diversify into horticulture, fishery, dairy, and animal husbandry with agro-processing industries in rural areas. ***(2.1.1 & 2.1.2)***

07. There are 78 cities in India with more than 300 thousand population, and the total population of these cities is 107 million, which is equal to 10% of the total population of India based on the 2001 Census. Such rapid urbanization, coupled with increased income for the middle class in the megalopolises, will trigger faster growth of demand for superior food items, especially fresh vegetables and fruits. ***(2.1.3)***

Development Policy and Programs of Himachal Pradesh State

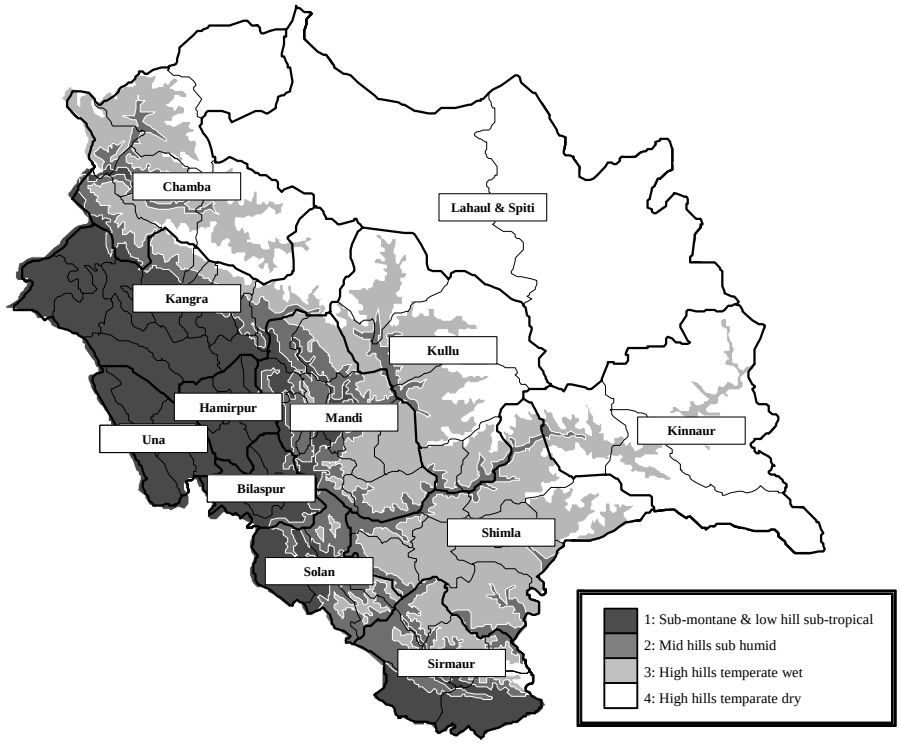
08. The State's Eleventh Five-Year Plan has the main objective of providing essential public services especially for disadvantaged sectors of society. It is also aimed at increasing farm incomes, developing vital infrastructure, nurturing human capital, protecting the environment and improving governance. The Plan focused on four core economic sectors with quantifiable target: (i) agriculture; (ii) rural connectivity; (iii) hydropower and (iv) forestry and environment. These sectors are closely related with the promotion of diversified agriculture. Moreover, the State's Eleventh Plan selected eleven priority areas, particularly focusing on crop diversification from traditional crops to commercial ones where irrigation potential has been created. ***(2.2)***

III. PRESENT CONDITIONS OF HIMACHAL PRADESH

Natural Conditions and Agro-Ecological Zones

09. The State extends over a mountainous region, with a range of altitude from 350 m to 6,975 m above mean sea level. Due to this wide range of altitude, the State's climate varies from sub-humid tropical for altitudes of 350 ~ 1,000 m in the southern low tracts, to cold alpine and glacial in the 2,500 ~ 7,000 m-high northern and eastern mountain ranges. From the agro-ecological viewpoints, the climatic characteristics are classified into four agro-ecological zones (AEZ), according to elevation and rainfall, and their specific features are shown in Fig. S-2 and Table S-1 in the next page:

The features described above shows that the advantage of the agriculture sector in the State is its cool climate, enabling production of high-value crops, particularly off-season vegetables and temperate fruits, demand of which is rapidly expanding. ***(3.1.1 & 3.1.2)***



Source: Agro-Ecological Zonation of Himachal Pradesh – Agricultural System Information Development at micro-level by Geo-Centre, CSK HPA University, Palampur (2006)

Fig. S-2 Agro-Ecological Zones in the Himachal Pradesh State

Table S-1 Specific Features of Agro-ecological Zones

Agro-ecological Zone	Area	Climate and Major Crops
Zone 1: Sub-mountain & low hills sub-tropical**,** 240 to 1,000 m	10,300 km²: 18.4% of land	Sub-tropical climate, rainfall 1,100 mm, rainfed food grains and sub-tropical fruits (citrus, mango and litchi).
Zone 2: Mid hills sub humid**,** 1,000 to 1,500m	4,700 km²: 8.4% of land	Sub-humid climate, rainfall 1,400 to 3,000 mm, rainfed, food grains, citrus and off-season vegetables.
Zone 3: High hills temperate wet**,** 1,500 to 3,250 m	9,200 km²: 16.5% of land	Temperate wet climate, rainfall 1,000 mm, food grains, temperate fruits (apple) and nuts, off-season temperate vegetables.
Zone 4: High hills temperate dry**,** over 2,500m	31,500 km²: 56.6% of land	Temperate dry climate, rainfall below 700 mm, crops in Apr. to Oct., food grains, temperate vegetables & fruits, potato seed, hops

Source: Agro-Ecological Zonation of Himachal Pradesh- Agricultural System Information Development at micro-level, Geo-Centre, CSK HPAU, Palampur (2006)

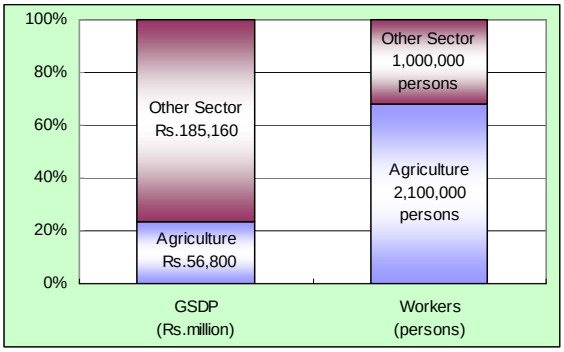
Economic and Social Conditions

10. In the State, there are 12 districts under which 75 development blocks are set up as the administration units in charge of rural development activities. Under the blocks, there are 3,243 Gram Panchayats as the lowest governance unit, in which rural development activities are managed by the Panchayat administration with the support of the State Government. ***(3.2.1)***

11. During the period from 1995/96 to 2006/07, the real Gross State Domestic Product (GSDP) showed a favourable growth at an average rate of 6.8% per annum, almost the same as the national average. Under such economic situation, per capita income of the State has reached Rs.33,800 (US$760) in 2005/06, slightly higher than the national average of Rs.32,000 (US$720). ***(3.2.2)***

12. The share of agriculture sector in the total GSDP has been decreasing from 22.1% in 2001/02 to 18.8% in 2006/07. According to the 2001 Census, out of the total households of 1,222,000 in the State, 88% or 1,080,000 households are in the rural area, and 914,000 are farm households. These households are directly or indirectly engaged in agriculture, and about 2 million of farm employment or 68% of total workers are working in the State. This indicates that the agriculture sector is the core of the rural economy and sustains livelihood of the rural population in the State. ***(3.2.2)***

13. Based on the nominal GSDP and the total number of the workers the GSDP per worker is estimated at Rs.73,300 on the average, with a large gap among the sectors, Rs.25,800 per worker (of which 95% are the cultivators) in the agriculture sector. And Rs.168,000 in the other sectors. In order to fill this gap, agricultural development is required to increase productivity, particularly, for farm income generation by producing and selling higher value-added outputs. ***(3.2.2)***



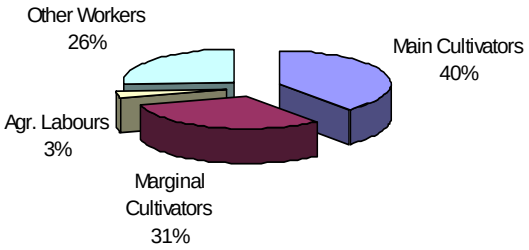
Source: Economic Survey and Economic Abstract, Economic & Statistical Dept, Himachal Pradesh.

Fig. S-3 Nominal GSDP and Worker by Sector

14. The State Government has put forth more efforts to increase its financial sources to meet the expenditure on administration and development as well as to reduce interest payments. Tax and non-tax revenues, as a result, have been increased and the chronic revenue deficit has been reduced to a minimum level. In addition, budget allocation shows that total expenditure is Rs.125.4 billion and net capital expenditure is Rs.19.3 billion. Interest payment and loan repayment amount to 22.5% of the total expenditure. ***(3.2.3)***

15. The 2001 population census reveals that the population of the State was 6.08 million, of which, 5.48 million persons or 90.2% lived in rural area, while only 0.60 million persons or 9.8% were residents in urban areas. The working population in the State was 2.99 million, out of which the total number of main workers (working 6 months or more in a year) was 1.96 million, corresponding to 32.1% of the total population, while marginal workers (working less than 6 months) were 1.03 million or 16.9%.

Out of total workers, 2.05 million or 68.5%, of the total workers were engaged in agriculture as cultivators and agriculture labourers, and the remaining 0.94 million worked in other economic sectors. Thus, the agriculture sector is absorbing majority of work force, and this trend is particularly prominent in the rural areas as shown in Fig. S-4. ***(3.2.4)***



Source: Population Census 2001/2002

Fig. S-4 Workers by Status in the Rural Area

16. The Himachal people are known for their diligence and hard work. Given the difficult terrain and topography of the State, the agriculture sector has evolved mainly due to the industrious farmers. The industriousness of the farmers is also evident in the rapid adoption of the horticultural initiatives of the State. From being entirely dependent on traditional agriculture, at present almost 6.7% of the total cropped area is under vegetable cultivation and 17.6% planted with fruits.

    The Himachal people are also known for their simplicity, peace-loving nature and their honesty. In the recent Study conducted by Transparency International, in the composite ranking of States on corruption, Himachal Pradesh was ranked the second least corrupt state in India. Himachal Pradesh is also adjudged recently as being the fourth most peaceful State in the country. Perhaps the greatest asset of the State is its social capital and social cohesion of its people. ***(3.2.7)***

17. The State average of 23.9% of households is below poverty line, lower than the national average of 26.1%. There exist significant regional imbalances due to limited availability of infrastructure, income opportunities and land, and the proportion of poverty across the districts varies. Vulnerability assessment by the World Bank shows 22% of the population could slip into poverty within the next three years if the State's good economic performance cannot be maintained. It should be noted that about 46% of the households belonging to vulnerable groups that are either near or below the poverty level, have precarious livelihood. ***(3.2.9)***

Public Infrastructure

18. The total length of roads in Himachal Pradesh was 29,000 km as of March 2006, comprising of 4.3% by national highways, 2.4% by boarder roads, 7.5% by state highways and 85.9% by other arterial and rural roads. The data shows that 11,000 villages, out of the 17,500 inhabited until March 2006, are connected with roads while, the remaining 37% of villages are not accessible This situation has been causing difficulty in transportation and marketing of high value products as well as farm input, and affecting the progress of agricultural diversification. ***(3.3.1)***

19. Three lines of the Northern India railway are in operation, these are the 96-km long Kalka to Shimla line, the 164-km long Pathankot to Joginder line with narrow gauge, and the

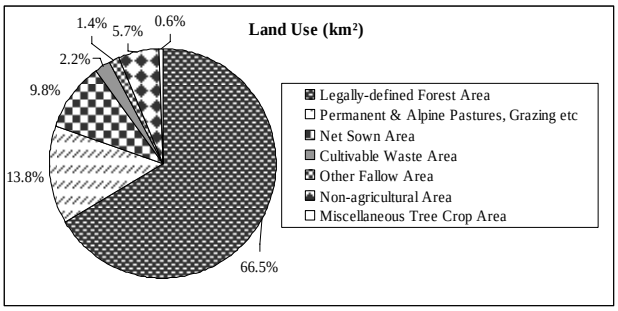
Sirhind to Una line with broad gauge branches at Sirhind on Jammu Tawi to New Delhi line. The line from Una to New Delhi is 300 km, and a direct passenger train service is available everyday. At the moment, limited amount of perishable agricultural products is transported by railway due to time bounding by train schedule. ***(3.3.2)***

20. All the census villages have been provided with drinking water facilities since March 1994. However, there still remained many smallest units, where habitations did not have access to safe drinking water supply. According to the latest survey officially conducted in 2005, 13.3% of the total 45,400 habitations surveyed were categorized as partially-covered and zero not-covered habitation. ***(3.3.3)***

21. Hydroelectric potentials of 20,400 MW have already been identified, but only 6,100 MW or 29.8%, had been exploited by various agencies so far. As per census 2001, 17,200 villages or 98% of inhabited villages have been electrified by the end of November 2006. With such high electrification ratio in the rural areas, the agro-processing industry is conceivable in a small scale utilizing local resources after the progress of agricultural diversification. ***(3.3.4)***

Agriculture Production

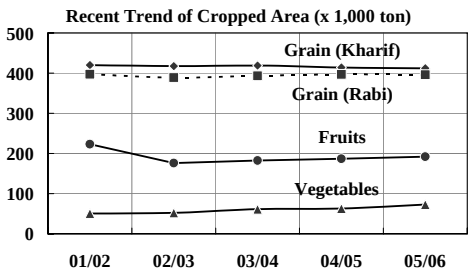
22. Out of the total geographical area of 55,670 km^2 in the State, the forest area comprises 37,030 km^2 (66.5%), as shown in Fig. S-5. Out of the total agricultural lands, net sown area is 5,400 km^2 (9.8%), non-agricultural use 3,190 km^2 (5.7%), cultivable wastes of 1,220 km^2 (2.2%), fallow lands of 760 km^2 (1.4%), and land under miscellaneous tree crops not included in cultivation of 330 km^2 (0.6%). The remaining area of 7,700 km^2 (13.8%) consists of permanent pastures, other grazing lands, alpine pastures, barren, uncultivable wastes and so on. ***(3.4.1)***



Source: Department of Land Records, Himachal Pradesh

Fig. S-5 Distribution of Land Use

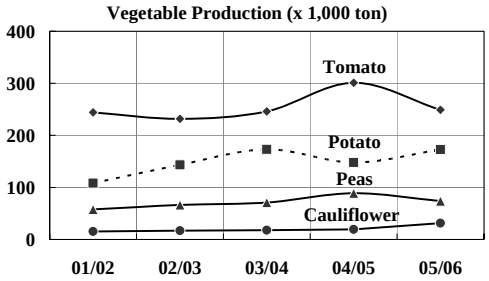
23. The recent trend of cropped area in the State during the last five years from 2000/01 to 2005/06 is summarized in Fig. S-6. The cropped area for grains seems slightly decreasing, however, that for fruits and vegetables tends to increase somewhat, and this shows that the total cultivated area is almost constant due to slopes of geographical condition, and that crop diversification in the State has started by converting cultivation of food grains to vegetables and fruits.

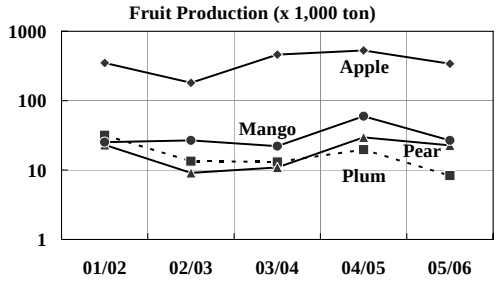


Source: Department of Land Records, and Department of Horticulture, (01/02 - 04/05), and JICA Study Team (05/06)

Fig. S-6 Cropped Area

The production by crops for vegetables and fruits are shown in Fig.s S-7 and S-8 respectively. Major vegetable production is going up, while fruits production fluctuates year by year thanks to climatic condition and market situation. ***(3.4.2)***





Source: Department of Land Records, and Department of Horticulture, (01/02 - 04/05), and JICA Study Team (05/06)

Fig. S-7 Vegetable Production **Fig. S-8 Fruits Production**

24. District-wise crop diversification rate (the proportion of crop area out of total cropped area) is 24% on the average as shown in Table S-2. Higher ratios are given in mountainous districts, such as in Lahaul-Spiti (85%), Kinnaur (68%) and Shimla (50%). On the other hand, lower ratios are shown in relatively plain areas in the State, like in Hamirpur (8%), Una (10%), Bilaspur (13%)

Most (94%) of fruit production is concentrated in the top five districts of Shimla, Kullu, Kangra, Kinnaur and Mandi, which are relatively small or specific districts, while vegetables are widely produced in the State. ***(3.4.2)***

Table S-2 District-wise Cropped Area and Production of Food Grain Crops (2004/05)

District	A. Total Vegetables		B. Total Fruits		C. Total Food Grains		(A + B)
	Area	Produce	Area	Produce	Area	Produce	(A+B+C)
Bilaspur	2,100 ha	50,300 ton	6,000 ha	4,500 ton	55,900 ha	120,800 ton	13%
Chamba	2,400 ha	28,400 ton	13,900 ha	10,000 ton	59,900 ha	113,900 ton	21%
Hamirpur	1,300 ha	22,500 ton	4,900 ha	2,400 ton	69,200 ha	137,600 ton	8%
Kangra	7,400 ha	111,800 ton	35,300 ha	85,600 ton	195,800 ha	314,600 ton	18%
Kinnaur	2,600 ha	29,700 ton	9,300 ha	39,000 ton	5,700 ha	5,000 ton	68%
Kullu	5,200 ha	78,200 ton	24,300 ha	175,600 ton	51,400 ha	94,200 ton	36%
Lahaul-Spiti	4,700 ha	56,600 ton	600 ha	200 ton	900 ha	1,200 ton	85%
Mandi	7,000 ha	109,400 ton	31,500 ha	24,300 ton	142,000 ha	287,300 ton	21%
Shimla	12,900 ha	185,700 ton	35,000 ha	322,900 ton	47,100 ha	70,500 ton	50%
Sirmaur	8,200 ha	118,200 ton	15,000 ha	12,700 ton	60,800 ha	109,000 ton	28%
Solan	7,200 ha	173,900 ton	6,300 ha	8,300 ton	56,900 ha	101,300 ton	19%
Una	2,000 ha	30,300 ton	4,900 ha	6,500 ton	65,300 ha	132,200 ton	10%
State	63,100 ha	994,900 ton	186,900 ha	692,000 ton	811,000 ha	1,487,600 ton	**24%**

Source: 2004/05 data of Department of Land Records, Himachal Pradesh State Government

25. Non-edible crops in the State are cut flowers, ornament plants and medical & aromatic plants. As floriculture has recently been one of major thrust areas in the State, however, the cultivation area is still less, i.e. 30 ha in 1993/94 & 510 ha in 2006/07. ***(3.4.2)***

Production in Agriculture-Allied Sector

26. Major livestock population is dominated by cattle, goat, sheep and buffaloes. Cattle and buffaloes provide milk for producing dairy products and buffaloes are also used as draft animals. Goats, sheep and pigs are raised for meat or wool production. Livestock is considered a household asset, not only for production but also to be sold for family emergency expenditure. Fodder production is required to increase due to its shortage in the State, especially in winter. ***(3.5.1)***

27. Total fish production in the State is 6,900 ton in 2006/07, out of which reservoirs and rivers produced 4,800 ton (70%) and ponds, 2,010 ton (29%). Carp and trout aquaculture farms produced less than 1% or 48 ton in 2006/07. Inland fisheries are practiced mainly by about 7,000 fishermen. Fishery yield has tendency of decreasing while aqua farming yield is increasing in the state recently. ***(3.5.2)***

Categorization of Diversified Agricultural Pattern

28. Agricultural activities vary depending upon present conditions. In order to seek direction, spatial categorization was carried out based on the current progress and development potential of agricultural diversification. ***(3.6.1)***

29. As a result of the spatial categorization, the entire State is divided into four categories as mentioned in Table S-3 below. ***(3.6.2)***

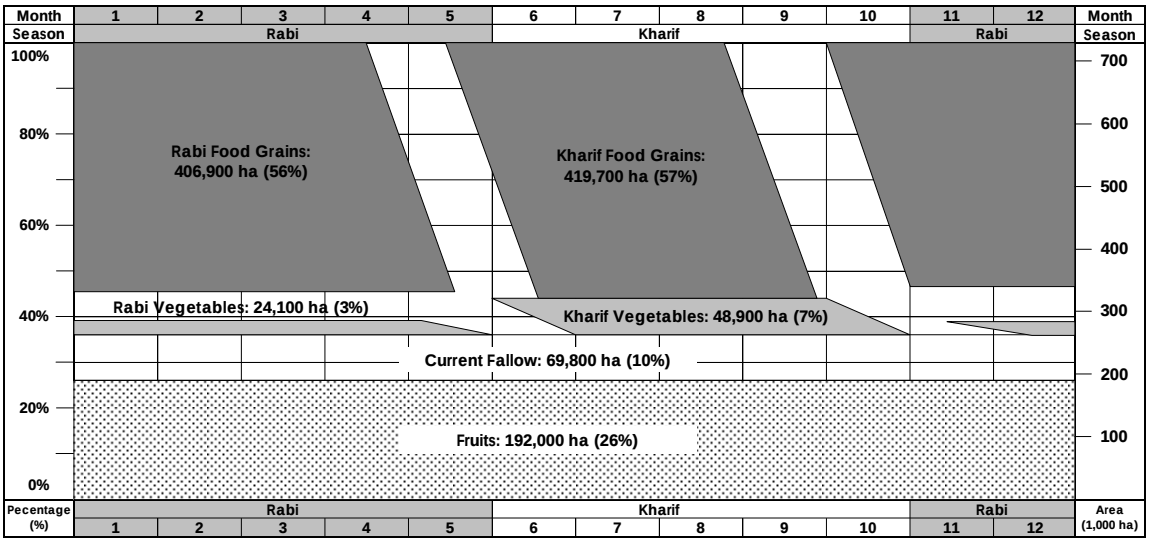
Table S-3 Features and Development of Category

Category	Characteristics	Features and Direction
Category-I 21 Blocks	Farm land: 166,600 ha AEZ-3 & 4 Advanced crop diversification area (vegetables area above 10.0%) with less area expansion possibility	Further enhancement of farm income through productivity and quality improvement
Category-II 11 Blocks	Farm land: 117,200 ha AEZ-3 & 4 Crop diversification starting area (vegetables area 5.0% to 9.9%) with area expansion possibility	Enhancement of farm income through acceleration of crop diversification
Category-III 30 Blocks	Farm land: 344,700 ha AEZ-1 & 2 Predominantly grain crop cultivation and least crop diversification area (vegetable area below 5.0%) with high diversification area expansion potential	Enhancement of farm income through promotion of crop diversification
Category-IV 13 Blocks	Farm land: 101,900 ha AEZ-3 & 4 Area not covered by the above Category I to III	Enhancement of farm income through introduction of crop diversification followed by integrated farming consisting of horticulture, animal husbandry or fishery.

Note: AEZ – Agro-Ecological Zone Prepared by JICA Study Team

30. The cropping pattern for the entire State has been summarized on the basis of the cropping data and farming practices collected in the Study. The food grains area in Kharif and Rabi seasons are about 57% and 56% respectively, whereas the area under vegetables are 7% and 3% respectively in the two seasons. Some farmers grow vegetables in Kharif season

under rainfed condition with some water harvesting facilities (small tanks, pipes from springs etc.). Meanwhile only the farmers who assure irrigation facilities grow vegetables in Rabi season. Fruits occupy about 26% of the cultivable area, and the current fallow area is about 10%, as shown in Fig. S-9. ***(3.7.1)***

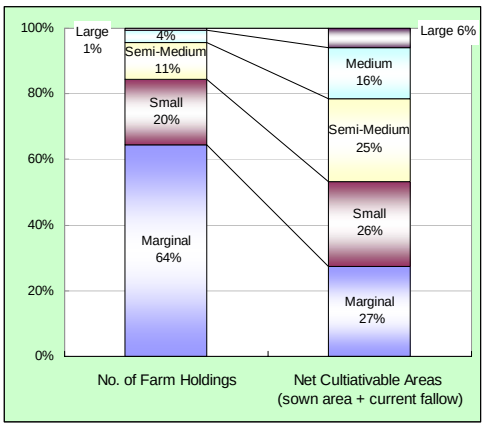


Category	Season	Food Grain		Vegetables		Fruits		Current Fallow		Year Total (ha)
		(ha)	(%)	(ha)	(%)	(ha)	(%)	(ha)	(%)	
All State	Rabi	406,900	56%	24,100	3%					730,400
	Kharif	419,700	57%	48,900	7%	192,000	26%	69,800	10%	

Source: Data of Department of Agriculture, Himachal Pradesh. Collected by JICA Study Team. (Data in 2005-2006 season)
Note: Current Fallow; Presently Fallow Land for one year, but used for cultivation in the previous year.

Fig. S-9 Cultivation area and Cropping Pattern of Himachal Pradesh

31. According to the Agricultural Census 1995-96, total net cultivated area was estimated at 652,700 ha. About 85% of farm households are categorized as marginal and small farmers, whose operational sizes are less than 2.0 ha. This percentage is almost the same as the national average of 86%. Farm households have been increasing and arable land is limited due to equal succession of farm land to the next generations. The average farm size shows a tendency of decrease from 1.30 ha in 1985/86, 1.21 ha in 1990/91, 1.16 ha in 1995/96, which includes uncropped land. The average net cultivable area comprising of net sown area and current fallow land is estimated at 0.73 ha. ***(3.7.2)***



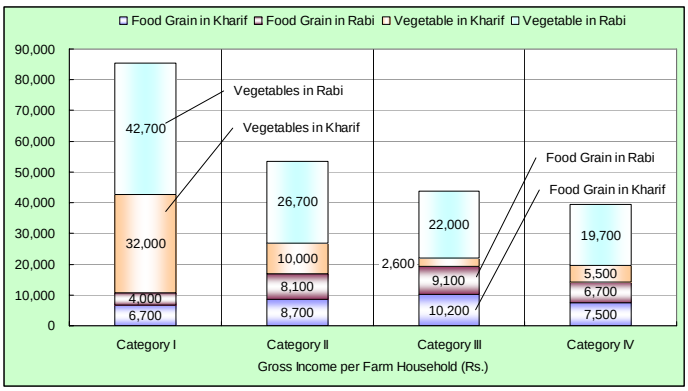
Source: Agricultural Census 1995-96

Fig. S-10 Size and Farm Land Distribution

32. Average workers of farm households in the 2001 census are estimated at 2.20 persons, consisting of 1.19 persons of the main cultivators, 0.95 persons of the marginal cultivators

(working less than 6 months in a year), and 0.06 persons of agricultural labors. In addition, marginal workers in other sectors would be available to work in the farm households on a part time basis as a family member or laborer in the busy seasons. ***(3.7.2)***

33. The net farm income (excluding from fruit) is calculated for the average farm households in each spatial category, as shown in Fig. S-11. Farm households in Category I obtain Rs.85,400, the highest income, of which 87% of the net income is from vegetables. Similarly, farm income is estimated at Rs.53,500 in Category II, Rs.43,900 in Category III and Rs.39,400 in Category IV. In each case, more than half of the income is generated from vegetables. The result suggests that i) income from food grains is far less than that from vegetables, and ii) production volume and quality of vegetables are key factors to increase farm income in the rural areas. Consequently irrigation development is vital for vegetable cultivation throughout a year and to promote agricultural diversification including increasing productivity of food grains. ***(3.7.2)***

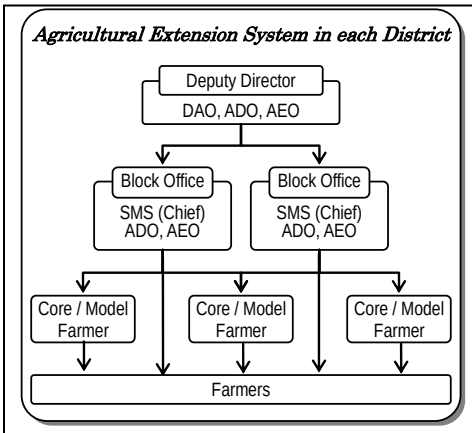


Source: estimated by the JICA Study Team, June 2007.

Fig. S-11 Net Crop Production Value of Food Grains and Vegetables by Category

Agricultural Supporting Services

34. The Department of Agriculture (DOA) is responsible for the planning and implementation of agricultural Programs and schemes in the State. DOA is broadly classified into two sections, i.e., Extension Section and Soil Conservation Section. Extension activities at the block level are carried out for cereals, vegetables, pulses, and oil seeds. These activities are related to following fields: i) production technology, ii) protection technology, iii) post-harvest and marketing management, and iv) pest management. The organizational structure for the extension system is shown in Fig. S-12 on the right. ***(3.8.1)***



Prepared by JICA Study Team

Fig. S-12 Organizational Structure of Extension System

35. Autonomous institutions named as Agricultural Technology Management Agency (ATMA) as pilot schemes, have already established in all districts in the State. ATMA model enabled farmers to receive various extension services in a single channel under Strategic Research and Extension Plan (SREP). It has linkages with all the line departments such

as horticulture, animal husbandry, and fishery, Himachal Pradesh Agriculture University, Farmer Interest Groups / Farmer Organizations and allied institutions including NGOs and private firms. Therefore, the ATMA is a potential model for efficient and effective extension, however, its implementation system has not yet been fully developed in some newly-introduced districts and it would take more time for practice. ***(3.8.2)***

36. The State Agricultural Management and Extension Training Institute (SAMETI) is registered as an autonomous institution with the mandate of capacity development of extension functionaries. It conducts courses on participatory extension management, project management, watershed management, human resources management and information technology etc. The SAMETI also provides consultancy in agricultural extension management as well as facilities for conducting training like training halls with conference system and multimedia projection facility. ***(3.8.3)***

Agricultural Marketing System

37. In the State, ten Agricultural Produce Market Committees (APMCs) cover 12 districts in order to conduct the smooth marketing of agricultural produce under the supervision of the Himachal Pradesh State Agricultural Marketing Board. Currently, there are 39 market yards functioning as wholesale markets of the State, the locations of which are shown in Fig. S-13. In the market yard, farmers leave their products to a Commission Agent (CA). Each CA carries out auction of the farmers' produces so that CA can get a commission fee from buyers. Meanwhile, the CA pays the auction amount to farmers and does not give any charge to farmers. In general, farmers can select any CA taking his performance into consideration. Direct purchase has been gradually disseminated, according to the revision of the APMC Act. Currently, some private companies such as Reliance Fresh, ADANI, ITC, etc. have some direct purchase of vegetables from progressive farmers in Bilaspur and Hamirpur for their future actual entry into Himachal

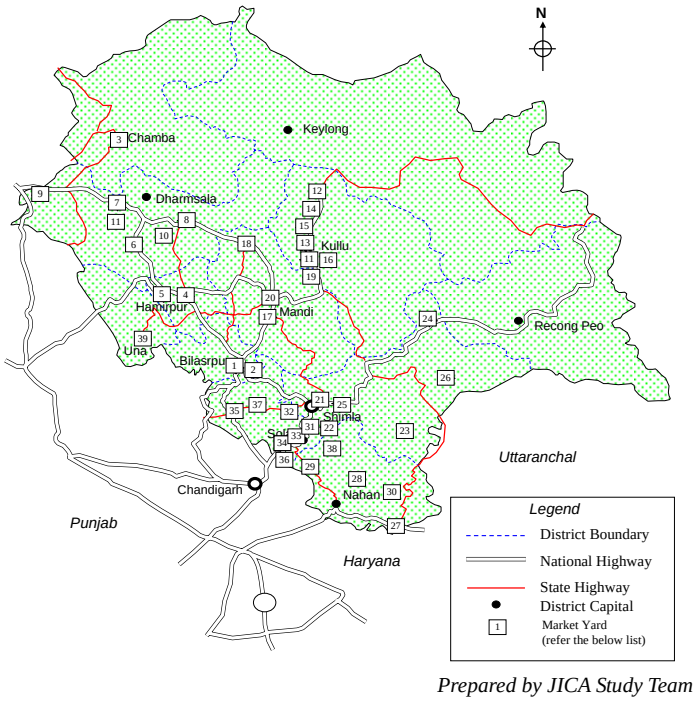
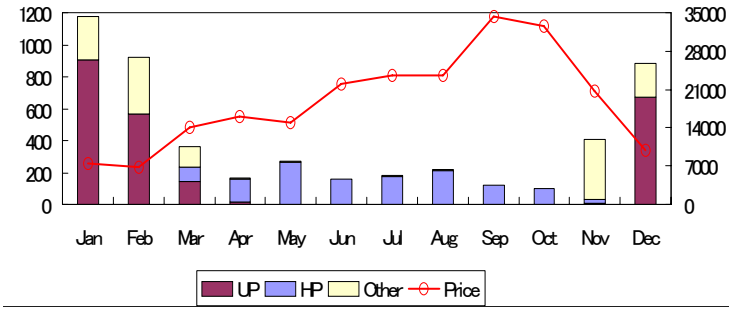


Fig. S-13 Locations of Market Yards in the State

Pradesh. ***(3.9.1)***

38. Quantity of vegetables arriving at all the market yards is around 160,000 tons (actual in 2006). Wholesale prices are decided by auction, having been checked and recorded by auction recorder, who is a staff of the APMC. The auction recorder checks the selling price to buyers as wholesale price (or market rate). Then, each APMC records the daily maximum and minimum prices of major crops. These wholesale prices are then informed to the AGMARKNET, DOA, radio stations, and major newspapers on a daily basis. Market information through the radio stations as well as newspapers covers only major commodities. ***(3.9.1)***

39. Regarding arrival quantity and price of pea as a sample in Azadpur wholesale market in Delhi, Uttar Pradesh and other states in the plain supply a large amount of pea during winter time up to March causing low market price, while Himachal Pradesh state supply it from March to November but limited volume. The price goes up accordingly during March-November as shown in Fig. S-14. ***(3.9.2)***



Source: Azadpur Wholesale Market 2006

Fig. S-14 Monthly Arrival Quantities and Average Wholesale Price

40. In the State, there are no authorized standard on grading and packing for vegetables to be produced. Since importance of grading has been understood by farmers, commission agents and buyers, they have been carrying out simple grading and packing to add more value into products. Therefore it is necessary to improve grading and packing by the farmers as well as to establish the authorized standard. Features and price of different vegetables are introduced in Photo S-1. ***(3.9.3)***

Date: June 16, 2007
Peas (best quality)
Market Yard: Dhali, Shimla

Date: June 16, 2007
Peas (normal quality)
Market Yard: Dhali, Shimla

Date: June 16, 2007
Peas (lower quality)
Market Yard: Dhali, Shimla

Date: June 16, 2007
Peas (bad quality)
Market Yard: Dhali, Shimla

Date: June 18, 2007
Beans (higher quality)
Market Yard: Dhali, Shimla

Date: June 18, 2007
Beans (lower quality)
Market Yard: Dhali, Shimla

Date: June 18, 2007
Cauliflower (higher quality)
Market Yard: Dhali, Shimla

Date: June 18, 2007
Cauliflower (lower quality)
Market Yard: Dhali, Shimla

Prepared by JICA Study Team

Photo S-1 Features and Price of Different Vegetables

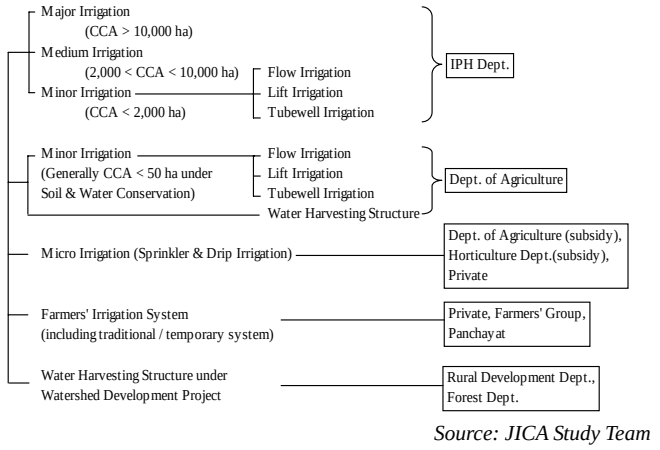
41. Food processing activities are established mainly based on the availability of fruits and vegetables. Almost all processing activities involve traditional and conventional products, such as jams, juices, juice concentrates, purees, dry fruits, candies, pickles and many kinds of fruit wines. About 70% of the agro-processing industries of vegetables are managed by the private sector at present. It is prospected that the share of the agro-processing managed by the private sectors will increase in future, and the task of the Government will be shifted from direct operation of the plants to planning and control the total management of the processing industry. ***(3.10.1)***

42. Regarding large and medium scale vegetable and fruits processing industries, total initial designed processing capacity is announced 88,000 ton annually, while there is no data on small scale vegetable processing, since vegetable processing is usually done by comparatively in small scale, such as women's groups or housewives in the villages. Selling price of fresh vegetables and fruits are generally higher than those as processing materials. Therefore, farmers intend to sell their fresh products at market yard etc. Agro-processing is useful and beneficial in order to utilize not-suitable produce for fresh eating or in the event of over production. ***(3.10.2)***

43. In the future, it is expected that the ratio of the processing industry managed by the private sector will increase, and the role of the governmental sectors will be shifted from direct plant operation to planning and regulating the industry. The Government will be requested to provide land and infrastructures such as preparation of road, electricity and water system for the processing industrial zone. Favourable taxation and special financing systems with low interest for the private sector are also expected in order to encourage the investors to build processing plants in the State. It is also important to disseminate production information to the investors through Public-Private Partnership (P.P.P.) workshops or other channels. ***(3.10.2)***

Irrigation

44. Due to the precipitous geography of the state, the developed irrigation system is limited to 207,000 ha and actual irrigated area is further limited to 107,000 ha, which are 36% and 18%, respectively, of the net sown area of 583,000 ha. Irrigation schemes are classified into five depending upon their scale, type and management: as shown in Fig. S-15 in the right. The irrigation development is given higher priority in the five-year plans and annual plans, thus, the irrigable area has been increased to almost double during the period from the 1980s to date. ***(3.11.1)***



Source: JICA Study Team

Fig. S-15 Type of Irrigation Schemes of the State

45. The DOA is implementing soil & water conservation schemes under the centrally supported Rural Infrastructure Development Fund (RIDF) Program. This Program includes development and improvement of minor irrigation schemes consisting of flow irrigation, lift irrigation and tubewell schemes. These cover Cultivable Command Areas (CCAs) of less than 50 ha and developed through farmers' participatory approach under the financial and technical support by the DOA. ***(3.11.2)***

46. Farmers' participation should be vital not only after taking over the system but also during planning, survey, design and construction. The construction works are carried out by the KVS (Water Users' Association) upon receiving the payment. Payment amount is sanctioned with the condition that materials such as cement, reinforcement, and pipes etc. are provided by the department, while local materials such as sand and gravel, etc. and common labour are managed by the KVS. From the total cost, the amount of 10% is deducted from the gross running bill and the same is released in the account of KVS for the O&M after the completion of the construction. ***(3.11.2)***

Farm Road

47. In the rural areas, minor roads used as farm roads consist of various types: (1) temporary earthen jeepable Katcha roads with 2-3 m width, poor drainage facilities, and mostly no pavement, (2) mule tracks with 1.8 m width, partly paved by stone or concrete, with no drainage facilities, and (3) footpaths with 1 m width or less partly paved by stone or concrete, and with no drainage facilities. These roads are constructed mainly for a single Panchayat by the District Block Office, APMC and DOA, while village roads connect villages under the Public Works Department. Most of these roads do not function well in the rainy season due to muddy earth sections when harvesting of off-season vegetables and temperate fruits are in its peak. Development of the access farm roads is therefore vital to

the crop diversification, because transportation quantities of produce will increase by about ten times in weight from food grain to vegetables. ***(3.11.3)***

Organization for Agriculture

48. In promoting agricultural diversification, the main agencies concerned are the Directorate of Agriculture, Directorate of Horticulture, Directorate of Animal Husbandry and Directorate of Fishery. The breeding and development of new horticultural varieties are under the jurisdiction of agricultural research institutes of the Central Government. The marketing of horticultural products are managed by an independent board called the Himachal Pradesh Marketing Board. ***(3.12.1)***

49. While the Minister and the Principal Secretary of Agriculture are the policy-making authorities in the State, the Director of Agriculture is responsible for the planning and implementation of agricultural programs and schemes. In the Department, there are 684 vacant posts, equivalent to 53% of the 1,302 sanctioned posts and there is urgent need to increase the staff. In addition, the capacity of the staff of monitoring, evaluation and feedback for further improvement are not sufficient. Therefore, the capacity development for Plan-Do-Check-Action" cycle for planning-monitoring-evaluation and mobility improvement are required. ***(3.12.1)***

50. Various types of farmers' organizations, cooperatives, and groups, as well as many Self-Help Groups (SHGs) have been established by different organizations under different programs. Farmers' organizations formed under the National Agriculture Technology Project (NATP) of DOA at the village level evolved into community associations (CAs), cooperatives and other types of farmers' organizations. The village extension workers of the line departments were instrumental in establishing the links with the farming community at the village level. These farmers' organizations and farmer interest groups (FIGs) are involved in the preparation of block A/Ps. These organizations coordinate in organizing on-farm demonstrations, and give their feedback to the extension and research. Their representatives are directly involved in the block level Farmer Advisory Committee (FAC) and also the governing board of ATMA. Himachal Pradesh Agriculture University has responsibility for development of applied technology on farming practices to be requested through implementation of demonstration plots. ***(3.12.1)***

Externally Aided Projects

51. A total of nine externally-aided projects are under execution in the State, and five projects include agriculture-related components. These are the i) Integrated Watershed Development Project (IWDP) financed by the World Bank; ii) Water, Sanitation & Hygeine Project (WASH) financially assisted by the German Federal Ministry for Economic Cooperation and Development (BMZ) and technically supported by the German Public Corporation for Technical Cooperation (GTZ), iii) Swan River Flood Management, Integrated Land Development and Watershed Management Project financed by the Japan Bank for International Cooperation (former JBIC), iv) Rural Roads Project financed by

World Bank group and v) Strengthening Agricultural Marketing System (SAMS) aided by USAID. ***(3.13.1)***

52. The World Bank has recently approved to provide funding to the State Government of Himachal Pradesh for the State Road Project in June 2007 and the First Himachal Pradesh Development Policy Loan and Credit Project in September 2007. The former project aims to reduce transport costs and to improve traffic flows on priority segments of the core road network of the State. The latter project supports the medium-term program of the State Government focusing on the implementation of structural, fiscal and administrative reforms needed to achieve sustainable and rapid economic growth, coupled with sustaining the environmental heritage of the State. ***(3.13.2)***

Himachal Pradesh among Hill States

53. Himachal Pradesh and other 11 hilly states are designated as the 'special category states'. These states, having comparative disadvantage to mobilise additional resources and a limited ability to develop a economic base, have been recipients of special central assistance to support their growth and development. Consequent to their constrained potential for economic development, the hilly states are among some of the poorest states of India. ***(3.14)***

54. Since its statehood in 1971, Himachal Pradesh has its social indices and economic growth exceeding the other hilly states. Since the 1990s, the State has achieved remarkable development progress. Therefore, following the national crop diversification policy stipulated in the Eleventh Five-Year Plan and the situation of the hilly states in India, Himachal Pradesh is the most suitable state at present to implement the national diversification policy as a pilot hill state among the 11 Hill States. ***(3.14)***

IV. WORKSHOP AND DEVELOPMENT NEEDS

Workshop

55. A series of workshops were organized from February to September 2008, inviting the block and district officers of agriculture-allied line departments in all twelve districts. The objectives of the workshops are as follows: (i) to collect agricultural needs, required for diversification of crops to vegetables, from each of the 75 blocks, in order to formulate the M/P and A/P, and (ii) to provide capacity development in agricultural planning to block and district officers. ***(4.1.1)***

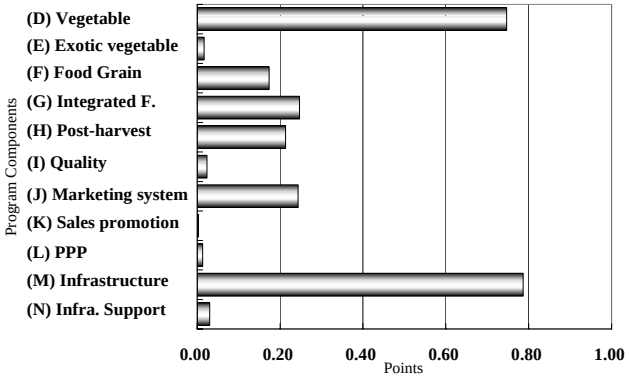
Table S-4 Schedule and Agenda of the Workshops

No.	Period	Workshop Place	Agenda
1st	Feb. to Mar. '08	11 Districts except Lahaul & Spiti	• Collecting information/needs on block basis, • Explanation of required information/needs
2nd	April '08	Shimla at SAMETI office	• Explanation of draft M/P & Components • Re-explanation of required information/needs
3rd	June '08	All 12 Districts	• Explanation of draft M/P & draft Components with target small & marginal farmers, • Re-explanation of required information/needs • Check & discussion on data collection
Final (4th)	Aug. to Sept. '08	All 12 Districts	• Re-explanation of M/P, Components and target small & marginal farmers, • Confirmation of data/information on block basis • Discussion on priority Program Components of respective blocks in workshop among participants

Prepared by JICA Study Team

Needs of Priority Components in Farmers' Support & Infrastructure Development Program

56. As shown in Fig. S-16, Vegetable Promotion and Infrastructure Development/ Improvement were ranked as the highest priorities on the needs from the blocks. In addition, such components as Food Grain Crop Productivity Improvement, Integrated Farm Management, Post Harvest Processing Promotion, and Marketing System Improvement are second priorities. These results are utilized for the formulation of the M/P in meeting the community needs. ***(4.1.2)***



Prepared by JICA Study Team

Fig. S-16 Averaged Scouring of Draft Program

Present Constraints and Development Needs

57. Based on the constraints, potentials and opportunities derived from the analysis of the present conditions, development needs for agricultural diversification are identified and specified as future strategies and measures. These needs are categorized in the sectors of i) agricultural organization, ii) agricultural extension, iii) agriculture and vegetable cultivation, iv) agriculture-allied sector (horticulture, animal husbandry & fishery), v) marketing of vegetables and fruits, vi) post-harvest activities, and vii) irrigation and access farm roads. ***(4.3)***

V. DEVELOPMENT POTENTIAL AND TARGET FARMERS

Crop Diversification Potentials

58. Climatic conditions within the States are extremely diverse; therefore, crops and products need to be proposed corresponding to each endowed condition. In this exercise, the AEZ classification is taken into account as one of the guidelines. Based on the identified potentials and constraints, the sectors are prioritized by setting the criteria from the viewpoints of natural conditions, marketing and economy. Optimum level of diversification is also determined for farm households by considering food security. This analysis is integrated into the M/P formulation as well as in the target setting for the A/P. ***(5.1.1)***

59. To determine the core sector for crop diversification in the State, the criteria in Table S-5 are set up according to the potentials and constraints of each sector and the agro-economic conditions. The results of prioritization are summarized in Table S-6:

Table S-5 Criteria for the Sector Prioritization

Criteria	Rating		
	High (5 points)	Medium (3 points)	Low (1 point)
A Coverage of Agro-ecological Zones by Crop	4 Zones	3 Zones	2 Zones and below
B Marketing Potential	Delhi and Other States	Himachal Pradesh	Specific Markets
C Impacts on State Economy			
1) Area	More than 50,000 ha	1,000 – 50,000 ha	Less than 1,000 ha
2) Per capita production	More than 150 kg	1.0 – 150 kg	Less then 1.0 kg
D Impacts on Farm Economy			
1) Number of family	More than 10,000	5,000 – 10,000	Less than 5,000
2) Share of farm income	More than 15%	1 - 15%	Negligible small

Source: prepared by JICA Study Team

Table S-6 Sector Assessment for Diversification

Sector	Criteria of Rating (specified in previous page)						Average
	Number of AEZ Coverage	Marketing Potential	Impacts on State Economy		Impacts on Farm Economy		
			Area	Per Capita Production	Number of Families	Share of Farm Income	
1) Vegetables	5	5	5	5	5	5	5.0
2) Fruits	5	5	5	3	5	5	4.7
3) Floriculture	5	5	1	1	1	NA	2.6
4) Medical & Aromatic Plants	3	1	1	NA	3	NA	2.0
5) Animal Husbandry	5	3	5	1	5	3	3.7
6) Inland Fishery	5	1	3	3	3	NA	3.0

Note: NA = Data not available, NA is excluded from average calculation. Source: prepared by JICA Study Team

The results show that vegetable, fruit and animal husbandry sectors with higher points are the priority for the crop diversification in the State. Among three sectors, the vegetable sector is selected as the core sector for crop diversification since: i) vegetable sector gets the highest point and covers the entire State, ii) fruits sector is monoculture with high risk and active only in five districts and iii) grazing land potential necessary for animal

husbandry is relatively small and fodder production is limited in the State. ***(5.1.2)***

60. The strategic crops are selected from 13 vegetables with planted area of above 100 ha through the following procedures: (i) 13 crops are categorized into four vegetable types; root, fruit, leafy and legume, (ii) one crop is selected from each vegetable type, (iii) strategic crops are selected from major crops in the State, (iv) strategic crops are the main trading crops in Azadpur market and (v) the dietary habits of India is taken into consideration.

Through the procedure, four vegetables are selected as the strategic crops for diversification in the State: (i) Peas, (ii) Tomato, (iii) Cauliflower and (iv) Potato. In addition, exotic vegetables will be the next possible crops to be promoted in the future, since their market potential will be high and they can be grown in the State. ***(5.1.3)***

Market Potentials for Diversified Crops

61. In India, the recent trend of cultivated area of fruits and vegetables show that fruits cultivation is increasing from 4.0 million ha in 2001/02 to 5.3 million ha in 2005/06, and vegetable cultivation area is stable at around 7 million ha during 2001/02-2005/06. On the other hand, Himachal Pradesh state is ranked second in apple production and peas in annual vegetable production. In accordance with the crop statistics in 2005-06, the State produces 30% of apples and 8% of peas in India. The competitors of Himachal Pradesh state are Jammu & Kashmir for apple and Uttar Pradesh for peas. ***(5.2.1)***

62. Demands for major vegetables in the target markets of Delhi, Haryana, Punjab and Chandigarh were projected to years 2017/18 and 2022/23 based on the population projection and annual per capita consumption. The vegetables used for demand projection were above mentioned four strategic vegetables and three other commercial vegetables (cabbage, capsicum and French beans), which had a large demand in the target markets. The results indicated that the present total demand of 3.30 million ton will increase to 5.19 million ton in 2017/18 and to 6.32 million ton in 2022/23, as summarized below: ***(5.2.2)***

Table S-7 Total Demand of Major Vegetables in Delhi and Surrounding States

Year	Summer	Rainy	Winter	Total	Increment
2005/06	1,097,000 ton	1,006,000 ton	1,196,000 ton	3,299,000 ton	-
20017/18	1,707,000 ton	1,587,000 ton	1,896,000 ton	5,190,000 ton	1,891,000 ton
2022/23	2,075,000 ton	1,938,000 ton	2,304,000 ton	6,317,000 ton	1,127,000 ton
Total Increment	978,000 ton	932,000 ton	1,108,000 ton	3,018,000 ton	-

Notes: **1: The three seasons of summer, rainy, and winter are only used for demand projection. The periods for each seasons are: Summer: March to June, Rainy: July to September, Winter: October to February*
In this report, Kharif and Rabi are generally used for indicating the cropping season, i.e. Kharif: June to October, Rabi: November to May
**2: The three seasons of summer, rainy, and winter are linked for reference with the two cultivation seasons of Kharif and Rabi: Kharif includes Rainy season, Rabi includes Summer and Winter seasons.*

Source: *Agro-Economic Research Centre, Himachal Pradesh University, 2008 and modified by JICA study team*

63. An interview survey was conducted to collect information on the market share for Himachal vegetables by the Agro-Economic Research Centre in 2005. Taking the survey

results into account, demand share allocation for Himachal vegetables was estimated at about 16.7% on the average, amounting to 0.87 million tons in 2017/18 and 1.06 million tons in 2022/23, as shown in the following table. ***(5.2.2)***

Table S-8 Demand Projection of Major Vegetables for Share for Himachal Pradesh

Year	Summer	Rainy	Winter	Total	Increment
2005/06	127,000 ton	412,000 ton	9,000 ton	548,000 ton	-
20017/18	198,000 ton	654,000 ton	16,000 ton	868,000 ton	320,000 ton
2022/23	241,000 ton	801,000 ton	19,000 ton	1,061,000 ton	193,000 ton
Total Increment	114,000 ton	389,000 ton	10,000 ton	513,000 ton	-

Remarks: For explanation on seasons to be referred to Note in Table S-7

Source: Agro-Economic Research Centre, Himachal Pradesh University, 2008, and modified by JICA study team

64. Based on the market demand projections, the anticipated production of vegetables in the State is estimated to meet the future demand, taking into account transportation loss and local consumption. Accordingly, the present 785,000 tons of vegetable production will increase by 775,000 tons to 1,560,000 tons in 2022/23 as the target of the M/P. ***(5.2.2)***

Table S-9 Anticipated Production for Major Vegetables in Himachal Pradesh

Year	Existing or New	Kharif	Rabi	Total	Increment
2005/06	Existing Diversified Area	585,000 ton	200,000 ton	785,000 ton	-
	Newly Diversified Area	0 ton	0 ton	0 ton	-
	Total	585,000 ton	200,000 ton	785,000 ton	-
20017/18	Existing Diversified Area	559,000 ton	274,000 ton	833,000 ton	48,000 ton
	Newly Diversified Area	**384,000 ton**	**47,000 ton**	**431,000 ton**	431,000 ton
	Total	943,000 ton	321,000 ton	1,264,000 ton	479,000 ton
	Increment from 2005/06	**358,000 ton**	**121,000 ton**	**479,000 ton**	-
2022/23	Existing Diversified Area	560,000 ton	276,000 ton	836,000 ton	3,000 ton
	Newly Diversified Area	**603,000 ton**	**121,000 ton**	**724,000 ton**	293,000 ton
	Total	1,163,000 ton	397,000 ton	1,560,000 ton	296,000 ton
	Increment from 2005/06	**578,000 ton**	**197,000 ton**	**775,000 ton**	-

Remarks: i) Kharif season: June to October, ii) Rabi season: November to May, iii) Increment in existing vegetable cultivated area is also considered. iv) The local consumptions in the State and transportation loss is estimated at approximately 20% of total products. The remaining vegetables of 80% are assumed to be marketed outside of the State (Delhi and Surrounding States 85% and other big consumption area 15%).

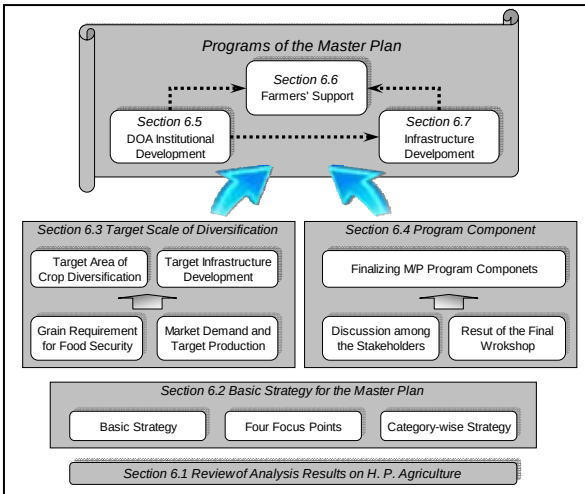
Source: Prepared by JICA study team

VI. MASTER PLAN FOR DIVERSIFIED AGRICULTURE

General

65. In the State, agriculture is the main economic activity in the rural areas, where about 90% of the people stay, and it sustains the livelihood of the rural people. Review of the State economy indicates that the agriculture sector has been growing, but its share in the Gross State Domestic Product (GSDP) has been constantly declining since the 1980s and had recently become less than 20% of the total GSDP. This declining share of the agriculture sector has been causing stagnation of the rural economy and the income growth in the rural areas has become much lower than that in the urban. In order to change this declining economic trend in the rural area, the productivity of the agriculture sector needs to be increased. ***(6.1)***

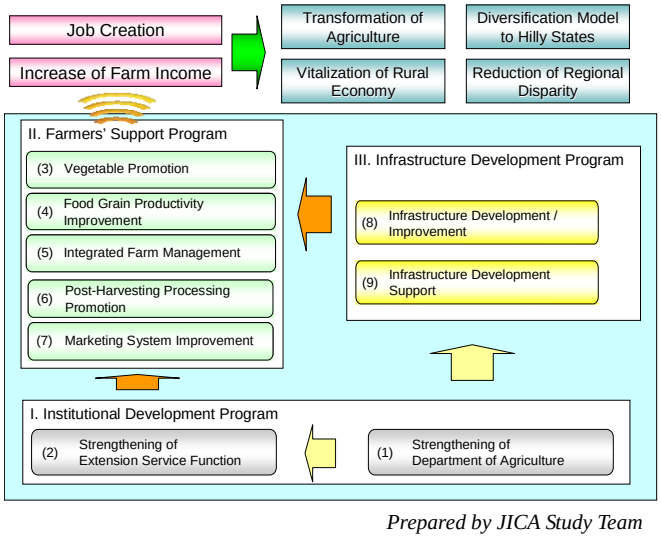
66. The Study is carried out to formulate the M/P for 2022/23 and the A/P for 2017/18, in order to promote diversified agriculture for enhanced farm income. The formulation process of the M/P is shown in Fig. S-17 on the right. The M/P contains the basic strategy, target scale, and development programs. ***(6.1)***



Prepared by JICA Study Team

Fig. S-17 Formulation Flow of Master Plan

67. For the promotion of agricultural diversification, three programs, namely, "Farmers' Support", and "Infrastructure Development" and "Institutional Development" are created. The programs are composed of a series of program components, which are the groups of activities to satisfy the development needs. Nine program components are prepared and their interrelation between the programs is illustrated in Fig. S-18 on the right: ***(6.1)***



Prepared by JICA Study Team

Fig. S-18 Interrelation between Programs and Components for the Promotion of Diversified Agriculture

Basic Strategy for Master Plan

68. The target of the Master Plan has been set below along with the basic strategy and approach, taking the view points of state-economy, farm households and socio-economy in the rural area.

Target: Agriculture Diversification through Conversion from Food Grains to Diversified Crops, especially to Vegetables for Enhanced Farm Income of Small and Marginal Farmers.

Basic Strategy:

a) To maximize special agro-climatic advantage of the State for the diversification of food grains to value-added produce, particularly off-season vegetables, to the growing domestic market in large cities in India
b) Improvement of food grain productivity to sustain food security of small & marginal farmers and infrastructure development to support the diversification
c) To increase farm income based on the production of food grains and vegetables with post-harvest and market system improvement, integrating horticulture, animal husbandry and fishery
d) Institutional strengthening of organizations and stakeholders

Basic Approach for Diversification of Enhanced Farm Income:

a) To increase production area by crop diversification from traditional food grains
b) To increase productivity of diversified produces
c) To improve quality of the produces,
d) To sell the produces at higher prices
e) To improve support services and infrastructure for the stable diversified production

Livestock and inland fishery in the M/P are fields of integrated agriculture applicable to be supplied in the local markets, around the production area. Major focus is given to firstly vegetables and secondarily fruits in the State. Category – I is an relatively advanced area, then followed by II, III, IV in order of the stage. By increase of presently available government human and financial resources, it is expected to step up the stages of the diversification to reach targets for 10 years and 15 years. ***(6.2.1)***

69. In the formulation of M/P, the following focus points have been taken into consideration. ***(6.2.2)***

Focus points in the formulation of Master Plan:

i) Step-by-Step Diversification corresponding to Farmers' Needs and their Cultivation Techniques,
ii) Farmers' Self-active Diversification,
iii) Step-down Support to Diversified Farmers for their Sustainability, and
iv) Extension System considering Public-Private sector Partnership

Target Scale of Crop Diversification

70. Food demand in the State for the target years of 2017/18 and 2022/23 is estimated based on the population projection and per capita consumption, the result of which is tabulated in Table S-10, indicating that future food grain production will increase by 232,000 tons and satisfy the minimum food demand of the State level intake, with a slight surplus of 47,000 tons or 2.6% of the total production. ***(6.3.1)***

Table S-10 Future Demand and Production of Food Grains

Year	Population in H. P. State	Food Demand	Increment of Demand	Food Grain Production	Increment of Production	Balance
2008	6,595,000	1,563,000 ton	-	1,571,000 ton	-	+8,000 ton
2017	7,151,000	1,695,000 ton	+132,000 ton	1,730,000 ton	+159,000 ton	+35,000 ton
2022	7,408,000	1,756,000 ton	+193,000 ton	1,803,000 ton	+232,000 ton	+47,000 ton

Source: Prepared by the JICA Study Team based on the Population Projection for India and States 2001-2006, Report of the Technical Group on Population Projections.

71. Based on the average family size and minimum food intake per capita, food consumption requirement per household was estimated. Then, the food balance was calculated based on the grain production and requirement, as shown below:

Table S-11 Food Balance at Farm Household Level by Category

	Category I	Category II	Category III	Category IV	Average
Family Size	5.7 persons	5.9 persons	6.2 persons	5.1 persons	5.9 persons
Food Consumption	1.36 ton	1.41 ton	1.47 ton	1.22 ton	1.40 ton
Grain Production	1.15 ton	1.83 ton	2.08 ton	1.55 ton	1.77 ton
Balance	-0.21 ton	+0.42 ton	+0.61 ton	0.33 ton	0.37 ton
Unit Yield of Food Grain	2.2 ton/ha	2.1 ton/ha	2.1 ton/ha	2.1 ton/ha	2.1 ton/ha
Area after Food Balance	**-0.10 ha**	**+0.20 ha**	**+0.29 ha**	**+0.16 ha**	**+0.18 ha**

Note: Average food consumption per capita is estimated at 237 kg per annum based on the minimum daily food intake of 650g per capita.

Source: Estimation by the JICA Study Team, based on the block level data.

The result shows that, except for Category I, the present food grain production exceeds household consumption, and farm land equivalent to produce surplus grains would be available for crop diversification within 0.18 ha in the average farm household. The real situation reveals that 84% of farm households are marginal and small farmers. For this farm size class, food security needs to be initially secured to avoid any vulnerable situation, thereafter, diversification would be started. In this case, the yield increase of food grains would be effective to ensure food security. ***(6.3.2)***

72. Within the future anticipated production based on the market demand in Delhi and the surrounding areas, the target production of vegetables for diversification is estimated at the stage of M/P (2022/23) and A/P (2017/18). These are summarized in the table below: ***(6.3.2)***

Table S-12 Future Target Production of A/P and M/P Based on Demand Projection

(unit: ton)

	Present	A/P (2017/18)		M/P (2022/23)	
	Production	Demand	(Increment)	Demand	(Increment)
Strategic Vegetables	675,800	1,074,500	(398,700)	1,320,600	(644,800)
Peas	202,700	360,000	(157,300)	466,400	(263,700)
Potato	172,900	262,400	(89,500)	319,900	(147,000)
Tomato	248,900	362,400	(113,500)	437,100	(188,200)
Cauliflower	51,300	89,700	(38,400)	97,200	(45,900)
Other Commercial Vegetables	134,500	198,600	(64,100)	229,200	(94,700)
Sub-Total	**810,300**	**1,273,100**	**(462,800)**	**1,549,800**	**(739,500)**
Other Vegetables	279,100	369,000	(89,900)	412,300	(133,200)
Total	**1,089,400**	**1,642,100**	**(552,700)**	**1,962,100**	**(872,700)**

Source: Estimated by JICA Study Team based on the Table S-8

73. In order to meet the anticipated target production, the cropped areas are estimated for respective strategic crops as well as other major commercial vegetables based on the unit yields of each crop and their total production. On the basis of projected crop yields of each crop and their total production, as tabulated in Table S-12, the future cropped area was estimated, as given below in Table S-13. The analysis indicates that about 51,000 ha of the crop diversification from food grain to the strategic crops through irrigation development is required in the State. ***(6.3.3)***

Table S-13 Future Cropped Area for Vegetables

Year	Cropped Area in Kharif	Cropped Area in Rabi	Total Cropped Area	Increment
2005/06	48,900 ha	24,100 ha	73,000 ha	-
2017/18	75,200 ha	28,000 ha	103,200 ha	**30,200 ha**
2022/23	91,100 ha	33,200 ha	124,300 ha	**51,300 ha**

Source: prepared by the JICA Study Team

74. The target of infrastructure development is on small-scale minor and supplementary irrigation systems within the crop diversification areas in the proposed program component. On this basis, the irrigation development area for the M/P for the 15-year period is estimated at 20,900 ha, consisting of 16,000 ha for minor irrigation and 4,900 ha for supplementary irrigation. These are shown in Table S-14: ***(6.3.4)***

Table S-14 Proposed Irrigation Development Area

Irrigation Type	Present	2017/18	2022/23
Existing and on-going program	**113,100 ha**	**143,100 ha**	**158,100 ha**
Irrigation Area	100,700 ha	100,700 ha	100,700 ha
Supplementary Irrigation	12,400 ha	12,400 ha	12,400 ha
New Irrigation by on-going Program	0 ha	30,000 ha	45,000 ha
Under Master Plan and Action Plan	**0 ha**	**14,000 ha**	**20,900 ha**
Minor Irrigation	0 ha	10,700 ha	16,000 ha
Supplementary Irrigation	0 ha	3,300 ha	4,900 ha
Rainfed Area	**617,300 ha**	**573,300 ha**	**551,400 ha**
Total Area	**730,400 ha**	**730,400 ha**	**730,400 ha**

Source: prepared by JICA Study Team

75. Development of the access farm roads is vital to promote the crop diversification especially in the hilly area like Himachal Pradesh. Total road length is estimated at 1,330 km for the Master Plan and 890 km for the Action Plan, taking into consideration that 57% of total required farm road in the State will contribute the crop diversification. The required quantity of the access farm road to be developed by DOA after balancing of the on-going schemes is tabulated below: ***(6.3.4)***

Table S-15 Proposed Access Farm Road

Farm Road	2017/18 (A/P)		2022/23 (M/P)	
	Total for Agriculture	Required for Diversification	Total for Agriculture	Required for Diversification
A. Required Farm Road	5,360 km	3,070 km	8,040 km	4,580 km
B. Rural Road developed by Panchayat / RDD	3,500 km	2,010 km	5,250 km	2,990 km
C. Link Road developed by APMC	300 km	170 km	450 km	260 km
D. Balance (A – B – C)	1,560 km	890 km	2,340 km	1,330 km
DOA: Access Farm Road for Crop Diversification	-	**890 km**	-	**1,330 km**

Programs and Components

76. In order to achieve the target of the Master Plan, the Programs and Components are created based on the development needs, as shown below: ***(6.4, 6.5, 6.6)***

Institutional Development Program
1. Strengthening of DOA • Capacity development of staff for PDCA Cycle • Establishment of the MIS with staff training • Provision of equipment and tools • Increase of extension and soil conservation staff 2. Strengthening of Extension Service • Coordinating the extension officers under ATMA model • Preparation of useful information on diversified agriculture • Improvement of soil diagnosis services of DOA • Linkage with research institute
Farmers' Support Program
3. Vegetable Promotion • Introduction of cropping patterns suitable for market • Promotion of strategic vegetables • Promotion of exotic vegetables • Improvement of productivity and quality • Promotion of organic farming 4. Food Grain Productivity Improvement • Promotion of cropping pattern suitable for productivity increase of food grains • Promotion of optimum farm input application • Promotion of organic farming

Continued to next page

5. Integrated Farm Management • Improvement of productivity and quality of horticulture crops • Promotion of fodder production and reuse of vegetable residues • Promotion of fish culture in irrigation system 6. Post-Harvesting Processing Promotion • Introduction and promotion of grading, sorting and packing • Introduction of small scale agro-processing activities • Introduction and promotion of P.P.P activities 7. Marketing System Improvement • Capacity Development of marketing board and APMC staff • Preparation and Dissemination of quality standard • Improvement/establishment of Market Information System • Construction and rehabilitation of market yards and other facilities • Market promotion through branding etc.
Infrastructure Development Program
8. Infrastructure Development / improvement • Construction and rehabilitation of minor and traditional irrigation system • Construction of supplementary irrigation (water harvesting facilities) • Construction and improvement of access farm road, footpath, mule track, ropeway 9. Infrastructure Development Support • Strengthening of WUA for irrigation management • Strengthening of O&M activities for farm road by farmers' group • Strengthening of support system for micro irrigation system by demonstration

Implementation Schedule

77. The implementation schedule prepared for the M/P is for a 15-year period, i.e., from 2008/09 to 2022/23, outline of which are as follows: (i) the Institutional Development Program would start immediately after formulation of the M/P, (ii) Farmers' Support Program and Infrastructure Development Program would be implemented at the site and (iii) Priorities of the four main development components are set depending on their categories. ***(6.7)***

VII. ACTION PLAN

Outline of Target Scale of Action Plan

78. The target beneficiaries of the A/P are small and marginal farmers in the State, and the target production and crop conversion area from food grain crops to vegetables in the year 2017/18 are given in the following table:

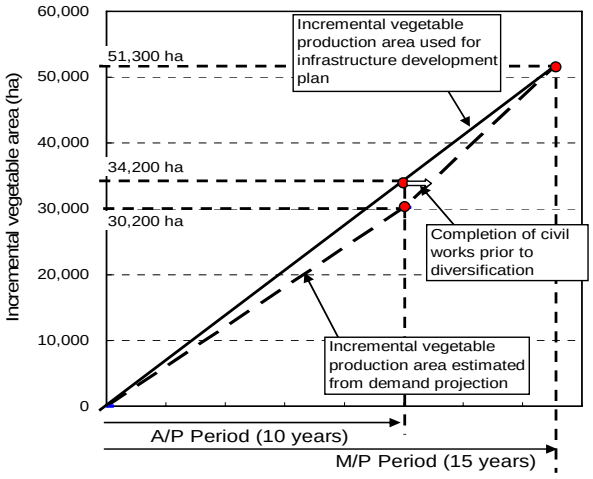
Table S-16 Target Vegetable Cultivation Area and Production

Diversified Crops	Present & Target Production (ton)			Present & Target Cultivation Area (ha)		
	Present (2005/06)	Action Plan (2017/18)	Incremental (till 2017/18)	Present (2005/06)	Action Plan (2017/18)	Incremental (till 2017/18)
Peas	202,700	360,000	157,300	19,500	34,900	15,400
Potato	172,900	262,400	89,500	15,000	16,000	1,000
Tomato	248,900	362,400	113,500	8,300	11,700	3,400
Cauliflower	51,300	89,700	38,400	3,200	5,000	1,800
Other Commercial Vegetables	134,500	198,600	64,100	9,300	13,100	3,800
Sub-total	810,300	1,273,100	462,800	55,300	80,700	25,400
Other Vegetables	279,100	369,000	89,900	17,700	22,500	4,800
Total	**1,089,400**	**1,642,100**	**552,700**	**73,000**	**103,200**	**30,200**

*Note; *: Data in 2005/06 Blocks, Department of Agriculture, Production & Area have half-adjusted.*
Source: prepared by JICA Study Team

Target incremental production of vegetables is 552,700 ton and target incremental cultivation area is 30,200 ha up to 2017/18. ***(7.1.2)***

79. The target infrastructure development in the A/P period of 10 years was simply estimated by interpolating from the total requirement in the M/P period of 15 years. The estimate of the incremental vegetable area for 10 years was based from marketing conditions as mentioned in the previous paragraph, since the development of civil works should progress with the same rate in both first 10 years and the remaining 5 years, as shown in Fig. S-19 at the right. ***(7.1.2)***



Source: Prepared by JICA Study Team

Fig. S-19 Schematic Progress of Irrigation Development
(Estimated by Interpolation from Incremental Target of M/P)

80. Target infrastructure development requirements of the A/P up to 2017/18 for irrigation and access farm roads were estimated from the requirement in the M/P and the interpolation estimate method given above and is summarized below in Table S-17 and Table S-18, respectively. ***(7.1.2)***

Table S-17 Target Irrigation Development Area of Action Plan

Irrigation Area	Diversification to Vegetable	Target Area for Irrigation	Remarks
Existing Irrigation Area	9,500 ha	-	
Irrigation Area by On-going Programs	13,000 ha	-	
Minor Irrigation Area	4,700 ha	10,700 ha	
Supplementary Irrigation Area	3,300 ha	3,300 ha	
Rainfed Area	3,700 ha	-	
Total	34,200 ha	14,000 ha	
Irrigation Needs in Workshop		18,000 ha	Short List
		33,200 ha	Long List

Note; Short list: relatively realistic needs, Long list: needs with less information Source: Prepared by JICA Study Team

Table S-18 Target Access Farm Road Development of Action Plan

Farm Road	Total for Rural	Farm Road for Crop Diversification (57%)	Remarks
Total Requirement	**5,360 km**	**3,070 km**	
RDD Farm Road Construction	3,500 km	2,010 km	
APMC Farm Road Construction	300 km	170 km	
DOA Access Farm Road Construction	1,560 km	890 km	
Access Farm Road Needs in Workshop		1,900 km	Short List
		4,600 km	Long List

Note; Short list: relatively realistic needs, Long list: needs with less information, RDD: Rural Development Dept., APMC: Agricultural Produce Market Committee of Market Board, DOA: Dept. of Agriculture
Source: Prepared by JICA Study Team:

81. In order to attain the above targets, the following activities are proposed to be implemented during the period of the A/P, which is given below: ***(7.1.2)***

Table S-19 Proposed Major Activities in Action Plan

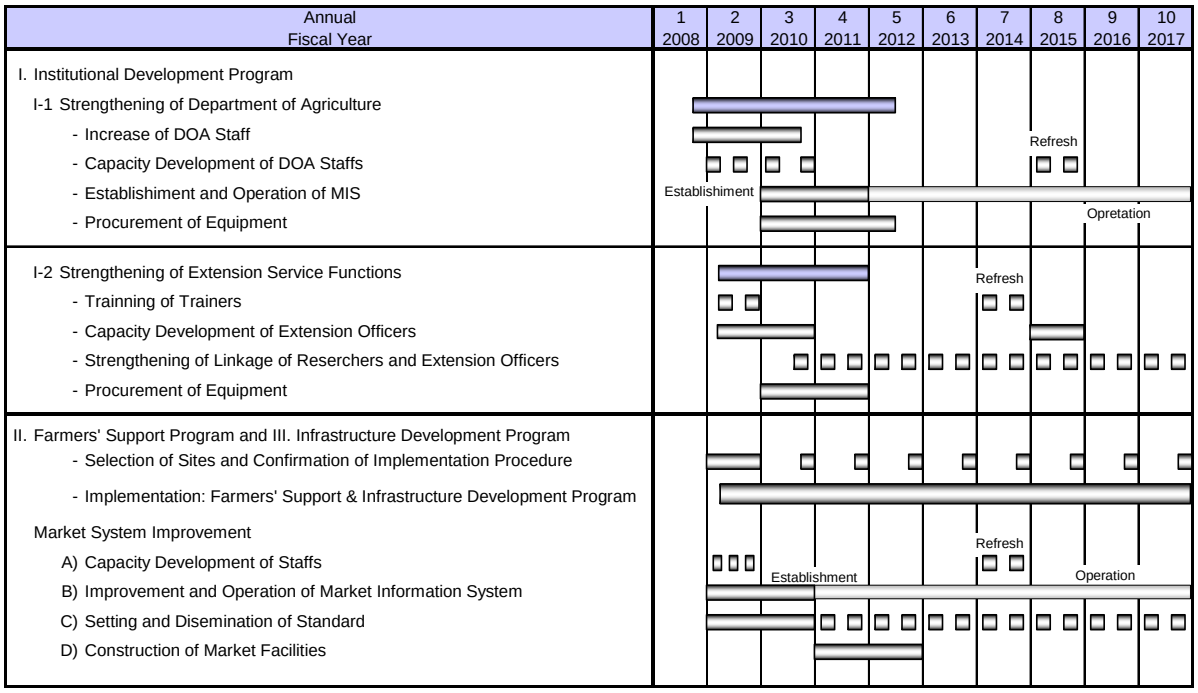
Program	Plan	Major Activities
Institutional Development	Strengthening of DOA	• Capacity development of staffs • Establishment of the MIS and capacity development on the effective use and maintenance • Provision of necessary equipment and tools to department, district & soil conservation offices and office renovation/construction • Increase of staffs
	Strengthening of Extension Service Function	• Trainings for the extension trainers • Establishment of farm schools (model demonstration farms) • Workshops & field visits
Farmers' Support - Production	Vegetable Promotion	• Promotion of cultivation through crop conversion from food grain crops to diversified crops, especially vegetables • Increase of their productivity and quality • Provision of protective farm facility for demonstration
	Food Grain Productivity Improvement	• Improvement of productivity of food grain crops to generate the crop diversification area
	Integrated Farm Management	• Improvement of productivity and quality of horticulture crops • Promotion of fodder production, fish culture in irrigation system.
- Marketing	Post Harvest Processing Promotion	• Introduction or improvement of post harvest works such as sorting, grading and packing for marketing • Promotion of small scale agro-processing activities • Introduction of P.P.P activities
	Marketing System Improvement	• Capacity development of Market Board staffs, • Establishment of market information system, • Construction or improvement of marketing facilities

Continued to next page

Infrastructure Development	Infrastructure Development /Improvement	• Development and improvement of minor irrigation systems and access farm roads • Provision of micro irrigation instruments for demonstration
	Infrastructure Development Support	• Strengthening of operation and maintenance (O&M) of the constructed/improved facilities

Implementation Schedule

82. Overall implementation plan of proposed action plan is illustrated as follows: ***(7.1.2)***



Prepared by JICA Study Team

Fig. S-20 Proposed Overall Implementation Plan of Action Plan Development

Preliminary Cost Estimation

83. The program cost has been estimated based on past experiences in the DOA, the results of the sample study at pre-feasibility level, and the workshops' results. On preliminary basis, the program cost is estimated at Rs.9,435 million in total, as summarised below: ***(7.6.4)***

Table S-20 Preliminarily Estimated Project Cost

Item			Amount (Rs.Million)
1. Institutional Development	(1)	Strengthening of Department of Agriculture	309
	(2)	Strengthening of Extension Service Function	247
		Sub-total of 1.	**556**
2. Farmers' Support	(1)	Vegetable Promotion	523
	(2)	Food Grain Productivity Improvement	128
	(3)	Integrated Farm Management	79
	(4)	Post Harvest Processing Promotion	2
	(5)	Marketing System Improvement	130
		Sub-total of 2.	**862**
3. Infrastructure Development Program	(1)	Infrastructure Development/Improvement	3,757
	(2)	Infrastructure Development Support	175
		Sub-total of 3.	**3,932**
Total (1+2+3)			**5,350**
4. Price escalation			**1,433**
5. Physical contingency			**678**
Total (1+2+3+4+5)			**7,461**
6. Engineering services		Engineering services	380
		Price escalation and Physical contingency	106
		Sub-total of 6.	**486**
Total of 1+2+3+4+5+6			**7,947**
	a	Land Acquisition	0
	b	Administration cost	397
	c	Other cost (Market board, ATMA, etc.)	296
	d	Tax & Duty	795
		Sub-total (a+b+c+d)	**1,488**
Grand Total			**9,435**

Note: US$1.00 = Rs.43.73 = Japanese Yen109.33 for exchange rate. Source: Prepared by JICA Study Team

Project Evaluation

84. Economic internal rate of return (EIRR) and other indicators were calculated for evaluation and are summarized as follows.

Table S-21 Economic Benefit of the Project

EIRR	Net Present Value (12% discount rate)			B/C
	Benefit	Cost	B-C	
13.5%	Rs.4,525 million	Rs.4,062 million	Rs.463 million	**1.11**

Prepared by JICA Study Team

The results of EIRR analysis indicate that the project is economically viable. Moreover, since the project is aiming at crop diversification and sustaining food security, it was confirmed that the project is feasible, with its focus on marginal and small farmers. Therefore, it can be concluded that the project also socially acceptable. ***(7.6.5)***

VIII. ENVIRONMENTAL EXAMINATION

General

85. Initial environmental examination (IEE) was carried out in order to identify potential negative environmental impacts caused by the implementation of the proposed program

components of the M/P and proposed activities in six sites in the sample area. ***(8.2.1)***

Initial Environmental Examination for the Master Plan

86. From the field studies, other information gathered and discussions presented, it is concluded that the proposed program components will be beneficial to the communities living in the Himachal Pradesh. No serious adverse environmental impacts are predicted for the projects, since all are small-scale with no large-scale development. Major mitigation measures are as follows: (i) consensus building for land securement, (ii) participatory water source planning, and (iii) environmental consideration in the construction works. Mitigation and enhancement measures are suggested where necessary and these will bring about an overall improvement in environmental quality. Once completed, well-managed implementation of the proposed programs should enhance the long-term sustainability of the rural environment. In view of the above conclusions arising out of the IEE of the program components, a full scale Environmental Impact Assessment (EIA) is not considered necessary if the proposed mitigation measures are concurrently carried out. ***(8.2.2)***

IX. CONCLUSIONS AND RECOMMENDATIONS

Conclusions

87. In order to promote diversified agriculture through effective use of favourable environmental conditions in the State, the study team selected the Farmers' Support Program, Infrastructure Development Program and Institutional Development Program to support the former two programs. These three programs consist of nine components, to produce 1.6 million tons of vegetables in 2017/18 and 2.0 million tons in 2022/23. It is expected that the proposed three programs will be implemented and will contribute to the enhancement of farm income and to improve the living standards of small and marginal farmers. Taking these contributions into consideration, it is concluded that the proposed A/P should be implemented as early as possible. ***(9.1)***

Recommendations

88. The following issues are recommended on the basis of the Study: (i) arrangement of financial resources for implementation of the action plan, (ii) need of monitoring of the implementation of the action plan, (iii) a view from comprehensive rural development, (iv) development of diversification technology package, (v) improvement of extension officers' capacity for providing effective impacts to farmers for the diversification, (vi) improvement of farm management including farm economy, and (vii) formation of farmers' groups and farmers' organizations for smooth implementation of crop diversification. ***(9.2)***

THE STUDY ON DIVERSIFIED AGRICULTURE FOR ENHANCED FARM INCOME IN THE STATE OF HIMACHAL PRADESH

FINAL REPORT

Table of Contents

List of Tables

List of Figures

LIST OF ABBREVIATIONS AND LOCAL WORDS

AADO	Assistant Agricultural Development Officer
ADO	Agricultural Development Officer
AE	Assistant Engineer
AEO	Agricultural Extension Officer
AERC	Agro-Economic Research Centre at Himachal Pradesh University
AEZ	Agro-ecological Zoning
AI	Artificial Insemination
AIBP	Accelerated Irrigation Benefit Programme
AIC	Agriculture Insurance Company
AMC	ATMA Management Committee
APL	Above Poverty Line
APO	Agriculture Project Officer
A/P	Action Plan
APMC	Agricultural Producers' Market Committee
ASCO	Assistant Soil Conservation Officer
ATMA	Agriculture Technology Management Agency
B/C	Benefit Cost Ratio
BA	Beneficiary area
BAP	Block Action Plan
BASP	Backward Area Sub-Plan
BDO	Block Development Officer
BHP	Break horsepower
BLDC	Block Level Development Committee
BPL	Below Poverty Line
BPLR	Bank's Prime Lending Rate
BTT	Block Technology Team
CA	Commission Agent
CAD	Command Area Development
CADP	Command Area Development Programme
CC	Cement concrete
CCA	Culturable Command Area
CITA	Centre for International Trade in Agriculture
CPRI	Central Potato Research Institute
Crore	10 Million
CSKHPAU	Chaudhary Sarwan Kumar Himachal Pradesh Agricultural University
DAAP	District Agriculture Action Plans
DAC	Department of Agriculture Cooperation
DAO	District Agriculture Officer
DAP	District Agriculture Plan
DE	Divisional Engineer
DEST	Department of Environment and Scientific Technologies
DOA	Department of Agriculture of Himachal Pradesh State
DOEACC	Department of Electronics Accreditation for Computer Courses
DOF	Department of Fisheries

DPR	Detailed Project Report
DRDA	District Rural Development Agency
DST	Department of Science and Technology
EC	Executive Council
EE, XE	Executive Engineer
EEI	Extension Education Institute
EIRR	Economic Internal Rate of Return
EPA	Environmental Protection Act
FAC	Farmer Advisory Committee
FAO	Food and Agriculture Organization
FFDA	Fish Farmers Development Agency
FFTD	Farmer to Farmer Technology Dissemination
FIAC	Farm Information Advisory Center
FIG	Farmer Interest Group
FIS	Flow Irrigation Scheme
FO	Farmers Organizations
FO	Fisheries Officer
F/S	Feasibility Study
GB	Governing Board
GC	Governing Council
GDP	Gross Domestic Production
Geo-Centre	Centre for Geo-Informatics Research and Training of CSK Himachal Pradesh
GOHP	Government of Himachal Pradesh
GOI	Government of India
GOJ	Government of Japan
GSDP	State Gross Domestic Product
GWSS	Gravity Water Supply Schemes
HAMS	Himachal Pradesh Aquaculture & Marketing Society
HDPE	High Density Polyethylene
HEO	Horticultural Extension Officer
HIMCU	Himachal Pradesh Fruit Canning Unit
HIMURJA	Himachal Pradesh Energy Development Agency
HP	Himachal Pradesh
HPFSRP	Himachal Pradesh Forest Sector Reforms Project
HPMC	Himachal Pradesh Marketing Committee
HRD	Human Resource Development
HTM	Horticulture Technology Mission
IARI	Indian Agricultural Research Institute
ICAR	Indian Council of Agricultural Research
ICDS	Integrated Child Development Scheme
IEE	Initial Environmental Examination
IDWG	Inter Departmental Working Group
IHBT	Institute of Himalayan Bioresource Technology
IMC	Indian Major Carp

INM	Integrated Nutrient Management
IPH, IPHD, I&PH	Irrigation and Public Health Department of Himachal Pradesh State
IPM	Integrated Pest Management
IRDP	Intensive Rural Development Programme
ISOPOM	Integrated Scheme of Oilseed, Pulses, Oil Palm and Maize
ITD	Innovations in Technology Dissemination
IWDP	Integrated Watershed Development Programme
JE	Junior Engineer
JICA	Japan International Cooperation Agency
Khad	River
Kharif	Southwest monsoon cropping season (June to September)
Kuhl	Small channel for surface irrigation
Kuttcha, Kaccha	Temporary facilities constructed with local materials
KVK	Krishi Vigyan Kendras (Agriculture Science Centres) – Training Centres of the Agricultural University
KVS	Krishak Vikaas Sangh (Water Users' Association / Farmers' Group)
Lakh, Lac	100 Thousand
LAN	Local Area Network
LIS	Lift Irrigation Scheme
LPS	Lahaul Potato Society
LWSS	Lift Water Supply Scheme
MADA	Modified Area Development Approach
MANAGE	National Institute of Agricultural Extension Management
MC	Management Committee
MCH	Marginal Commercial Households
MHWDP	Mid-Himalayas Watershed Development Project
MIS	Market Interventions Scheme
MIS	Management Information System
MLA	Member of Legislative Assembly
MOA	Ministry of Agriculture of Government of India
MORD	Ministry of Rural Development
MOU	Minutes of Understanding
M/P	Master Plan
MPCE	Monthly Per Capita Expenditure
MSP	Market Support Price
NABARD	National Bank for Agriculture and Rural Development
NAFed	National Agriculture Cooperatives Marketing Federation of India
NAIS	National Agricultural Insurance Scheme
Nallah	Small River and Stream (Seasonal and Perennial)
NARP	National Agricultural Research Programme
NATP	National Agricultural Technology Project
NGO	Non Governmental Organization
NH	National Highway
NIAM	National Institute of Agriculture Marketing

NRC	National Research Centre
NRCM	National Research Centre for Mushroom
NREGA	National Rural Employment Guarantee Scheme
NRM	Natural Resource Management
NSS	National Sample Survey
NSSO	National Sample Survey Organization
NWDPRA	National Watershed Development Programme for Rainfed Areas
O&M	Operation and Maintenance
OAS	One -Stop Aqua Shops
OBC	Other Backward Caste
OFD	On-farm Development
Panchayat	Local public administration assembly at the village (or group of villages)
Pc	Potential Created (Water resources development facility constructed)
PCR	Project Completion Report
PDS	Public Distribution Systems
PF	Protected forest
PFAE	Policy Framework for Agriculture Extension
PIC	Project Implementation Cell
PMC	Pre-mix bituminous carpet for road metalling
PMGSY	Pradhan Mantri Gram Sadak Yojana (Prime Minister's Village Road Programme)
PMU	Project Management Unit
POP	Package of Practices
PPP	Public Private Partnership
PRA	Participatory Rural Appraisal
PRI	Panchayati Raj Institution (System of governance in which gram panchayats are the basic units of administration)
Pu	Potential Utilized
Pucca, Pacca	Permanent facilities constructed with cement concrete, or stone masonry
PWD	Public Works Department
Rabi	Winter cropping season (November to May)
REF	Research Extension Farmer
RDD	Rural Development Department
RIDF	Rural Infrastructure Development Fund
RKBY	Rashtriya Krishi Bima Yojana (National Agricultural Insurance Scheme)
RKVY	Rashtriya Krish Vikas Yojana (National Agricultural Development Plan)
RMY	Regulated Market Yard
RRA	Rapid Rural Appraisal
SAMETI	State Agricultural Management Training Institute
SAP	State Agricultural Plan
SAU	State Agriculture University
SC / ST	Scheduled Caste / Scheduled Tribes
SCCP	Scheduled Caste Component Plan
SDSCO	Sub-divisional Soil Conservation Officer
SE	Superintending Engineer

SFO	Senior Fisheries Officer
SGDP	State Gross Domestic Product
SGSY	Swaranjayanti Gram Swarozgar Yojana (Golden Jubilee Employment Scheme)
SH	State Highway
SHGs	Self-help Groups
SM	Sub Market Yard
SMS	Subject Matter Specialist
SREP	Strategic Research and Extension Plan
SWC	Soil and Water Conservation
SEWP	State Extension Work Plan
TASP	Tribal Area Sub-Plan
TDMC	Technology Dissemination Management Committee
TDU	Technology Dissemination Unit
Tehsil	Administrative and revenue division
TIS	Tank Irrigation Scheme
TPDS	Targeted Public Distribution System
UCO	United Commercial Bank
UPF	Unprotected forest
VD	Veterinary Dispensary
VH	Veterinary Health Center
VR	Village Road
Warabandi	Irrigation Schedule (Rotational water supply)
WASH	Water, Sanitation & Hygiene Project
WASH	Water Availability through Self Help Project
WBM	Water Bound Macadam for road metalling
WUA	Water Users' Association
WUG	Water Users' Group
YSP UHF	Dr. Y.S.Parmar University of Horticulture and Forestry
ZRS	Zonal Research Station

Units and Currency

kg	kilogram
t, MT	Metric tonnes = 1,000 kg
qt	quintal (100 kilogram)
biga	12.5 biga = 1 ha / 1 biga = 0.08 ha
h	hour
mm	millimeter
cm	centimeter
m	meter
km	kilometer
ha	hectare
HP	Horsepower
INR, Rs.	Indian Rupee
km^2, sq.km	square kilometer
m^3	cubic meter
MCM	million cubic meter
MSL	Mean Sea Level
MW	mega Watt
LPS, l/s	litters per second
mm/mon	millimeter per month
mm/d	millimeter per day
m/s	meter per second
m^3/s	cubic meter per second
˚C	degrees centigrade
%	percent
US$	United States of America Dollar

US$ 1.0 = ¥ 109.33 = INR 43.73 (INR 1.0 = ¥ 2.5)

(as of September 1 2008)

¥ = Japanese Yen

INR = Indian Rupee

CHAPTER 1 INTRODUCTION

1.1 Authority

This final report was prepared in accordance with the Scope of Work for "The Study on Diversified Agriculture for Enhanced Farm Income in the State of Himachal Pradesh (the Study)" agreed between Department of Agriculture (DOA) of the State Government of Himachal Pradesh and the Japan International Cooperation Agency (JICA) on July 18th, 2006.

The report consists of the following volumes:

(i) Volume-I: Main Report

(ii) Volume-II & III: Annexes for Main Report

1.2 Background and Objectives of the Study

The State of Himachal Pradesh (the State), located in the northern part of India at the foot of the Western Himalayas, has an area of around 55,700 km^2, with a population of about 6 million including a rural population of 5.5 million. About 70% of the working population is engaged in agriculture, which contributes to the main source of income of the rural population. However, their farm lands are spread over the mountainous and hilly terrains, with small or marginal land holdings. In addition, shortage of irrigation facilities, farm roads and insufficient marketing facilities are the major constraints of the agricultural development in the State. Since there are no other major industries in the rural areas, unemployment has become its major problem. Therefore, the rural population who can not earn livelihood from agriculture, move to urban areas outside Himachal Pradesh and work with the military. In order to enhance the farm income and improve the living conditions in the rural areas, it is therefore highly essential to increase the productivity of the existing cultivated area, through shifting from self-subsistence crop cultivation to diversified agriculture. This is accomplished by adopting cash crops such as vegetables suitable for cultivation in hilly and highland areas.

Based on the Tenth Five-Year Plan (2002/03-2006/07), the State government has identified 13 main thrusts in agriculture development. In order to effectively and efficiently accelerate the agriculture and rural development in the State, it urgently needed the formulation of a corresponding master plan (M/P).

Due to above concerns, the Government of India requested the Government of Japan in 2005 for assistance in the formulation of the study on diversified agriculture to enhance farm income in the State. In response to the request, JICA dispatched a mission four times between August 2005 and March 2006, to clarify the direction of the proposed study. Consequently, the Scope of Work for the Study was signed and exchanged on July 18, 2006. (See Attachment - 1)

The Eleventh Five-Year Plan (2007/08-2011/12) was launched in April 2007. The Government of India then formulated nine priority policies in the agriculture sector, where one of which concerns the diversification into high value crops such as vegetables, fruits, etc with adequate measures to ensure food security. The State meanwhile has identified 11 focal points in the agriculture sector development, which included a point on the diversification from traditional to commercial crops.

The objectives of the Study defined in the Minutes of Meeting are as follows:

(i) To formulate a master plan (M/P) on rural development through diversified agriculture for enhanced farm income in the State;

(ii) To formulate the action plan (A/P); and

(iii) To transfer relevant skills and technologies to the Indian counterpart personnel through on-the-job training in the course of the Study.

1.3 Study Area and Study Period

The Study covers formulating of the M/P and A/P for the entire State. It focused on six sites which were selected for the pre-feasibility study, in order to realize results to be reflected to the M/P and A/P, prior to their finalization.

The Study was carried out for about two years from February 2007 to March 2009 and divided into two phases as follows:

Phase 1: February 2007 ~ November 2007

(Formulation of draft M/P and A/P)

Phase 2: November 2007 ~ March 2009

(Finalization of the Plans through workshops & pre-feasibility study)

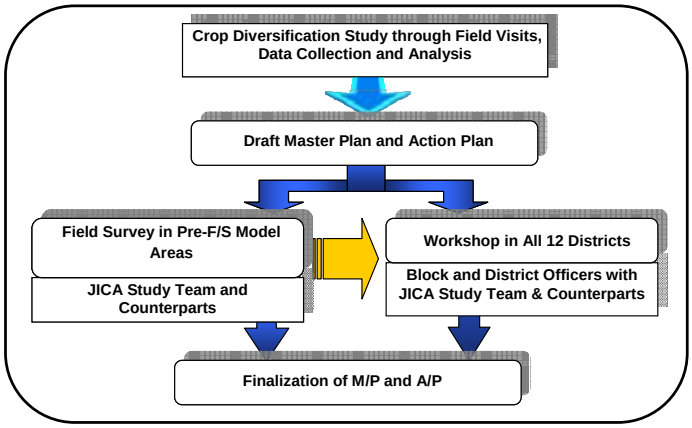


Fig. 1.3.1 Conceptual Flow of Study

Fig. 1.3.2 Scene of Workshop

1.4 Counterpart Organization and Steering Committee for the Study

The Department of Agriculture (DOA) of the State government, which is the main counterpart organization of the designated study team, organized a steering committee for the smooth implementation of the Study. The members of the steering committee, chaired by the Principal Secretary of the DOA, include: 1) Joint Secretary, NRM Division, Ministry of Agriculture, the Government of India; 2) Advisor (Planning) to the State government; 3) Director of Agriculture; 4) Engineer-in-Chief of Irrigation & Public Health; 5) Director of Horticulture; 6) Director of Animal Husbandry; 7) Director of Fisheries; 8) Managing Director of Himachal Pradesh Marketing Board; 9) Director of Research, CSK HP Agricultural University; 10) Director of Research, University of Horticulture and Forestry; 11) JICA India Office; and 12) JICA Study Team.

The counterpart team led by the Director of Agriculture was formed with seven members including the Director of Horticulture, Deputy Director (Animal Production) of Animal Husbandry, Assistant

Director (Fisheries) of Fisheries, Divisional Engineer of DOA, Senior Marketing Officer of Himachal Pradesh State Agricultural Marketing Board, and three Subject Matter Specialists from the DOA.

Technology transfer was carried out in accordance with the scope of work, mainly through: 1) on-the-job trainings; 2) technical discussions and field visits; and 3) meetings and workshops.

Fig. 1.4.1 Scenes of Steering Committee Meetings

CHAPTER 2 NATIONAL AND STATE POLICIES

2.1 National Policy and Food Demand

2.1.1 Eleventh Plan (2007/08 - 20011/12)

The economy accelerated during the Tenth Plan period (2002/03 - 2006/07) with a recorded average growth rate of 7.7%, the highest so far among the plan periods. The growth rate in the last four years of the plan period has averaged 8.7%, making India one of the fastest growing economies in the world.

The central vision of the Eleventh Plan is to trigger a development process which ensures broad-based improvement in the quality of life of the people, especially the poor, Scheduled Castes (SCs)/ Scheduled Tribes (STs). The National Development Council (NDC) endorsed a target of 9% GDP growth for the country as a whole. If this is achieved, it would mean that the per capita GDP would grow at about 7.6% per year and will double in less than ten years. Hence, the target is a faster and more inclusive growth, that is, a growth process which yields broad-based benefits that ensures equal opportunity for all the people.

This broad vision of the Eleventh Plan includes several inter-related components, namely: 1) rapid growth that reduces poverty and creates employment opportunities; 2) access to essential services in health and education especially for the poor; 3) equality of opportunity; 4) empowerment through education and skills development; 5) employment opportunities; 6) environmental sustainability; 7) recognition of women's agency; and 8) good governance.

The agriculture sector still provides livelihood to nearly 60% of the people and remains vital for food security. To ensure a better life for population engaged in agriculture, it is necessary to double the growth rate of 1.7% achieved in the Tenth Plan and put agriculture on a growth path of 4% in the Eleventh Plan, based on the proposed growth rates of agricultural sub-sectors as shown below:

Table 2.1.1 Projected Growth Rates of Sub-sectors of Agriculture

Sub-sector	Output Share (%)	Proposed Growth Rate (% per annum)	Sub-sector	Output Share (%)	Proposed Growth Rate (% per annum)
Crops	46	2.7	Livestock	25	6.0
Food grains	26	2.3	Fisheries	4	6.0
Oilseeds	6	4.0	Forestry/Logging	4	0.0
Other crops	14	3.0			
Horticulture	21	5.0	Total/Overall	100%	4.1%

Source: Towards Faster and More Inclusive Growth, an Approach to the Eleventh Five Year Plan, Planning Commission, Government of India

In order to attain this growth rate and at the same time maintain prices and profitability, supply based on productivity improvement is required to meet increased demands shown in Table 2.1.2.

Table 2.1.2 Projected Growth Rate and Demand for Various Food Commodities

Food Item	Projected Growth Rate (% per annum)	Projected Demand (million tons)	Food Item	Projected Growth Rate (% per annum)	Projected Demand (million tons)
Food grains	2.21	251.7	Fish	4.58	5.9
Milk and milk products	3.18	100.4	Oilseeds	2.94	49.2
			Vegetables	2.51	92.9
Meat	4.65	5.4	Fresh fruits	3.46	29.4
Eggs	4.62	35,770.0	Sugar and brown sugar	1.88	22.5

Source: Report on the Steering Committee on Agriculture and Allied Sectors for Formulation of the Eleventh Five Year Plan, Planning Commission, Government of India

In order to raise agricultural output, the strategy of the Eleventh Plan is based on elements such as: 1) double the rate of growth of irrigated area; 2) improve water management, rain water harvesting and watershed development; 3) reclaim degraded land and focus on soil quality; 4) bridge the knowledge gap through effective extension; 5) diversify into high value outputs such as vegetables, fruits, flowers, herbs and spices, medical plants, bamboo, bio-diesel etc., but with adequate measures to ensure food security; 6) promote animal husbandry and fisheries; 7) provide easy access to credit at affordable rates; 8) improve the incentive structure and functioning of markets; and 9) refocus on land reforms issues.

2.1.2 India Vision 2020

Vision 2020 reveals that the total population will exceed 1.3 billion in 2020, and the demand for principal foods at that time is projected to be 119 million tons of rice, 92 million tons of wheat, 9.8 million tons of other cereals, 19.5 million tons of pulses and 166 million tons of milk. The projections on household food demands in India for 2010 and 2020 are summarized below:

Table 2.1.3 Projections of Household Food Demand in India for 2010 and 2020

(unit: million tons)

Food Item/Year	2010	2020	Trend	Food Item/Year	2010	2020	Trend
Rice	97.99	118.93	↗	Milk & Milk Products	106.43	165.84	↗
Wheat	72.07	92.37	↗	Edible Oils	7.67	10.94	↗
Other cereals	11.06	9.81	↘	Meat and Fish	7.25	10.80	↗
All Cereals	181.12	221.11	↗	Sugar & Brown Sugar	17.23	25.07	↗
Pulses	14.58	19.53	↗	Fruits & Vegetables	75.21	113.17	↗
Food Grains	195.70	240.64	↗				

Source: Working Paper on Food Security and Nutrition for INDIA VISION 2020, Planning Commission, India

Assuming that the moderate growth rate of production is at the same rates as during the 1990s, India will be able to meet these projected demands for rice, wheat and milk, although there would be supply shortages of 2.6 million tons of coarse cereals and 3.5 million tons of pulses. If the high growth rate of production similar to that of the 1980s is achieved, India will also be able to meet the future demands for feed grains, which will grow significantly as milk consumption is likely to increase at a high rate. In this regard, India needs to sustain an agricultural growth rate of 4.0% to 4.5% in order to reduce food insecurity and poverty.

While maintaining this growth rate, agricultural development could more rapidly diversify into horticulture, fishery, dairying, animal husbandry and other enterprise. It would also spur the growth of agro-processing industries in rural areas. Such an achievement is well within reach, provided that there is requisite commitment to: 1) raise crop productivity by dissemination of advanced technologies; 2) increase investment in irrigation, research and training; 3) water harvesting; and 4) improve access to loans.

2.1.3 Urbanization and Food Demand Trend in India

According to 2001 Census, there are 78 cities in India with a population of more than 300 thousand. The total population of these cities is about 107 million, which is equal to 10% of the total population of India. The urban population projection made by United Nations, reveals that the population increase from 2005 to 2015 in the 11 major cities of India (with a population of more than 2.5 million) is 2.36%, as compared to the total population increase of 1.61%. The estimated population from 2005 to 2020 in these 11 major cities is shown below.

Table 2.1.4 Estimated Population in Major Cities of India

City	State	2005 (1000 persons)	2010 (1000 persons)	2015 (1000 persons)	2020 (1000 persons)	2005 ~ 2020 Yearly Increase (%)
Mumbai	Maharastra	18,196	19,952	21,878	23,990	1.86
Delhi	Delhi	15,048	16,729	18,597	20,674	2.14
Calcutta	West Bengal	14,277	15,571	16,982	18,521	1.75
Chennai	Tamilnadu	6,916	7,569	8,283	9,065	1.82
Bangalore	Karnataka	6,462	7,263	7,939	8,780	2.08
Hyderabad	Andra Pradesh	6,115	6,735	7,418	8,170	1.95
Ahmedabad	Gujarat	5,120	5,678	6,297	6,983	2.09
Pune	Maharastra	4,409	4,935	5,524	6,183	2.28
Surat	Gujarat	3,557	4,056	4,625	5,274	2.66
Kanpur	Uttar Pradesh	3,018	3,350	3,719	4,128	2.11
Jaipur	Rajastan	2,747	3,087	3,469	3,898	2.36

Source: World Urbanization Prospects, 2005 Revision, United Nations

Outputs of 61st (2004-05) and 62nd (2005-06) rounds of the National Sample Survey done by the Ministry of Statistics & Programme Implementation reveal that the average monthly per capita consumption quantity of all cereals is 11.92 kg in rural areas and 9.76 kg in urban areas throughout India, while the average monthly per capita expenditure is Rs. 110 for cereals and Rs. 358 for other foods in urban areas. Considering that the average calorie intake per consumer per day in urban areas, 43 % of the daily intake is from non-cereal consumers. The share of vegetables & fruits occupies 7.2% of the non-cereal food or 3.2% of the total food on average. Hence, the monthly per capita expenditure of the middle class is around Rs. 1100.

The share of vegetables and fruits increases to 4.6 % in the upper middle class with monthly per capita expenditure of Rs. 1100 to Rs. 2540, and further increases to 5.2 % in the highest class with more than Rs. 2540. The share and consumption volume would increase at an exponential rate, depending on income increase or economic growth in urban areas.

Such facts show that the rapid urbanization coupled with faster income increase of middle classes in the above major cities such as Delhi, will trigger faster growth of demand for main food items, especially fresh fruits and vegetables.

2.2 Development Policy and Programs of Himachal Pradesh

2.2.1 Eleventh Plan of Himachal Pradesh (2007/08-2011/12)

(1) Objectives and Growth Projections for Eleventh Plan

The major objectives of the State's Eleventh Plan are the provision of essential public services especially for disadvantaged sections of society coupled with increasing farm incomes, developing vital infrastructure, nurturing human capital, protecting the environment and improving governance. The focus remains on reduction of poverty, enhancing equity among various sections of the society and balanced regional development.

The target annual growth rate during the Eleventh Plan period is 8.5%, which is the same level as the national target. The sector-wise target of growth rate and contribution to gross state domestic product (GSDP) are as summarized below:

Table 2.2.1 Sector-wise Targets of Economic Growth Rate and Contribution to GSDP

Sector	Tenth Plan (2002-07)		Eleventh Plan (2007-12)	
	Growth Rate (%)	Share in GSDP (%)	Growth Rate (%)	Share in GSDP (%)
Primary	8.50	22.45	7.50	21.16
Secondary	7.42	35.98	9.30	36.85
Tertiary	7.53	41.57	9.00	41.09

Source: Approach Paper Eleventh Five Year Plan (2007~2012), Planning Department, Himachal Pradesh, Remarks; GSDP: Gross State Domestic Products

(2) Development Strategies of Core Sectors for Eleventh Plan

In the Eleventh Plan, the development strategies set up for core economic sectors are summarized as follows:

(i) Farm sector:

To fulfill the twin objectives for increasing the incomes from farming and allied activities as well as the employment opportunities within the sector, the focus shall be directed on the improvement of irrigation facilities, supply of high quality seeds, fertilizers and other crops, facilitation of adequate loans and effective market linkage, and initiating research and extension works. All of which are expected to lead to sustainable value addition. Among others, the priority is put over speedy completion of ongoing irrigation projects, providing an additional 98,000 ha for irrigation and bridging the existing gap between irrigation potential already created and its actual utilization;

(ii) Rural connectivity sector:

In Himachal Pradesh, road connectivity is crucial for the people as over 90% of them live in rural areas. Aiming to serve all weathered roads to all villages with more than 250 habitants by 2012, the components of special program “Pradhan Mantri Gram Sadak Yojana (PMGSY)” is to be enhanced;

(iii) Hydropower sector:

The anticipated twin benefits include ameliorating of shortages in the crucial infrastructure sector through enhanced production of “green energy,” and augmentation of the State’s financial resources by reducing its financial dependence on central resources. These shall be ensured by the development of hydropower potential of 5,676 MW, which is to be implemented by 2012; and

(iv) Forestry and environment sector:

To minimize problems on floods and soil erosion, the goal is to ensure that 35.5% of the total State’s geographical area is under forest and tree cover, considering that vast areas are already above tree line (limit of tree vegetation) and/or that forests are not maintained. In order to meet this goal of nurturing and preserving the forest cover and wild life sanctuaries, investments shall be provided in a considerable manner.

The sector-wise physical targets of the Eleventh Plan is set up as shown in Table 2.2.2, following the above development strategies.

Table 2.2.2 Sector-wise Physical Targets for Eleventh Plan

Target Items	Unit	Tenth Plan Actual Achievement	Eleventh Plan		
			Target	Change compared with Tenth Five Year Plan	
				Quantity	Rate (%)
Food grain production	'000 MT	1,669	1,700	+31	+1.9
Vegetable production	'000 MT	1,000	1,300	+300	+30.0
Fruit production	'000 MT	696	906	+210	+30.2
Milk production	'000 MT	870	920	+50	+5.7
Fish production	ton	8,100	40,000	+31,900	+393.8
Additional irrigation area created	ha	8,287	31,000	+22,713	+274.1
Afforestation	ha	6,934	4,000	-2,934	-42.3
IRDP family assisted: SGSY (Disbursement of credit)	million Rs.	996	750	-246	-24.7
Road length added	km	2,714	7,580	+4,866	+179.3
Electricity installed capacity added	MW	472	5,744	+5,272	+1,116.9
Opening of Ayurvedic dispensaries	number	22	60	+38	+172.7
Rural water supply to left-out habitations	number	10,196	3,000	-7,196	-70.6
Construction of housing units	number	8,216	54,036	+45,820	+557.7
Hand pumps installed	number	1,779	1,500	-279	-15.7

Source: Draft Eleventh Five Year Plan (2007-2012) and Annual Plan (2007/08), Planning Department, Himachal Pradesh

(3) Proposed Outlay for Eleventh Plan

Following the basic concept and the sector-wise physical targets, the proposed outlay for the Eleventh Plan works out to Rs.140 billion. As compared with the originally approved outlay for the previous Tenth Plan, the total amount increases by Rs.37 billion or 35.9%. The increased amount and rate against the accumulated annual plan outlay for the Tenth Plan period are Rs.56,144.3 million and 67.0%, respectively. The priority is put on transport and communication, water supply/sewerage/housing/urban development, irrigation and flood control, and agriculture and allied services sectors in accordance with the allocated amount. Realizing the past enormous debt liabilities of the State, the limits of its fiscal prudence would be to not loan more than 10% of its aggregate plan size. This implies the need for a total central assistance of Rs. 126 billion (90% of Rs. 140 billion) for an aggregate Eleventh Plan size of Rs. 140 billion in the State.

The sector-wise outlay proposed for the Eleventh Plan is as shown in Table 2.2.3.

Table 2.2.3 Sector-wise Outlay Proposed for Eleventh Plan

Sector	Proposed Outlay for Eleventh Five Year Plan (x 10 million)	Comparison with Outlay for Tenth Five Year Plan			
		Originally Approved Amount (x 10 million)	Rate of Change (%)	Actually Accumulated Amount* (x 10 million)	Rate of Change (%)
Agriculture & Allied Services	1,493.77	1,201.69	+24.3	868.70	+72.0
Rural Development	361.35	415.49	-13.0	258.37	39.9
Special Area Program	20.80	20.80	0.0	35.60	-41.6
Irrigation & Flood Control	1,240.29	453.17	173.7	538.64	130.3
Energy	1,140.22	1,257.68	-9.3	872.37	30.7
Industry & Minerals	180.54	104.73	72.4	71.94	151.0
Transport & Communication	2,176.85	1,638.05	32.9	1,313.41	65.7
Science, Technology & Environment	2.97	6.42	-53.7	3.79	-21.6
General Economic Services	811.46	223.74	262.7	399.55	103.1
Education	1,706.94	2,732.66	-37.5	1,168.50	46.1
Health	1,468.48	787.72	86.4	907.60	61.8
Water Supply, Sewerage, Housing & Urban Development	2,159.47	995.90	116.8	1,382.69	56.2
Social Services	823.05	377.20	118.2	396.90	107.4
General Services	413.81	84.75	388.3	192.72	114.7
Total	14,000.00	10,300.00	35.9	8,286.38	690

Source: Draft Eleventh Five Year Plan (2007-2012) and Annual Plan (2007/08), Planning Department, Himachal Pradesh
*Remarks: *: Accumulated amount of annually planned outlay amount for 5 years (2002/03 – 2006/07)*

2.2.2 Sector-wise Focal Points of Eleventh Plan of Himachal Pradesh

(1) Agriculture Sector

Eleven priority areas given below in the agriculture sector are demarcated based on the State's Eleventh Plan, particularly focusing on diversification from traditional to commercial crops where irrigation potential has been realized.

(i) Diversification of area from traditional to commercial crops where irrigation potential is realized. The farmers shall be motivated to cultivate organic vegetables with less use of pesticides and chemical fertilizers;

(ii) Development of rainfed areas through large scale watershed approach to efficiently utilize the natural resources. Increased funding shall be arranged under the rural infrastructure development fund;

(iii) Rainwater harvesting is another measure which will not only provide life-saving irrigation to the crops but shall also recharge the groundwater and check erosion. The DOA shall seek financial assistance from the Government of India for small irrigation tanks/shallow wells and pumping sets;

(iv) Increase in maize productivity through high yielding hybrids;

(v) Organic farming;

(vi) Post harvesting and efficient marketing system;

(vii) Farm mechanization in hill agriculture;

(viii) A strong research extension interface directed towards problems oriented research programs. Research projects to be identified and funded in problem areas;

(ix) Extension reforms through public-private partnership;

(x) Agro processing and value addition; and

(xi) Increase in productivity and quality.

In general, all the on-going programs and projects in the Tenth Plan will be continuously implemented during the Eleventh Plan period. In addition, two new schemes will be taken up focusing on integrated cropping system approach under different agro-climatic zones, and support the farm mechanization and seed storage facility.

Table 2.2.4 shows the prospective physical targets of the Eleventh Plan in terms of crop area and production of food grains, as well as commercial crops.

Table 2.2.4 Prospective Physical Targets of Food Grains and Vegetables for Eleventh Plan

Category	Cropping Season	Crop	Cropped Area			Crop Production		
			Prospective Target	Change based on Tenth Five Year Plan		Prospective Target	Change based on Tenth Five Year Plan	
			('000 ha)	('000 ha)	(%)	('000 tons)	('000 tons)	(%)
Food Grains	Kharif	Paddy	75.00	-1.00	-1.3	140.00	-22.00	-13.6
		Maize	295.00	-7.00	-2.3	795.00	-100.00	-11.2
		Ragi	2.50	-0.50	-16.7	4.50	0.00	0.0
		Millet	8.00	-2.00	-20.0	7.50	-3.00	-28.6
		Pulses	28.00	-7.00	-20.0	12.00	-16.00	-57.1
		Total	408.50	-17.50	-4.1	959.00	-141.00	-12.8
Food Grains	Rabi	Wheat	358.00	-3.00	-0.8	690.00	-21.00	-.2.9
		Barley	22.00	-1.00	-4.3	41.00	-5.00	-10.9
		Gram	3.00	-1.00	-25.0	4.50	-2.50	-35.7
		Pulses	6.00	-2.00	-25.0	5.50	-5.50	-50.0
		Total	389.00	-7.00	-1.8	741.00	-34.00	-4.4
	Grand Total		797.50	-24.50	-3.0	1,700.00	-175.00	-9.3
Commercial Crops (Kharif & Rabi)		Potato	14.00	0.00	0.0	180.00	+5.00	+2.9
		Vegetables	65.00	+15.00	+30.0	1,300.00	+300.00	+30.0
		Ginger	5.00	0.00	0.0	70.00	0.00	0.0

Source: Draft Eleventh Five Year Plan 2007-2012 and Annual Plan (2007/08), Planning Department, Himachal Pradesh

It is understood from the above table that the 15,000 ha crop area intended for food grain cultivation will be converted to vegetable cultivation, in accordance with the diversification policy in the Eleventh Plan.

From the proposed outlay for the Eleventh Plan, a total of Rs.735.1 million is allocated to crop husbandry programs and schemes, while another Rs.943.3 million is shared out for soil and water conservation programs and schemes.

(2) Horticulture Sector

The horticulture sector in the State has higher advantage under the mountainous environment in terms of providing nutritional foods to the people, regardless of its ecological fragility and inaccessibility. Taking into account both its advantages and weaknesses, the following strategy is mapped out for the Eleventh Plan:

(i) Development of modern facilities for the propagation of plant materials to the farmers through the introduction of improved genome and plasma technology from abroad, and identification of the outstanding merits and disadvantages of the plant materials within and outside the State;

(ii) Improvement of water management through scientific method of on-farm water harvesting, conservation and application to properly utilize scarce water resources. This shall be initiated by means of micro irrigation techniques for the improvement of horticulture productivity;

(iii) Integrated nutrition management with emphasis on need-based application of fertilizer for

maintenance of soil productivity;

(iv) Implementation of program for pest and weather forecasting;

(v) Diversification of horticulture with greater emphasis on planting of nut crops, olive, cherry, pear, small fruits and others, as well as cultivation of medical and aromatic plants in the farmers' fields;

(vi) Utilization of information technology as an important tool for horticulture extension, and dissemination of technical know-how and marketing information;

(vii) Utilization of protected cultivation (cultivation in greenhouse, net house, etc) of flowers and high value horticulture crops like strawberries; and

(viii) Development of horticulture crops especially for processing fruits like grapes for producing wine varieties, apples for varieties of ciders and juice, and others.

Table 2.2.5 shows the prospective physical targets on planted areas and production of fruits for the Eleventh Plan.

Table 2.2.5 Prospective Physical Targets of Fruits for Eleventh Plan

Crop	Planted Area			Fruit Production		
	Prospective Target	Change based on Tenth Five Year Plan		Prospective Target	Change based on Tenth Five Year Plan	
	('000 ha)	('000 ha)	(%)	('000 tons)	('000 tons)	(%)
Apple	99.00	-1.72	-1.7	578.40	+110.60	+19.1
Other temperate fruits	27.80	-8.36	-23.1	80.60	+54.23	+205.7
Nuts and dry fruits	18.46	-5.96	-32.3	4.70	+0.21	+4.7
Citrus fruits	42.77	-19.57	-45.8	37.20	+51.73	+268.9
Other tropical fruits	46.92	+8.58	+18.3	94.50	+65.33	+224.0
Total	245.03	-27.03	-11.0	906.00	+248.33	+37.8

Source: Draft Eleventh Five Year Plan 2007-2012 and Annual Plan (2007/08), Planning Department, Himachal Pradesh

In order to attain the above, corresponding items shall be worked out as follows:

(i) Prospective physical target of 20,000 ha as additional area for fruit production and 10,000 ha for re-plantation, meets the same target as that for the Tenth Plan. The target areas for fruit trees apart from apples are 55,000 ha of mango and litchi including 1,000 ha for in-situ plantation of mango, 6,000 ha for walnut/picannut, 80 ha for hops and 15 ha for olives. All of which are set up at higher levels compared with the previous ones under the Tenth Plan;

(ii) The prospective target of fruit plant distribution is 10.0 million;

(iii) The physical targets for fruit processed products shall be 1,000 tons for the processing unit under the Department of Horticulture, and 250 tons for the community centers;

(iv) The physical targets of specific crop development activities other than fruits shall be 500 ha for floriculture, 6000 tons for mushrooms production, and 5000 bee colonies to be distributed for producing 1,500 tons of honey; and

(v) Area-based physical targets for cultivation of forest resource based plants are mapped out at 200 ha each for medical and aromatic plants.

Meanwhile, the Medical Plants Policy 2006 was issued by the Department of Forestry to highlight the concerns on medical plants growing in forests and to set comprehensive programs in motion for long-term development. At present, three different agencies in the State are involved in this new field, namely, the Department of Forestry, the Department of Horticulture and Ayurveda Directorate Himachal Pradesh under the National Medical Plant Board. It is noted however that there is no effective coordination between these agencies for the establishment of a policy that will formulate and implement programs and plans related to medial and aromatic plants in Himachal Pradesh.

Although the Department of Horticulture has mapped out the following strategies for promoting cultivation of medical and aromatic plants on farmers' fields, a detailed scheme aiming at the

implementation of medical and aromatic crop planting is yet to be formulated:

(i) Establish demonstration farms for the collection and multiplication of medical and aromatic plants for supply to the farmers;
(ii) Demonstrate the technology in the cultivation of medical and aromatic plants on farmers' fields;
(iii) Provide incentives to the farmers for increasing the production of medical and aromatic plants in the State in order to offer raw materials to pharmaceutical and cosmetic industries; and
(iv) Supplement the farmers' income to uplift their living conditions.

From the proposed outlay for the Eleventh Plan, a total of Rs.431.6 million is allocated to programs and schemes in the horticulture sector.

(3) Animal Husbandry Sector

The most important objectives of the animal husbandry sector in Himachal Pradesh are: 1) breeding policy focusing on cross-breeding cattle with Jersey to maintain exotic inheritance at 50%, upgrading Murrah buffalo to maintain 75% Murrah inheritance, and cross breeding sheep with Rambouillet and Russian Merino to maintain 75% exotic inheritance; 2) artificial insemination for cows and buffaloes; 3) castration; 4) vaccination against contagious diseases; 5) drenching/dipping of sheep; 6) fodder plants, roots and seed distribution; 7) backyard poultry farming; 8) organization of infertility camps; 9) distribution of rams; and 10) increase in livestock productivity.

To attain the physical targets of the Eleventh Plan as shown in Table 2.2.6, a total of Rs.1,143.2 million is allotted to animal husbandry programs, and further Rs.51.8 million is distributed to dairy production. Milk and egg production is emphasized in the eleventh plan.

Table 2.2.6 Prospective Physical Targets of Livestock and Fish Production for Eleventh Plan

Item	Animal Husbandry				Item	Fishery			
	Unit	Prospective Target	Increase from Tenth 5-Year Plan	%		Unit	Prospective Target	Increase from Tenth 5-Year Plan	%
Milk	1,000 tons	920	+80	+9.5	Fish	1,000 tons	40	+25	+167
Eggs	Million	109	+10	+9.1	Carp seed	Million.	100	+50	+100
Wool	1,000 kg	1,675	+25	+1.5	Trout ova	1,000	1,000	-1,000	-50

Source: Draft Eleventh Five Year Plan 2007-2012 and Annual Plan (2007/08), Planning Department, Himachal Pradesh

(4) Fishery Sector

The objectives of the Eleventh Plan set up by the Department of Fishery are: 1) to generate employment opportunity in the fishery sector and ameliorate living conditions of the fishermen; 2) to enhance fish seed production of carp and other hill fishes in government and private fish farms; 3) to initiate suitable incentives including subsidy-oriented schemes for private entrepreneurs in order to set up fish farms/hatcheries/feed mill with the ultimate aim of raising fish production to 1,000 tons; 4) to strengthen aquaculture promotion programs; 5) to implement large scale seed stocking programs in rivers/streams; 6) to protect and conserve reservoir and lacustrine fisheries resources; 7) to promote game fishery with particular emphasis on commercial farming of trout; and 8) to encourage habitat restoration and management of riverine fisheries.

To attain the physical targets of the Eleventh Plan as shown in Table 2.2.6, a total of Rs.159.5 million is allocated. Carp production is emphasized in the eleventh plan.

(5) Irrigation Sector

The main objectives of the irrigation sector under the Eleventh Plan are:

(i) To speed up completion of ongoing irrigation projects;
(ii) To provide additional 98,000 ha under irrigation;
(iii) To bridge the existing gap between irrigation potential already created and its actual utilization; and
(iv) To tap all sources of water and to construct water harvesting structures.

The physical targets set up by the Department of Irrigation and Public Health (IPH) and the DOA for the Eleventh Plan are summarized in Table 2.2.7

Table 2.2.7 Prospected Physical Targets of Irrigation Schemes under Eleventh Plan

Scheme	Executing Agency	Prospected Target (ha)	Increase from Tenth Five Year Plan	
			(ha)	(%)
Major and Medium Irrigation	IPH	16,000	+8,000	+100
Minor Irrigation	IPH	15,000	+5,000	+50
Command Area Development (Field Channel)	IPH	7,500	+4,500	+150
Command Area Development (Warabandi)	IPH	7,500	+4,500	+150
Soil and Water Conservation	DOA	18,000	-4,500	-20

Source: Draft Eleventh Five Year Plan 2007-2012 and Annual Plan (2007/08), Planning Department, Himachal Pradesh
Remarks: (Warabandi); system improvement for rotational irrigation

To realize such considerable physical targets of the Eleventh Plan, a total of Rs.11,105.4 million is allotted to IPH, which comprise Rs.2,770.7 million for major and medium irrigation schemes, Rs.8,100.5 million for minor irrigation schemes and Rs.234.2 million for command area development schemes. Rs. 943.3 million meanwhile is allotted to soil and water conservation schemes of the DOA.

From the above target development area and allocated budget, including recurrent administration cost, it is understood that average unit cost per development area under the IPH is approximately 173,200 Rs/ha for major and medium schemes, 540,000 Rs/ha for minor schemes, and 15,600 Rs/ha for command area development. Generally, minor irrigation scheme is more costly than the large scale irrigation scheme due to the steep topography in the State. On the other hand, the unit cost for water conservation schemes by DOA is 52,400 Rs/ha approximately.

(6) Agricultural Infrastructure

The Department of Public Works puts its emphasis on accelerating the improvement of road connectivity in remote parts of the State, coupled with the upgrading of existing National and State Highway networks, to support exploitation of development potential in agriculture, horticulture, tourism, industry and hydro-power generation. The physical targets are: 1) 13,077 km passable road; 2) village access road of about 5,500 km; and 3) upgrading and periodic maintenance of the existing 3,330 km road. The outlay allocated to road sector for the Eleventh Plan period amounts to Rs.19,520 million.

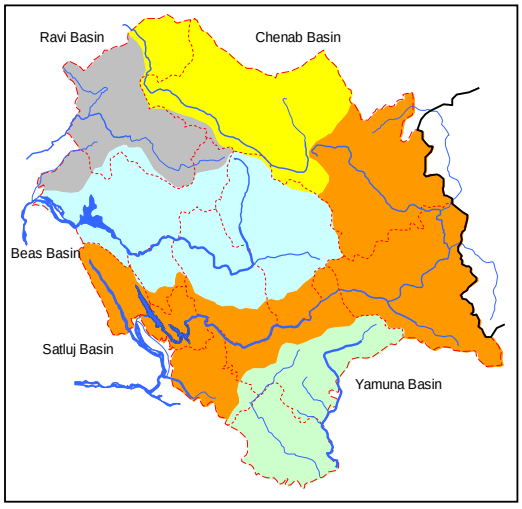
CHAPTER 3 PRESENT CONDITIONS OF HIMACHAL PRADESH

3.1 Natural Conditions

3.1.1 Geography and River System

Himachal Pradesh (the State) is a relatively small state in terms of area and population, and is geographically different from most Indian states in the plains. The State lies between 30°22'40" and 33°12'20"north latitude and 75°45'55" and 79°04'20" east longitude. As it extends over a wholly mountainous region at the lap of Himalayas, its altitude ranges from 350 m to 6975 m above mean sea level. Higher Himalayan reaches more than 4000 m above mean sea level, comprising of Pir Panjal, Dhuladhar, Zanskar and Great Himalayan ranges. The geographical area of the State is 55,673 km² in total. It borders the Jammu and Kashmir State in the north to northwest, Tibet in the east, the Uttarakhand State in the southeast, the Haryana State in south and the Punjab State in the southwest to west.

It has relatively abundant water resources from five major river systems mostly originating in glaciers. These river basins cover around 90% of the geographical area as shown in Fig. 3.1.1. Of these, the Chenab, the Beas and the Ravi originate from and flow through the State, covering 27,057 km² in total. The Satluj with its origin in Tibet goes across the State and forms the largest catchment area of 17,092 km² in the State. The Yamuna flows along the south-eastern border of the State and its catchment area is 5,901 km² within the State. The surface water resources of these river systems are perennial, originating from glaciers, and their flows are further augmented by run-off from the downstream catchments. Size of most glaciers are small with lengths of 2 ~ 25 km and accumulation zone of 2 ~ 4 km². Due to the adverse effect of the global warming phenomenon, a constant recession phenomenon is recently hastening in these glaciers. There exist a number of natural lakes in the State, and the major ones are Manimahesh, Khajiar, Chandratal, Surajtal, Rawalsar, Prashel and Kamrunag lakes.



Source: JICA Study Team

Fig. 3.1.1 River Systems in Himachal Pradesh

3.1.2 Climate and Agro-ecological Zone

(1) Climate

Climate in the State is different from most plain states in India. It has generally three seasons throughout the year, i.e., the cold season (October to February), hot season (March to June) and rainy season (July to September). However, due to its wide range with an altitude of over 6500 m, its climate varies from sub-humid tropical (EL.350 ~ 1,000 m) in the southern low tracts, to warm and temperate (EL.1,001 ~ 1,500 m), cool and temperate (EL.1,501 ~ 2,500 m), and cold alpine and glacial (EL.2,501 ~ 6,975 m) in the northern and eastern mountain ranges.

Temperature in the State is lower than that in other plain states in India. The range of maximum and

minimum temperature is between 20.4°C and 0.5°C at the highest location among its 27 stations, while 14.4°C and 28.6°C at its lowest site.

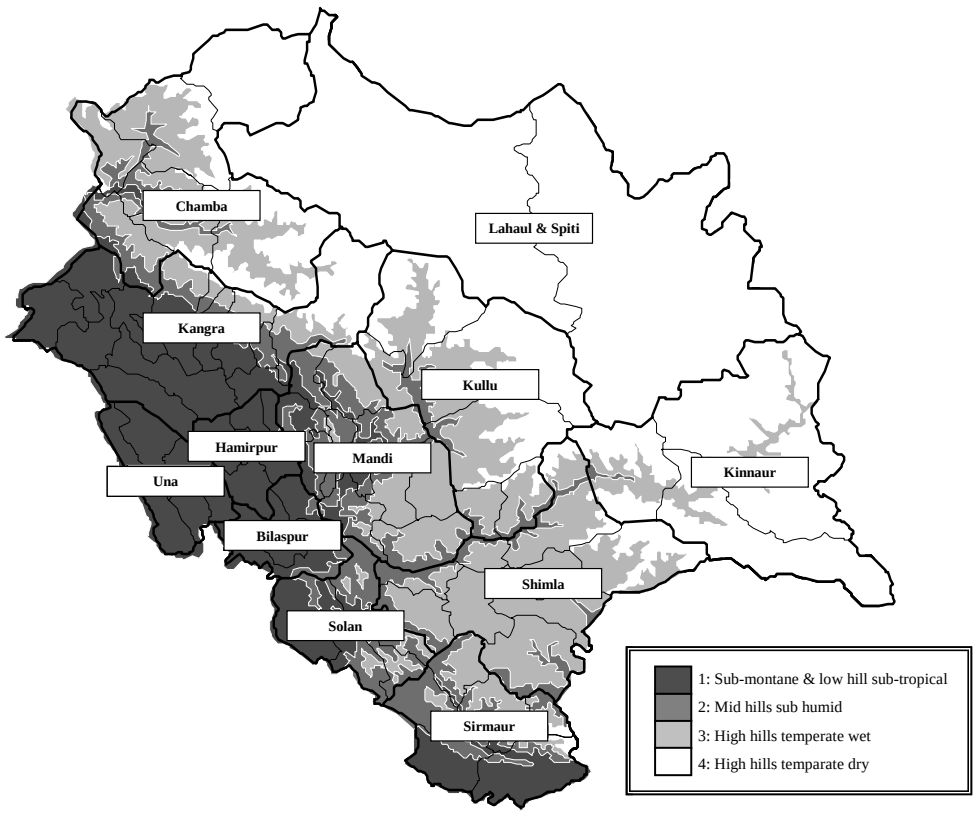
The average annual rainfall at 55 meteorological stations ranges from 332 to 2606 mm. Besides having less rainfall during hot season, the cold alpine and glacial areas have precipitation in the form of snow during cold season. It snows during winter down to an elevation of about 1500 m. Rainfall without snowfall concentrates during rainy season from July to September in most parts of the State.

(2) Agro-ecological Zone

There are four agro-ecological zones according to zoning criteria based on elevation and rainfall modified by CSK Himachal Pradesh Agricultural University in 2006. These zones are given below:

Table 3.1.1 Agro-ecological Zones and Distribution

Zone	Zoning Criteria		
	Sub-zone	Altitude range (m)	Rainfall (mm)
1.	Zone 1.1	240-1,000	Less than or equal to 1500
	Zone 1.2	240-1,000	Greater than 1500
2.	Zone 2.1	1,001-1,500	Less than or equal to 1500
	Zone 2.2	1,001-1,500	Greater than 1500
3.	Zone 3.1	1,501-2,500	Less than or equal to 1500
	Zone 3.2	1,501-3,250	Greater than 1500
4.	Zone 4.1	2,501-3,250	Less than or equal to 700 (dry)*
	Zone 4.2	3,251-4,250	Dry / snow
	Zone 4.3	>4,250	Dry / snow



Source: *Agro-Ecological Zonation of Himachal Pradesh – Agricultural System Information Development at micro-level by Geo-Centre, CSK HPA University, Palampur (2006)*

Remarks: **; it is in principal but varies area by area.*

Table 3.1.2 Specific Features of Agro-ecological Zones

Agro-ecological Zone	Area	Climate	Crops
Zone 1 Sub-montane & low hills sub-tropical 240 < Altitude ≤1,000m	10,260 km² (18.43% of the State)	Sub-tropical climate wherein the mean annual temperature lies between 15 to 23˚C. Average rainfall is 1,100 mm of which 80% is received during monsoon season.	Rainfed farming is mostly practiced in this zone. Important crops grown are wheat, maize, paddy, pulses and oil seeds. Barley, sugarcane and potato are grown to some extent. Sub-tropical fruits such as citrus, mango and litchi are the important fruit crops in this zone.
Zone 2 Mid hills sub humid 1,000<Altitude≤ 1,500m	4,664 km² (8.37% of the State)	Sub-humid climate wherein mean annual temperature lies between 14 to 22˚C. The rainfall around Palampur is as high as 3,000 mm, while in the remaining areas, it is about 1,500 mm.	Rain fed farming is mostly practiced in this zone. Important crops grown are wheat, paddy, barley, pulses and oil seeds. Citrus fruits are also grown in some areas of this zone. Some parts are suitable for off-season vegetables.
Zone 3 High hills temperate wet 1,500<Altitude≤ 3,250m	9,217 km² (16.54% of the State)	Temperate wet climate and the average rainfall is about 1,000 mm which is received during monsoon season.	The major crops are wheat, barley, maize, millets, pulses and oil seeds. Apple, other temperate fruits and nuts are important horticulture crops. This zone is suitable for off-season vegetables and seed production of temperate vegetables.
Zone 4 High hills temperate dry 2,500m <Altitude	31,509 km² (56.61% of the State)	Temperate dry climate. Average rainfall is generally less than 700 mm but is more in some area. High altitude areas (above 3,250 m) have perennial glacial reserves.	There is only one season for crop cultivation, i.e. April to October. Major crops are wheat, potato, barley, buckwheat, peas, minor millets and temperate vegetables. Apples, grapes, almonds, walnut and apricot are the main fruits. Some areas of this zone are highly suitable for quality potato seed. High value crops like hops, cumin and saffron are also grown in this zone.

Source: Agro-Ecological Zonation of Himachal Pradesh- Agricultural System Information Development at micro-level, Geo-Centre, CSK HPAU, Palampur (2006)

3.1.3 Geology and Soils

The geological structure of the State, which falls into four major zones, is the most complicated among the Himalayan regions. These zones are the outer- or sub-Himalayan zone consisting mainly of tertiary formations, lowest Himalayan range mainly composed of granite and other crystalline rocks, high Himalayan zone with granite rocks lacking fossils, and Tibetan or Tethys Himalayan zone comprising the wide basin covering the Spiti valley.

The soils vary from deep and rich alluvial soil of valleys to thin and bear soil of hill or snow-covered soil of high mountains. These are broadly classified into nine groups as follows, based on development process, and physical and chemical features:. 1) alluvial soils; 2) brown hill soils; 3) non-calcic brown soils; 4) brown forest soils; 5) grey wooded or brown podzolic soils; 6) grey brown podzolis soils; 7) planosolic soils; 8) humus and iron podzols; and 9) alpine humus mountain skeletal soils.

3.1.4 Land Resources and Land Utilization

From the land use viewpoint, the State has three regional characteristics as follows:

i) Southern part is featured by intensively cultivated and moderately forested land covers with marginal presence of pasture and other grazing lands;

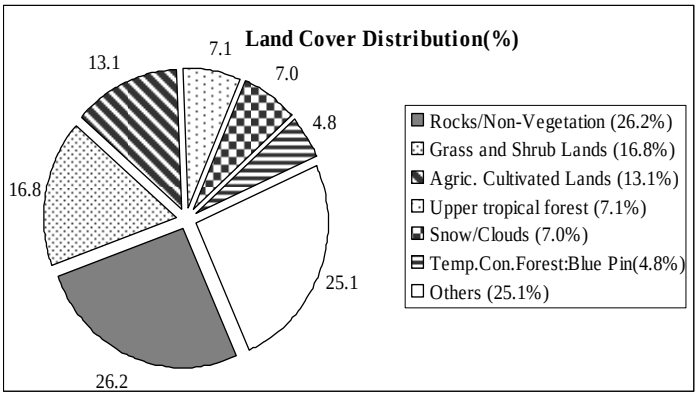
ii) Central part is predominated by moderately cultivated and highly forested land covers with a considerable proportion of pasture and other grazing lands; and

iii) Northern part is represented by poorly cultivated and sparsely forested land covers with a high proportion of pastures and other grazing land.

The spatial distribution of land cover types in the State is summarized in Fig. 3.1.2.

Its land cover is characterized by 54.9% wide rock/non-vegetation, grass and shrub, and forest.

The cultivated agricultural land cover of only 13.1 % is limited for expansion due to the State's topography as well as the view point on environmental conservation.



Data Source: Agro-Ecological Zonation of Himachal Pradesh, Geo-Center, CSK HPAU, Palampur (2006)

Fig. 3.1.2 Distribution of Land Cover Classes

3.1.5 Forestry

The forest area legally defined covering 37,033 km² of the State is classified into groups based on four different viewpoints::

i) Six groups based on legal status such as reserved forests of 1,896 km² or 5.1%, demarcated protected forests of 11,830 km² or 31.9%, un-demarcated protected forests of 21,213 km² or 57.3%, un-classed forests of 977 km² or 2.7%, other managed by Forest Department of 369 km² and not managed by Forest Department of 748 km² or 2.0%;

ii) Three groups based on ownership such as State owned forests of 35,916 km² or 97.0%, Cantonment & Municipal forests of 42 km² or 0.1% and private individual forests of 1,075 km² or 2.9%;

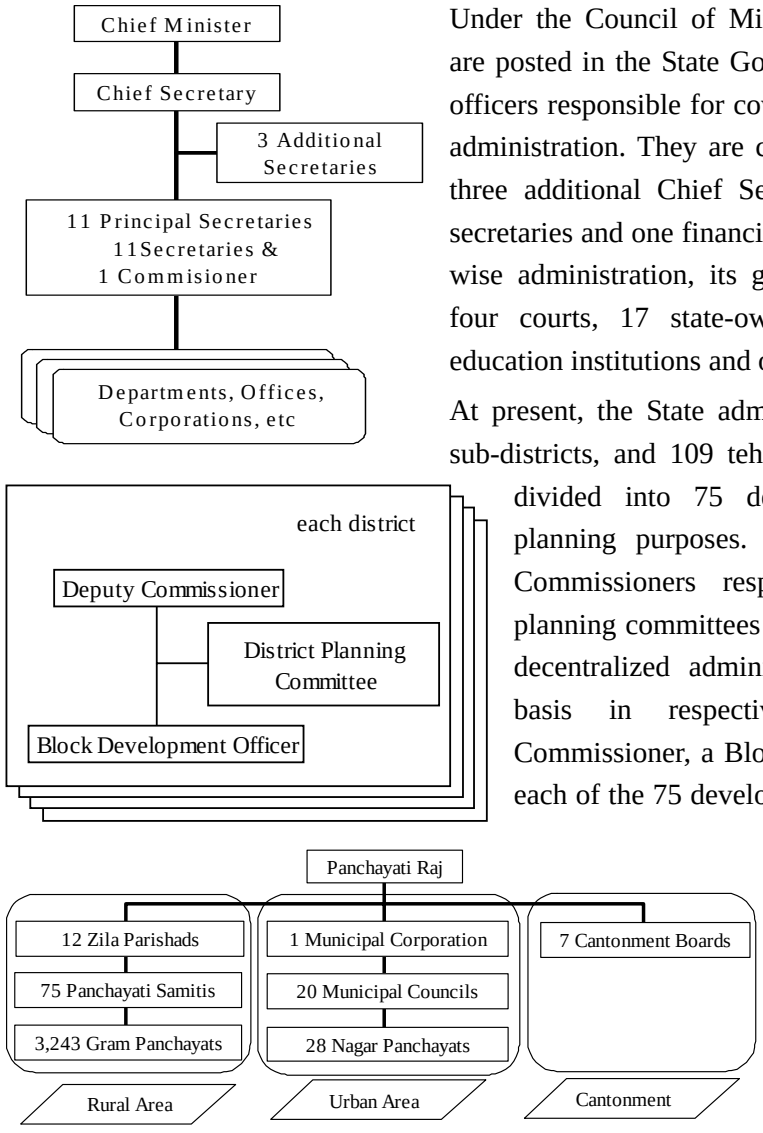
iii) Three groups based on crop composition such as coniferous of 9,002 km² or 24.3%, broad leaves/scrub of 7,306 km² or 19.9% and waste, blank/pasture of 20,663 km² or 55.8%; and

iv) Four groups based on density distribution of forests such as dense forests with crown density above 40% covering 8,976 km² or 24.2%, open forests with crown density between 10% and 40% extending over 5,377 km² or 14.6%, forest blanks with crown density less than 10% being 6,304 km² or 17.0% and uncultivable barren land including alpine pasture, snow covered area, etc. amounting to 16,376 km² or 44.2%.

3.2 Economic and Social Conditions

3.2.1 Administrative Structure

The State Government led by the Chief Minister, is formed by a council of presently appointed ten ministers. The council includes the Chief Minister, Minister of Public Works, Minister of Education, Minister of Forest, Minister of Irrigation and Public Health, Minister of Transport, Minister of Horticulture, Minister of Food Civil Supplies and Consumers Affairs, Minister of Health and Family Welfare and Minister of Social Justice and Empowerment. Each minister holds several other assignments apart from its designation.



Source: Hearing data in DOA by JICA Study Team

Fig. 3.2.1 State Administrative Structure

Under the Council of Ministers, senior Administrative Officers are posted in the State Government Secretariat, acting as the top officers responsible for covering specific parts of the government administration. They are composed of one Chief Secretary, with three additional Chief Secretaries, 11 principal secretaries, 11 secretaries and one financial commissioner. To carry out the state-wise administration, its government organized 36 departments, four courts, 17 state-owned corporations, eight Boards, 14 education institutions and others.

At present, the State administration consists of 12 districts, 52 sub-districts, and 109 tehsils and sub-tehsils. The State is also divided into 75 development blocks for development planning purposes. Its government appoints 12 Deputy Commissioners responsible for managing the district planning committees and for monitoring the performance of decentralized administrative activities on the grass-roots basis in respective districts. Under the Deputy Commissioner, a Block Development Officer is assigned to each of the 75 development blocks and delegated to conduct respective development planning works on economic activities.

Along with the national decentralization policy, three tier Panchayati Raj structures are presently functioning (*Panchayat: autonomous community group under governmental subsidy*).

The presently functioning institutions include 12 Zila Parishads, 75 Panchayat Samitis and 3243 Gram Panchayats on the rural side, one Municipal Corporation, 20 Municipal Councils and 28 Nagar Panchayats on the urban side, and seven Cantonment Boards.

Table 3.2.2 shows physiographical areas of 12 districts in the State as well as district-wise distribution of 75 development blocks and 3,243 Gram Panchayats.

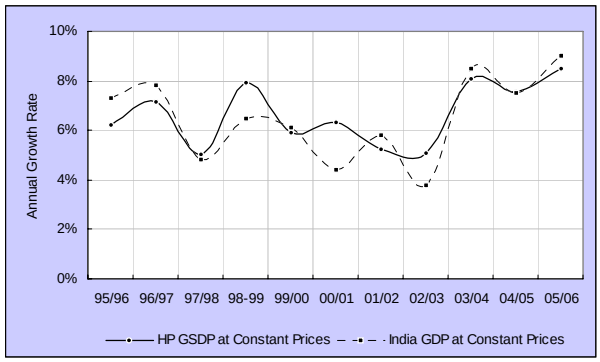
Table 3.2.1 Physiographical Area, Development Blocks and Gram Panchayats by District

District	Area (sq. km)	No. of Develop. Block	No. of Gram Panchayat	District	Area (sq. km)	No. of Develop. Block	No. of Gram Panchayat
Bilaspur	1,167	3	151	Lahaul-Spiti	13,835	2	41
Chamba	6,528	7	283	Mandi	3,950	10	473
Hamirpur	1,118	6	229	Shimla	5,131	9	363
Kangra	5,739	14	760	Sirmaur	2,825	6	228
Kinnaur	6,401	3	65	Solan	1,936	5	211
Kullu	5,503	5	204	Una	1,540	5	235

Source: Statistics and data, Planning Department, Himachal Pradesh

3.2.2 Economic Situation of the State

During the period from 1995/96 to 2006/07, the real Gross State Domestic Products (GSDP), expressed at constant price based on 1993/94, showed a favourable growth at an average rate of 6.8% per annum, ranging from 5.0% per annum in 1997/98 as the lowest to 8.5% in 2005/06 as the highest. This economic growth rate is almost the same as that of the entire India's rate, as shown in the right figure. Under such economic situation, the per capita income of the State has reached Rs.33,800 (USD 760) in 2005/06, which is slightly higher than the national average of Rs.32,000 (USD 720).

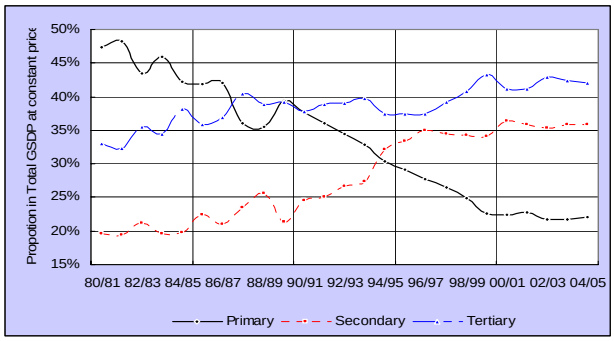


Source: Statistical Outline, Economic & Statistical Dept , Himachal Pradesh

Fig. 3.2.2 Economic Growth Rate of State & India

The economic sectors are generally categorized into primary, secondary and tertiary sectors. The primary sector includes the sub-sectors of agriculture, forestry, fishery, and mining and quarrying. The secondary sector consists of the manufacturing, construction, and electricity/gas/water supply.

Out of these sectors, 77% of the State's GSDP is derived from the secondary and tertiary sectors in 2006/7, where the primary sector contributes about 23%. The primary sector has been decreasing its share in the total GSDP from 45% in early 1980s, 30% in mid 1990s, and to 22% in 2004/05, as shown in the left chart.

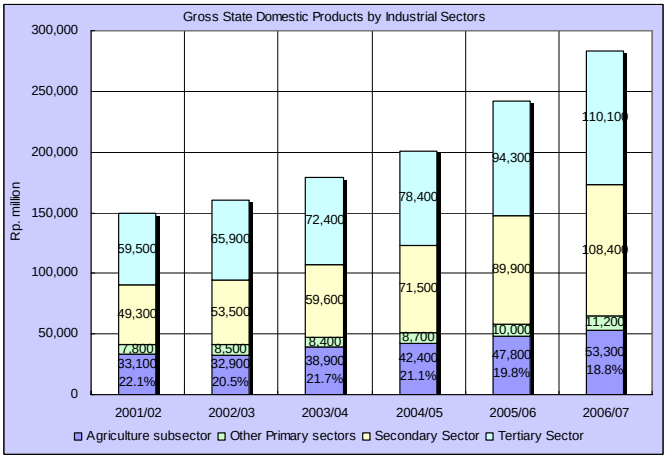


Source: Economic Survey, Economic & Statistical Dept, Himachal Pradesh.

Fig. 3.2.3 Proportion of Real GSDP by Sector

In the primary sector, agriculture is the dominant sub-sector producing more than 80% of the sectoral GSDP. However, the share of agriculture sub-sector in the total GSDP has been decreasing from 22.1% in 2001/02 to 18.8% in 2006/07, as shown in the right figure.

In such situation, the agriculture sector sustains rural economy and the main income of farm households, and farm employment. According to Population Census 2001, out of the State's total households of 1,222,000, 88% or 1,080,000 are located in the rural area,

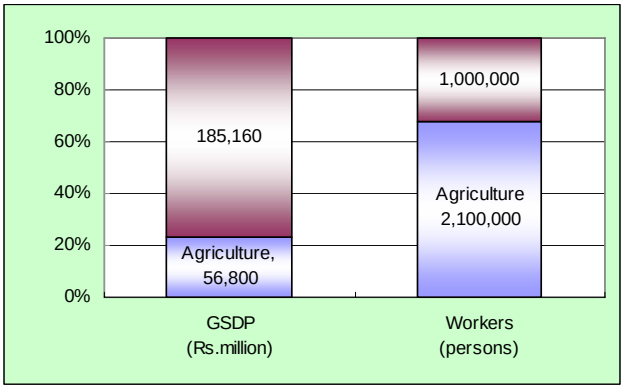


Source: Economic Survey and Economic Abstract, Economic & Statistical Dept, Himachal Pradesh.

Fig. 3.2.4 Nominal GSDP by Sector from 2001/02 to 06/07

while 914,000 are in the farm. These households are either directly or indirectly engaged in agriculture, where about 2 million of farm employment or 68% of the total workers are working in the State.

Based on the nominal GSDP and total number of workers, the average GSDP per worker is estimated at Rs.73,300 in the industrial sector, It exhibits a large gap with the agriculture sector, which has a GSDP of Rs.25,800 per worker (of which 95% are the cultivators) and other sectors with Rs.168,000 per worker. In order to fill this gap, agricultural development is required to further generate farm income, through production and selling of higher value-added merchandise



Source: Statistical Outline 2006-07, and Economic Survey and Economic Abstract, Economic & Statistical Dept, Himachal Pradesh.

Fig. 3.2.5 GSDP and Workers by Sector

3.2.3 Fiscal Management of State Government

Himachal Pradesh was given the status of 'special category state' ever since it was conferred statehood in 1971. Its financial viability has been dependent on transfers from the Central Government. The State government has put more efforts in increasing its financial sources through direct and indirect taxes, non-tax revenues, share of central taxes and grants-in-aid from the Central Government, to sustain its expenditures on administration and development activities, as well as to reduce interest payments.

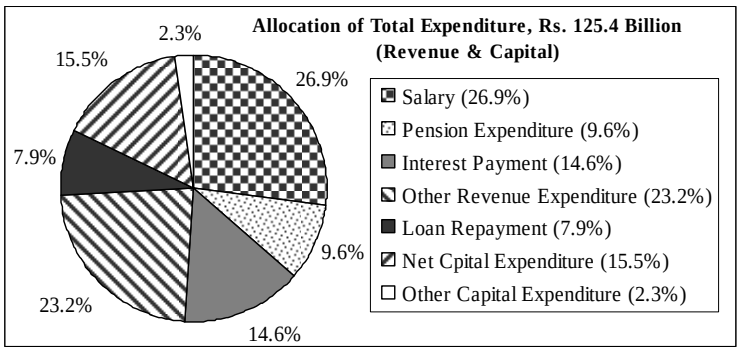
The tax and non-tax revenues, as a result, have been increased and recorded as the highest amount in 2005/06. The chronic revenue deficit meanwhile has been reduced to the minimum level as shown below:

The capital receipts include market borrowings with higher interest rates and negotiated loans which are normally utilised to meet expenditure for creation of assets and development purposes. However a part of the capital expenditure was already used for the revenue expenditure in the past. Nevertheless, the Sate has started to improve this past chronic situation since 2005/06 to achieve a sounder financial condition as shown in Table3.2.3.

Table 3.2.2 Financial Status of Himachal Pradesh State *Unit: Rs. 10 million*

Revenue & Capital Item	2000/01	2001/02	2002/03	2003/04	2004/05	2005/06
1. Revenue Receipts (=a+b+c)	3,046	3,716	3,659	3,981	4,636	6,333
a. Tax Revenue	1,059	1,241	1,235	1,434	1,789	1,913
b. Non-tax Revenue	177	198	175	292	611	626
c. Grants-in-aid by Central Government	1,810	2,277	2,249	2,255	2,235	3,794
2. Revenue Expenditure (including a.)	4,376	4,576	5,141	5,588	5,793	6,427
a. Interest payments	798	1,042	1,172	1,472	1,649	1,669
3. Net Revenue Surplus/Deficit (=1-2)	-1,330	-860	-1,482	-1,607	-1,158	-94
4. Capital Receipts (=a+b+c)	3,927	4,366	5,817	7,036	5,600	2,543
a. Recovery of Loans	27	29	29	28	26	29
b. Other Receipts	765	-66	846	371	999	413
c. Borrowing & Liabilities	3,135	4,403	4,942	6,637	4,575	2,101
5. Capital Expenditure	2,532	3,659	4,315	5,534	4,235	2,302
6. Net Capital Surplus/Deficit (=4-5)	1,395	707	1,502	1,502	1,365	241
7. Total Net Revenue & Capital (=3+6)	65	-153	20	105	207	147
8. Total Expenditure (=2+5)	6,908	8,235	9,456	11,122	10,028	8,729
a. Plan Expenditure	1,875	1,866	2,276	1,639	1,591	1,946
b. Non-plan Expenditure	5,033	6,369	7,180	9,483	8,437	6,783

Source: Economic Survey Himachal Pradesh 2004-05, 2005-06 & 2006-07



Source: Economic Survey Himachal Pradesh, 04-05, 05-06 & 06-07

Fig. 3.2.6 Allocation of Expenditure in 2008/09 Outlay

Allocation of the Budget 2008/09 is given in Fig. 3.2.6 based on the Finance Minister's speech on Mach 7, 2008. Total expenditure is Rs. 125.42 billion and net capital expenditure is Rs. 19.31 billion. Interest payment and loan repayment amount to Rs 28.26 million or 22.5 % of the total expenditure.

3.2.4 Population and Employment

The Population Census 2001 reveals that the State's population was 6,078,000 in total, which comprise 3,088,000 males and 2,990,000 females. Of these, 5,482,000 or 90.2% lived in 17,945 inhabited villages, while only 596,000 or 9.8% resided in urban areas. The working age population from 15 to 59 years old was 3,519,000 with a share of 57.9%. The younger population with age 7 to 14 years old was 1,118,000 or 18.4% followed by child population of 769,000 12.7% and aged population of 607,000 or 10.0%. The compounded growth of population per annum in the State between 1991 and 2001 was 1.75%. The total number of households in the State in 2001 was 1,240,633, and the average family size was 4.9 persons.

There were 1,502,000 SCs and 245,000 STs in the State sharing 24.7% and 4.0% of the total population in 2001, respectively.

According to the same census, the working population was 2,992,000, of which the total number of main workers was 1,964,000, corresponding to 32.1% of the total population, while marginal workers were 1,028,000 or 16.9%. About 2,049,000 or 68.5% of the total working population were engaged in agriculture as cultivators and labourers, while the remaining 943,000 worked in other economic

sectors including 227,000 as government employees. As the agriculture sector is absorbing majority of the labor force, the working population in urban areas of the State was only 220,000 as of 2001. Salient features of district-wise demography based on the said census are summarized in Table 3.2.4.

Even though almost 95% of agricultural workers have their own farm lands, 44% of them were forced to acquire non-agricultural jobs as shown in Table 3.2.5, mainly due to climatic condition and small land holding size.

Table 3.2.3 Demographic Features of District

District	Total Population	Growth Rate (%)	No. of Scheduled		Total No. of Households	Agricultural Workers	Share* (%)
			Castes	Tribes			
Bilaspur	340,885	1.53	86,581	9,180	67,195	117,167	70.3
Chamba	460,887	1.71	92,359	117,569	87,699	169,245	73.4
Hamirpur	412,700	1.16	98,539	155	87,596	146,826	71.5
Kangra	1,339,030	1.4	279,540	1,597	272,697	374,891	63.6
Kinnaur	78,334	1.78	7,625	56,268	20.781	32,078	67.1
Kullu	381,571	2.56	107,897	11,351	78,362	170,236	78.6
Lahaul-Spiti	33,224	0.62	2,605	24,238	9,155	11,499	54.5
Mandi	901,344	1.61	261,233	10,564	186,571	335,990	74.0
Shimla	722,502	1.69	188,787	4,112	160,646	247,304	66.8
Sirmaur	458,593	2.07	135,774	5,960	82,543	167,365	74.1
Solan	500,557	3.06	140,642	3,542	98,519	149,939	56.9
Una	448,273	1.84	100,588	51	88,869	126,501	62.7
Total of State	6,077,900	1.75	1,502,170	244,587	1,240,633	2,049,041	68.5

*Note: *; Share of agricultural workers against total workers*
Source: Fact Book on Manpower, Planning Department, Himachal Pradesh State Government

Table 3.2.4 Agricultural Workers per District

District	Total Workers	Agricultural Workers	Cultivators		Agric. Labourers		No. of Farm Households
			Main	Marginal	Main	Marginal	
Bilaspur	166,708	117,167	66,487	47,757	1,014	1,909	45,998
Chamba	230,452	169,245	72,827	94,763	667	988	63,859
Hamirpur	205,405	146,826	68,675	74,860	719	2,572	61,642
Kangra	588,994	374,891	144,834	190,523	11,266	28,268	169,111
Kinnaur	47,811	32,078	24,317	6,660	852	249	12,477
Kullu	216,513	170,236	120,959	43,687	3,008	2,582	60,074
Lahaul-Spiti	21,088	11,499	9,981	1,179	186	153	4,279
Mandi	454,292	335,990	163,760	165,712	1,442	5,076	133,462
Shimla	370,223	247,304	181,359	56,131	6,977	2,837	97,602
Sirmaur	225,872	167,365	119,585	42,013	2,775	2,992	57,949
Solan	263,445	149,939	65,255	78,375	3,385	2,924	55,888
Una	201,658	126,501	51,085	64,086	3,865	7,465	53,202
Total of State	2,992,461	2,049,041	1,089,124	865,746	36,156	58,015	815,543

Source: Fact Book on Manpower, Planning Department, Himachal Pradesh State Government

3.2.5 Education and Literacy

The decadal achievement of educational institutions was realized through the State government's continuous efforts. Hence, the literacy rate in the State consequently increased from 32.0% in 1971 to 77.1% in 2001. As of March 2005, there were 10,651 primary schools, 2,199 middle schools, 949 high schools, 696 senior high schools and 41 colleges. In addition, 50 industrial training institutes and seven polytechnics offer technical education opportunities to the young generation. The enrolment rate in March 2005 was 100% at the primary school level and 93.4 % at the middle school level.

As a result of the above efforts, the overall literacy rate in the State achieved a level of 76.5%, which is higher than the country's average of 65.4% in 2001. This has improved by 34.0% for a period of 20

years between 1981 and 2001. Female's literacy rate increased from 31.5% in 1981 to 67.4% in 2001, while male's rate went up from 53.2% to 85.3%.

3.2.6 Health

As of March 2005 the State has existing 116 hospitals, 505 primary health centres, community health centres, rural hospitals and subsidiary health centres, 22 allopathic dispensaries, 1,122 Ayurvedic dispensaries, and 2,068 health sub-centres. Statistics show therefore that its situation is better than that of the entire India. This was confirmed by the State's birth rate per 1,000 persons of 20.60, as against India's 24.40. Similarly, its death rate per 1,000 persons is 7.1 as compared to India's 8.0. Meanwhile, its infant mortality per 1000 babies is 49, which is lower than the country's 60. It is finally noted that the State's life expectancy at birth is 65.9 as against India's 62.5.

3.2.7 Cultural Characteristics

Through its long history, political Himachal has been the melting pot of several races and culture. This led to its present rich diversity of people and culture comprising of different ethnic stock, tribes, castes and religions. Cultural landscape of the State has originated from the Tibetan, Mongolian, Mughal, British, Punjabi cultures, which co-exist with distinct local and ethnic culture-religious practices of its Scheduled Tribes (STs) and Scheduled Castes (SCs).

Predominant among the SC population are the Kolis, Chamars, Rehars, Chanals, Lohars, Baris, Dagis and Truri. Among the non-SCs or 'general castes', Brahmins, Soods and Thakurs are predominant.

Majority of the STs are founds in the scheduled areas of districts Lahaul and Spiti, Kinnaur and Block Pangi and Bharamour in District Chamba. A small population of tribal area are also found in other parts of the State and are categorized as 'dispersed tribals'. The tribal culture of Himachal is both distinct and rich. The predominant tribes of the State are Kinners, Lahaulas, Pangwals, Gaddis and Gujjars[1]. While many of the tribes have settled in agriculture and horticulture, many still survive as pastoral nomads, earning their livelihood from cattle, sheep and goat rearing.

The development needs of the SCs and STs are addressed through the State's specific tribal and schedule caste sub-plans. The schedule Areas are administered through the Tribal Area Development Agencies that function under the Tribal Development Department.

The State is locally known as the 'land of gods' or 'dev bhumi'. Religion forms an integral part of the people's daily socio-economic living. Hence, in undertaking any work or activity, the sanction of the local deities is important. There are six important religious communities, namely, the Hindus, Muslims, Christians, Buddhists, Sikhs and Jains. Hinduism is the predominant religion with 95.43% of the people being Hindus. Muslims comprise 1.97% of the population and are concentrated mainly around Chamba, Kangra and Sirmaur. About 1.25% of the population is Buddhists and is concentrated in the districts of Lahaul Spiti, Kinnaur and Kullu. Sikhs, living mostly in Kangra, Shimla and Mandi districts comprise 1.19% of the population. Christians (0.13%) and Jains (0.02%) do not concentrate in specific locations[2].

The Himachal people are known for being industrious and hardworking. Given the difficult terrain and topography of the State, agriculture sector has evolved only due to the industrious Himachal farmers. Majority of the farmers have to earn their livelihood by tilling the poor, hard, stony denuding and thin-

[1] M.S. Ahluwalia 1998 Social, Cultural & Economic History of Himachal Pradeshi. Indus Publsihing Company, New Delhi.
[2] Statistical Outline of Himachal Pradesh 2006-2007.

surfaced soils within a small landholding. This farmers' virtue is also evident considering their motivation in adopting the horticultural initiatives of the State. For being entirely dependent on traditional agriculture, almost 6.7 % of the total cropped area is presently cultivated with vegetables and 17.6 % with fruits[3].

The Himachal people are also known for their simplicity, peace-loving nature and honesty. They are known to be 'god-fearing, chivalrous and extremely social[4]'. Even in the recent study conducted by Transparency International, in the composite ranking of states on corruption involving common citizen and in the context of eleven public services, Himachal Pradesh ranked as the second least corrupt state in India[5]. The State is also adjudged recently as being the fourth most peaceful state in the country[6]. Perhaps its greatest asset is the social capital and social cohesion of its people.

An implicit social compact and cohesion of the people in the State has been recognized as a key factor in the significant economic growth of the State in the last two decades[7]. Hence, people's participation through organized group activities has been successfully achieved in most areas of development in the State. This is evident considering the present large number of farmers' cooperatives groups, Farmers Interest Groups, Women Self-help Groups (SHGs), Women's Groups and the Water User Association/Krishi Vikas Kendras (500).

Finally, socio-economic advancement has always been attributed to a highly motivated, people friendly, transparent, peaceful political environment and result-oriented government[8]..

3.2.8 Gender in Agriculture

Women participate practically in every aspect of food grain, vegetable and fruit cultivation. According to the Population Census 2001, 1.16 million women or 88.8% of the total female workers in Himachal Pradesh are engaged in agriculture. It is observed that the level of women's participation in agriculture is higher than the male agricultural working population of 0.89 million, which is equivalent to 52.8% of the total male workers.

Women's participation rates in agriculture and related activities were estimated, as follows, through group discussions with female farmers conducted by the Study Team in several districts

i) Participation rates in food grain cultivation are 40~45% of land preparation, 80~90% of sowing, 35~40% of rice seedling transplanting, 35~40% of irrigation, 70~80% of compost and manure application, 40~42% of fertilizer application, 80~85% of weeding, 20~30% of plant protection, 75~80% of harvesting, and 50~55% of post-harvest practices;

ii) Participation rates in vegetable cultivation are 40~45% of land preparation, 60~65% of nursery raising, 50~52% of transplanting, 60~65% of inter-cultivation, 75~80% of picking, grading and packing, and 10~20% of marketing practices;

iii) Participation rates in horticulture crop cultivation are 40~50% of digging pits, 45~50% of planting, 15~20% of training/picking, 40~45% of spraying, 20~25% of fruit picking, 60~75% of transport to road head, 10~15% of marketing, and 70~80% of orchard maintenance practices; and

[3] Data of Department of Agriculture, Himachal Pradesh (2005-2006 Season).
[4] Padma Nabh Gautam 2008 'Socio-Admisntrative System of Himachal Pradesh' in Laxman S. Thakur (ed)Where Mortals and Mounatin Gods Meet: Society and Culture in Himachal Pradesh. Indian Institute of Advanced Studies, Simla
[5] India corruption study 2005 to Improve governance: Transparency India International and Centre for Media Studies, New Delhi, 2006.
[6] Survey on States of States carried out by the India Today Group, 2007
[7] World Bank 2007: Himachal Pradesh: Accelerating Development and Sustaining Success in a Hill State.
[8] Himachal Pradesh Human Development Report 2002.

iv) Almost 80~90 % of the animal husbandry work is done by women at the household level, as activities in this field are also low skill and high on labour, involving tending to cattle in the shed, grazing, fodder collection, dung collection, cleaning of sheds, preparing cattle feed, milking and preparing other dairy products.

As indicated above, the participation in land preparation reflects a lower rate because women are generally not permitted to plough the field in most areas. Meanwhile, vegetable cultivation involves more labor and participation of women. Marketing of vegetables and fruits are considered as male's job. Accordingly, it would be difficult to cultivate vegetables and fruits in a large family-owned farm land if there is no male in the family.

One of the approaches towards economic empowerment of women is through direct access to money. This has enabled them to undertake income-generating and entrepreneurship activities. Most of the income-generating activities which the State has promoted was through the SHG approach. These micro-credit and savings groups are aimed at women who got left out of the normal credit delivery systems. The National Bank for Agriculture and Rural Development (NABARD) was among the first to facilitate the SHG programme in the State. NABARD sponsored micro-credit programmes to help the formation of SHGs, in order for them to easily access credit. It is implemented through the collaboration of banks with NGOs and concerned government departments. NABARD has been working extensively through the Department of Social Justice and Empowerment. As of March 31, 2006, there were a total of 22,920[9] NABARD-sponsored SHGs which had been linked with banks . The State is keen on promoting agro-based income-generating initiatives, which are focussed on post-harvest management and processing of fruits and vegetables.

3.2.9 Rural Poverty

(1) Re-assessed Poverty in Himachal Pradesh

The current national level projection of poverty in the State seemed lower than what actually exists at the State level. As per estimates performed by the Planning Commission, the poverty level in the State has consistently declined from 26.39% in 1973-1974 to a mere 7.63% in 1999-2000. The poverty estimates of 1999-2000, however, have been controversial, as this decline particularly from 1993 to 2000, was attributed to the change in methodology. Hence, the 1999-2000 poverty ratios are not being considered by the State Department of Rural Development as the criterion for allocation of funds for the State.

The household survey for identification of below poverty line (BPL) in the State is based on 13 criteria with modification. The State level household survey suggests that the average 23.87% of household (approx. 0.3 million) below BPL is slightly lower than the national average of 26.1%.

Table 3.2.5 Poverty Ratios in HP: National and State

Year	National Level Rural Poverty Estimates	State Level Rural Poverty Estimates
1973-1974	27.42	Not available
1993-1994	30.34	Not available
1999-2000	7.94	27.62
2002-2007	10.7	23.87

Source: Government of India 2002 & Department of Rural Development, Government of HP

[9] NABARD Annual Report 2006.

Apart from the households identified as BPL, an additional 500,000 families have been identified to be under the Public Distribution Systems (PDS), which addresses the minimum food security needs[10]. Considering that the PDS functions mainly to provide for BPL families, the mentioned additional families can be considered as well to be under BPL.

(2) Significant Regional Disparities

Although the State as a whole has made notable economic advancement, there are significant regional imbalances that still exist. The development potentials in the high mountainous regions are limited infrastructure facilities, income opportunities, land availability and productivity, etc. According to Survey on Poor Families by State Rural Development Department, concentration of poverty across the districts varies, where the highest being the districts of Chamba and Lahaul Spiti. As noted from the World Bank report[11], access to social and economic benefits tend to be worse for poorer households, women, households with less educated members, households without regular employment, households with high dependency ratios (i.e., the ratio of the non-earning members to earning members) and remote areas.

(3) High Vulnerability to Poverty

Exposure to risk and vulnerability is not only a constituent dimension of poverty but is also an important cause of future poverty. The possibility of being unable to cope with income shocks due to weak financial institutions and social insurance mechanisms is often a key problem faced by poor families[12].

According to recent World Bank report on Himachal Pradesh[13], the State faces issues in terms of its vulnerability. Vulnerability estimates for the State suggest that the possibility of households falling into poverty level in the near future is higher than the proportion of households who are currently poor, especially in the rural areas. It is estimated that about a fifth of the population could slip into poverty level within the next three years if the State's good economic performance cannot be maintained. The vulnerability rate of the State is 22% or approx 270,000 households.

A recent study of the Food and Agriculture Organization (FAO)[14] looked specifically at the food security issues of subsistence farm and marginal commercial households among others. It concluded that unless the former household category diversifies considerably their livelihood strategies, they are susceptible to food insecurity and vulnerability. Thus, without irrigation, the agricultural produce can meet the average household food requirement for only three to seven months. For the marginal commercial households, it was observed that farmers who have started cultivating cash crops including vegetable, fruits or floriculture have higher levels of food security and reduced vulnerability because of enhanced income and asset accumulation. However, they require relatively high costs of production with low risk bearing capacity due to lack of adequate support, infrastructure and small landholdings.

[10] Department of Rural Development, Himachal Pradesh; Himachal Pradesh Development Report, Planning Commission, Government of India.
[11] World Bank Report 2007 (ibid)
[12] Ajay Tandon and Rana Hasan –'Conceptualising and Measuring Poverty as Vulnerability: Does it Make a Difference?'. ERD Policy Brief, ADB 2005.
[13] Himachal Pradesh: Accelerating Development and Sustaining Success in a Hill State. World Bank 2007
[14] Understanding the Dynamics of Food Insecurity and Vulnerability in Himachal Pradesh: ESA Working Paper No.07-22. FAO, 2007

3.3 Public Infrastructures

3.3.1 Road Network and Logistics Systems

Hilly terrain and forest cover occupy most part of the State and its winding roads are networked predominantly. During the rainy season, roads are often damaged by landslide or flood of torrents. However, major road networks have been maintained through the efforts of the Public Works Department (PWD). Transport in the State depends mainly on these road networks which form part of the economic life line.

The main route from northern Indian states to the capital Delhi is the National Highway No.1 (NH1) to which the State has several access routes. The branch routes that connect to NH1 include NH64 & NH21/NH22, NH 70 and NH 72. NH88, with a total length of 115 km, is one of branch roads in the State that traverses Shimla, Mataur via Bilaspur, Hamirpur and Kangra.

The total length of roads in the State is 29,011 km. This comprises 1,235 km national highways, 691 km boarder roads, 2,164 km state highways, and 24,921 km arterial and rural roads of. Of these, the passable section is 25,968 km (89.5% of the total road), which include a double-lane section of 2369 km, and metalled and tarred section of 14,974 km. According to the 2006 census data from the PWD, out of the 17,495 inhabited villages, 10,999 (62.9 %) have been linked to the roads.

3.3.2 Railway and Civil Aviation

Three lines of the Northern India Railway are operating in the State. Of these, 96-km long Kalka to Shimla line and 164-km long Pathankot to Joginder line are made up of 760-mm narrow gauge and operate only as passenger trains. Meanwhile, Sirhind to Una line with 1676-mm broad gauge branches at Sirhind on Jammu Tawi to New Delhi line via Ambala. The distance from Una to New Delhi is 300 km, and a direct passenger train service for this section is available daily. Unscheduled freight train operates based on demand. Kalka-Shimla line was constructed during colonial days and is patronized by many tourists visiting Shimla. Agricultural products such as grains, vegetables and flowers are transported by railways. However, their volumes are not as much as those transported by trucks.

There are three airports in the State. These are Shimla Airport located 12 km from Shimla with a 3,800-feet runway, Gaggal Airport situated 5 km from Kangra having a 3,900-feet runway and Kullu Manali Airport sited 9 km from Kullu. Flights are often cancelled in rainy or foggy days, especially during the rainy season.

3.3.3 Domestic Water Supply

All the census villages in the State have been provided with drinking water facilities since March 1994. However, it was found during the survey conducted by the Central Government that there are still many remaining small units, where residents do not have access to safe drinking water supply.

According to the latest survey officially conducted on April 1, 2005, from the total of 45,367 habitations, 39,337 or 86.7 % were fully provided, 6,030 or 13.3 % partially provided and zero not-covered habitation. In 2005/06 safe drinking water supply facilities were provided to 858 partially-covered habitations.

3.3.4 Power Generation and Rural Electrification

A hydroelectric potential of 20,386 MW has been already identified in the five river basins of the State. However, only 6067 MW or 29.8% out of the available potential have been utilized by various agencies so far. Out of these, a total of 330 MW or 5.4 % were controlled by the State, 3,830 MW or

63.1 % by the central sector, 1,500 MW or 24.7 % by joint sectors, 386 MW or 6.4 % by private sector and 21 MW by Himachal Pradesh Energy Development Agency (HIMURJA). The remaining 14,319 MW hydroelectric potential includes 7,602 MW under execution/stand allotted, 1,767 MW under project advertised, 4,200 MW as potential balanced, and 750 MW as present project under HIMURJA.

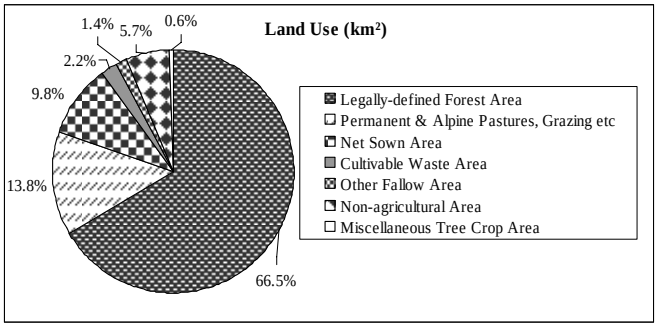
The State government achieved 100% of its rural electrification target of 16,807 inhabited census villages by 1998/99. As per census 2001, number of villages is 17,495, of which 17,155 or 98% have been supplied with electricity at the end of November 2006.

3.4 Agricultural Production

3.4.1 Agricultural Land Use

Out of the total geographical area of 55,673 km², the forest area legally defined occupies 37,033 km² or 66.5% followed by net areas sown of 5,446 km² or 9.8%, land for non-agricultural use of 3,192 km² or 5.7%, cultivable wastes of 1,222 km² or 2.2%, current and other fallow lands of 755 km² or 1.4%, and land with miscellaneous tree crops not included in cultivation of 329 km² or 0.6%. The remaining 7,696 km² or 13.8% consists of permanent pastures, other grazing lands, alpine pastures, barren, uncultivable wastes and so on. Distribution of land use is shown in Fig.3.4.1.

Overall average crop intensity of the State is 194 %. More than 800,000 cultivators in this State hold their farm land of 0.67 ha on average and they usually grow crops at least twice a year as given below:



Source: Department of Land Records, Himachal Pradesh

Fig. 3.4.1 Distribution of Land Use

Table 3.4.1 Agricultural Land Use in 2002/03

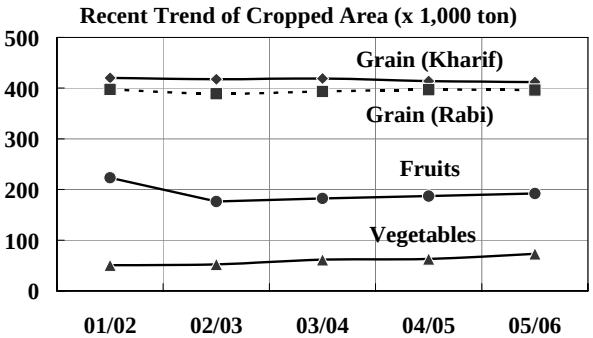
Items	Unit	State Total/Average
Cultivable Area	(ha)	653,000
Net Sown Area	(ha)	544,600
Farm Household	(no)	815,548
Average Landholding Size	(ha/family)	0.67
Total Cropped Area	(ha)	1,054,925
Annual Crop	(ha)	869,268
Perennial Crop	(ha)	185,657
Cropping Intensity*	(%)	194

Source: Department of Land Records, Himachal Pradesh
*Note: *Crop intensity = Total Cropped Area / Net Sown Area*

3.4.2 Crop Production

(1) Recent Trend of Edible Crop Production in Himachal Pradesh

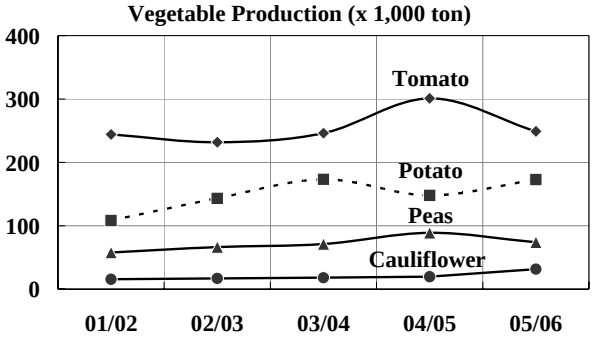
Annual crops grown in the State are maize, rice, millets, ragi (finger millet), pulses oil seeds for kharif season (June to September), and wheat, barley, gram, pulses and oil seeds for rabi season (November to April), while vegetable crops are mostly harvested from April to September. The harvesting season of temperate and tropical fruits is between July and October. The recent trend of crop cultivation area in the State during the last five years from 2000/01 to 2005/06 is summarized in Fig. 3.4.2. Cropped area of grains does not fluctuate in general, however, that of fruits or



Source: Department of Land Records, and Department of Horticulture, (01/02 - 04/05), and JICA Study Team (05/06)

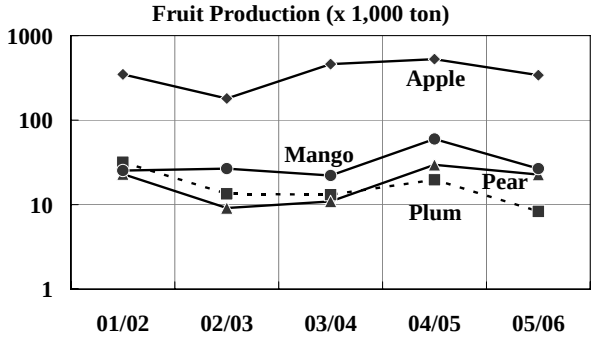
Fig.3.4.2 Trend of Cropped Area

vegetables tend to increase in the recent three years. Crop diversification has started in the State. The crop-wise production breakdowns of vegetables and fruits are shown in Fig. 3.4.3 and 3.4.4 respectively. Production of major vegetables is generally rising, while that of fruits fluctuates year by year.



Source: Department of Land Records, and Department of Horticulture, (01/02 - 04/05), and JICA Study Team (05/06)

Fig.3.4.3 Trend of Vegetable Production



Source: Department of Land Records, and Department of Horticulture, (01/02 - 04/05), and JICA Study Team (05/06)

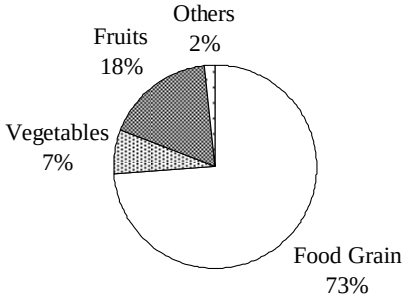
Fig.3.4.4 Trend of Fruit Production

As shown in table below, food grain is widely cultivated in the State and occupies 74 % of the total cropped area, producing 1.7 million ton in 2005/06. Vegetable area occupies 6.7 % of the total area and produces 1.1 million ton, while fruit area occupies 17.6 % and produces 0.5 million ton.

Table 3.4.2 Agriculture Production & Cropped Area 05/06

	Production (1,000 ton)	Cropped Area (1,000 ha)	Distribution of Cropped Area
Food Grain	1,714	808	74.0%
Vegetables	1,089	73	6.7%
Fruits	474	192	17.6%
Others	22	18	1.7%
Total	3,299	1,092	100%

Source: Department of Agriculture



Distribution of Cropped Area (%)

(2) Main Edible Crop Production Areas in Himachal Pradesh

District-wise crop production and its area of food grain crops, vegetables and fruits given in Table 3.10. Total production and cultivation area of food grain crops are 1.5 million ton and 811,000 ha respectively. Their production areas are in relatively plain areas such as Kangra, Mandi and Hamirpur districts. Total production and cultivation area of vegetables are approximately one million ton and 63,000 ha, respectively. Its major production areas are mostly in hilly districts such as Shimla, Solan, Sirmaur, Kangra and Mandi. On the other hand, fruits are cultivated in relatively limited hilly districts such as Shimla, Kullu, Kangra and Kinnaur, and the total production and area are 0.7 million ton and 187,000 ha, respectively. Diversified crop area out of the total cropped area (or crop diversification ratio) is 24% in overall. Higher ratios are determined in hilly and mountainous districts such as Lahaul Spiti (85%), Kinnaur (68%) and Shimla (50%). On the other hand, lower ratios are determined in relatively plain areas such as Hamirpur (8%), Una (10%), Bilaspur (13%).

Most of the fruit production is concentrated in top five districts (94%), i.e. Shimla, Kullu, Kanga,

Kinnaur and Mandi. Out of which, the production in Shimla occupies 47 % of the State's production. Less fruit production of 238 tons is in Lahaul Spiti and 2,400 ton in Hamirpur. Accordingly, production of fruits is relatively small for specific districts. Meanwhile, vegetables are widely produced in every district of the State. The district's minimum production exceeds 22,000 ton in Hamirpur as given below:

Table 3.4.3 District-wise Cropped Area and Production (2004/05)

District	Total Vegetables		Total Fruits		Total Food Grain		Veg.&Fruits out
	Area	Produce	Area	Produce	Area	Produce	of Total C. Area
	(ha)	(ton)	(ha)	(ton)	(ha)	(ton)	(%)
Bilaspur	2,141	50,261	5,979	4,472	55,939	120,753	13%
Chamba	2,418	28,411	13,911	9,957	59,944	113,920	21%
Hamirpur	1,251	22,497	4,881	2,400	69,243	137,629	8%
Kangra	7,414	111,756	35,333	85,587	195,807	314,566	18%
Kinnaur	2,628	29,729	9,316	39,018	5,673	5,022	68%
Kullu	5,223	78,194	24,263	175,625	51,375	94,249	36%
Lahaul-Spiti	4,701	56,625	570	238	917	1,210	85%
Mandi	6,951	109,359	31,470	24,274	142,026	287,251	21%
Shimla	12,923	185,737	34,966	322,895	47,108	70,503	50%
Sirmaur	8,162	118,235	15,022	12,746	60,843	109,029	28%
Solan	7,237	173,939	6,341	8,289	56,888	101,265	19%
Una	2,015	30,309	4,851	6,510	65,274	132,203	10%
State	63,064	**994,928**	186,903	**692,011**	811,037	**1,487,645**	**24%**

Source: 2004/05 data of Department of Land Records, Himachal Pradesh State Government

With regard to introduction of new horticulture crops such as exotic vegetables, some of the advanced farmers in the State grow broccoli, lettuce, lady finger (okra), baby corn, bitter gourd, French beans and Chinese cabbage on their fields to a small extent, at their own risks. Some advanced farmer's groups just started direct forwarding, using their own vehicles, to wholesale markets in nearby states such as Delhi.

(2) Non-edible Crop Production

Non-edible crops in the State are cut flowers, ornament plants and medical & aromatic plants.

Floriculture has recently been one of the major thrust areas for diversification of horticulture in the State. However, the cultivation area is still less, i.e. 30 ha in 1993/94 & 509.8 ha in 2006/07. The major flower growing areas are in Bilaspur, Chamba, Kangra, Kullu, Mandi, Shimla, Sirmaur and Solan districts. The flowers grown are gladiolus, marigold, chrysanthemums, rose, carnation and lilium. Although assessment system of the floriculture production is not available at present in the State, it has been estimated that its floriculture crop production is worth to Rs.199 million during 2006/07.

Cultivation of medical and aromatic plants in the State has been promoted by its government, aiming to create new income generation sources for the rural people. Generally, these plants are harvested in forest areas where they grow naturally. Medical and aromatic plants are also planted by farmers in 569.1 ha total land area.

3.5 Production in Agriculture-Allied Sector

3.5.1 Animal Husbandry Production

In the State majority of livestock population consists of cattle, goat, sheep and buffaloes. Cattle and buffaloes produce milk for dairy products. Buffaloes are also used as draft animals in rice growing areas, while goats, sheep and pigs are raised for meat or wool production. Livestock is intended not only for production of agricultural merchandise but also for saving for family's emergency expenditures. Concentrate feed is hardly used to breed these domestic animals, and the farmer mostly depends on green forage and dried plants to feed them. However, fodder production is required to increase due to its shortage in the State, especially in winter. In order to increase milk production, it is necessary to increase fodder production or to utilize available resources in the farm for feeding animals.

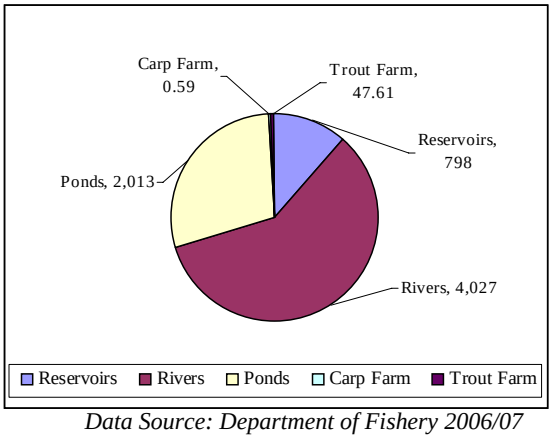
Between the 1992 and 2003 census period, crossbred cows increased by 163%, while indigenous cows decreased by 15%. The reported daily milk production rate of crossbred cattle is 3.18 kg, while that of indigenous cattle and buffaloes are 1.97 kg and 2.75 kg, respectively. About 869,000 ton of milk was produced in 2005/06, and the major production areas are Kangra, Mandi and Shimla. Although sheep population decreased by 16% during the two census periods, crossbred sheep population increased. The wool produced does not fetch remunerative prices due to the presence of burrs and vegetable mass in the wool.

Livestock dung is a biomass potential resource for organic manure production, which contributes to fertilizing soil that will enhance growth of food grain crops, fruits and vegetables. Most farmers keeping livestock in their houses use the animal dung for fuel, biogas production and manure fertilizer. The manure fertilizer is used for organic farming, considering that price chemical fertilizers are going up and hardly bought by farmers.

3.5.2 Inland Fisheries Production

The total fish production in the State is 6,900 ton in 2006/07. Out of which, reservoirs and rivers produce 4,825 ton or 70 % while ponds produce 2,013 ton or 29 % of the total. Carp and trout farms produce less than 1 % or 48 ton in 2006/07. Inland fisheries are practiced mainly by about 7,000 fishermen in the State.

Major producing areas are Kangra, Bilaspur, Mandi and Hamirpur districts. Production in Kangra of 2,483 ton is dominant over all other districts, which is equivalent to 36 % of the State's production.



Data Source: Department of Fishery 2006/07

Fig.3.5.1 Fish Production (ton)

Aquaculture has not become popular in the State. The major productions are trout farming in Mandi and Kullu districts and carp farming in Bilaspur district. Trout farming for business purpose needs higher initial investment, hence, ordinary farmers can not easily venture into such farming business. Department of Fisheries, however, expects expansion of aquaculture by efficient use of irrigation facilities such as check dams and irrigation ponds to supplement farmers' income generation.

Major constraints are low fish seed production of cultivable fish species and genetic degradation in widely cultivated cyprinus carpio. Establishment of additional fish seed farms capable of meeting the

seed requirements for stocking in water storage facilities in irrigation system will be required mainly by private enterprises or entrepreneurs. Principal requirement for fish culture is thought to be group activities by participants of fish farming in a local community. Accordingly organizing the participants is thought to be prerequisite in fish culture by rural farmers. It is necessary for the department to encourage the seed production and to fulfill the above requirement.

3.6 Categorization of Diversified Agriculture Pattern

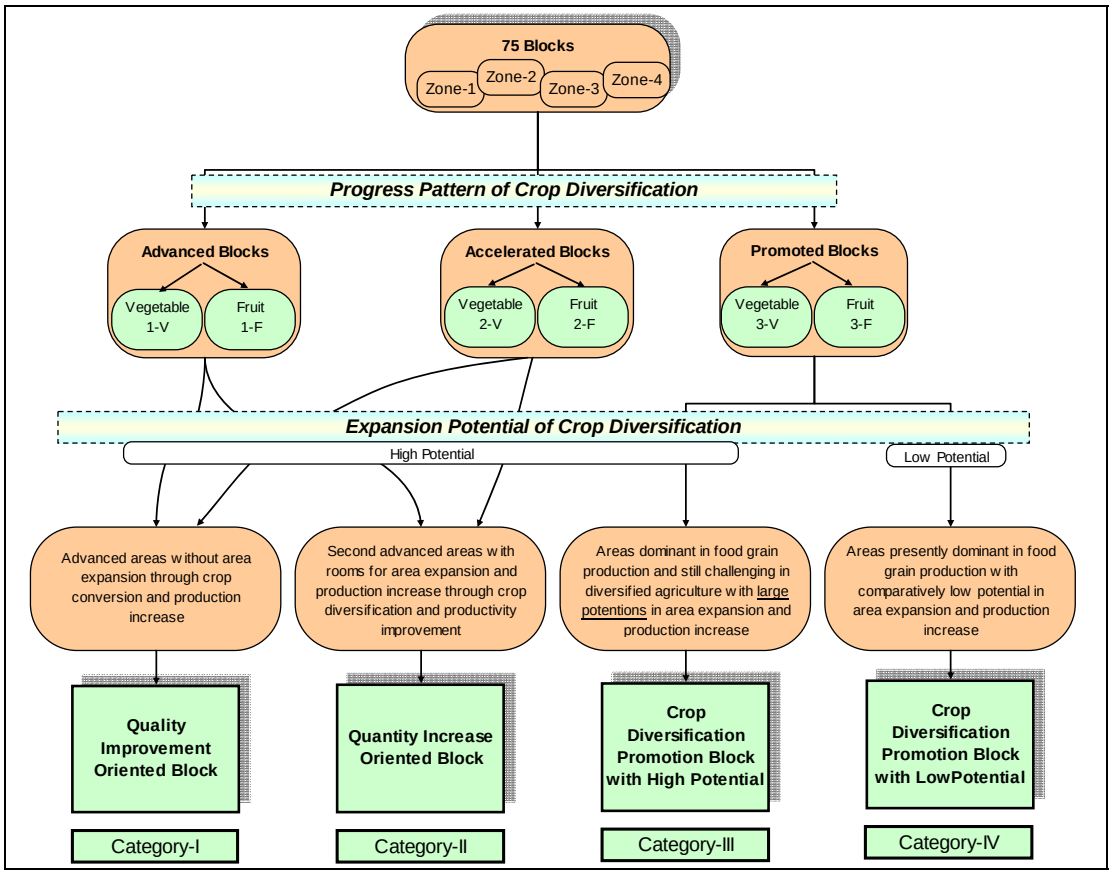
3.6.1 Objective and Method of Categorization

In order to formulate the plan for the promotion of diversified agriculture in the State, spatial categorization needs to be carried out on the basis of current progress and potential of diversified agriculture. This shall be followed by the preparation of direction of diversified agriculture for each spatial category. The category is the basis for the formulation of effective and efficient diversified agriculture plan, corresponding to the different conditions of agro-ecological and socio-economic conditions within the State.

Indexes representing regional characteristics are generally utilized for spatial categorization. *Administrative Block-based Categorization* was applied by overlaying administrative 75 blocks under 12 districts with numerical indexes re-organized for each block. Numerical indexes for the categorization are obtained from statistics issued by the State government, internal document from relevant organizations and the result of questionnaire survey carried out by the JICA Study Team. Such primary data are also utilized to produce secondary data for indexes of spatial categorization.

The State is endowed with diversified climatic and topographic conditions. Therefore, various crops are cultivated in the State. However, food grains such as wheat, rice and maize are predominant and occupy 74 % of the cropped area as explained earlier. These are followed by fruits with 17.6 % and vegetables with 6.7 %. Vegetable production is recently increasing remarkably while fruit production is not. Vegetable and fruit productions depend on specific space/locations in the State. Under these conditions, the spatial categorization is carried out stepwise and explained as follows: 1) the present status of crop diversification focusing on vegetable production is clarified for each district; 2) spatial and quantifiable potential of vegetable production is analyzed; and 3) direction of diversified agriculture promotion for each category is formulated by integrating horticulture, livestock and inland fishery sectors on the basis of present status and development potential of diversified agriculture.

The categorization is made based on the *Progress Pattern of Crop Diversification and Expansion Potential of future Crop Diversification*. Outline of the methodology on spatial categorization is illustrated in Fig. 3.6.1.



Source: *JICA Study Team*

Fig. 3.6.1 Flow of Spatial Categorization

3.6.2 Result of Categorization

(1) Spatial Categorization based on Progress Pattern of Crop Diversification

Indexes of spatial categorization based on present status and the progress of crop diversification are set up as summarized in Table 3.6.1.

Table 3.6.1 Numerical Indexes for Spatial Categorization Based on Present Status of Crop Diversification

Status of Crop Diversification		Categorization Indexes		Progress Pattern
		Vegetable Cropping Intensity	Fruit Cropping Intensity	
Advanced	Vegetable	Over 10.0%	<30%	1-V
	Fruit		> 30%	1-F
Accelerated	Vegetable	5.0 ~ 9.9%	< 15%	2-V
	Fruit		> 15%	2-F
Promoted	Vegetable	Under 5.0%	< 7.5%	3-V
	Fruit		> 7.5%	3-F

Source: JICA Study Team

In the above indexes, cropping intensity of vegetables or fruits has been estimated from block-wise cultivated area, with the annual production of food grains, vegetables and fruits as primary information.

Using the indexes explained above, result of the categorization is summarized below:

Table 3.6.2 Categorization of Administrative Blocks based on Progress Pattern of Diversified Agriculture

Status	Progress Pattern	Number of Blocks	Name of Blocks
Advanced	1-V	14	KG-18 Bhawarna, KG-24 Nagrota Bagwan, LS-39 Lahaul, LS-40 Spiti, MD-41 Chachyot, MD-49 Seraj, SH-55 Mashobra, SH-59 Theog, SM-61 Pachhad, SM-64 Sangrah, SM-65 Shillai, SO-66 Dharampur, SO-67 Kandaghat, SO-70 Solan
	1-F	5	KN-31 Kalpa, KN-33 Pooh, KU-35 Banjar, SH-58 Rohroo, SM-63 Rajgar,
Accelerated	2-V	8	KG-17 Baijnath, MD-44 Drang, MD-47 Mandi Sadar, MD-50 Sundernagar, SH-56 Narkanda, SM-60 Nahan, SO-68 Kunihar, UN-74 Haroli
	2-F	5	KN-32 Nichar, KU-36 Kullu, KU-37 Naggar, SH-52 Chhohara, SH-53 Chopal
Promoted	3-V	32	BP-1 Bilaspur Sadar, BP-2 Geharwin, CH-4 Bharmour, CH-5 Bhatiyat, CH-6 Chamba, CH-7 Mehla, CH-8 Pangi, CH-9 Salooni, CH-10 Tissa, HM-14 Hamirpur, HM-15 Nadaun, HM-16 Sujanpur Tira, KG-19 Dehra, KG-21 Indora, KG-22 Kangra, KG-25 Nagrota Surian, KG-26 Nurpur, KG-27 Panchrukhi, KG-28 Pragpur, KU-34 Ani, KU-38 Nirmand, MD-42 Chauntra, MD-43 Dharampur, MD-45 Gopalpur, MD-46 Karsog, MD-48 Rewalsar, SH-51 Basantpur, SH-54 Jubbal, SH-57 Rampur, SM-62 Paonta Sahib, UN-72 Bangana, UN-73 Gagret
	3-F	11	BP-3 Ghumarwin, HM-11 Bamsan, HM-12 Bhoranj, HM-13 Bijhri, KG-20 Fatepur, KG-23 Lamba Gaon, KG-29 Rait, KG-30 Sulah, SO-69 Nalagarh UN-71 Amb, UN-75 Una

Source: JICA Study Team

(2) Categorization based on the future Expansion Potential of Crop Diversification

There are two directions on the expansion potential of crop diversification in the State of Himachal Pradesh, namely: 1) area expansion and 2) productivity increase. As shown in Table 3.6.3, two sub-indexes are applied for the assessment of area expansion potential while three sub-indexes are selected for productivity increase potential.

Table 3.6.3 Numerical Indexes for Further Potential of Crop Diversification

Index	Area Expansion Potential		Productivity Increase Potential		
Score	Annual Cropped Area of Food Grain	Per Capita Wheat and Paddy Production	Irrigation Rate of Cultivated Area	Per Farm Household Annual Net Farm Income	Differential Rate with Average Yield of District
3	> 15,000 ha	>200 kg	>50%	< Rs. 25,000	>30 %
2	10,000 ~ 15,000 ha	150 ~ 200 kg	30 ~ 50 %	Rs. 25,000 ~ 49,999	20 ~ 30 %
1	5,000 ~ 10,000 ha	100 ~ 150 kg	15 ~ 30 %	Rs. 50,000 ~ 99,999	10 ~ 20 %
0	< 5,000 ha	< 100 kg	< 15%	> Rs. 100,000	<10%

Source: JICA Study Team

Area Expansion Potential has been estimated from block-wise annual cropping area of food grain, with per capita wheat and paddy production as the primary information. On the other hand, Productivity Increase Potential has been estimated from irrigation rate of cultivated areas with the per farm household, annual farm income as primary information.

Corresponding results shown below indicate 41 blocks are categorized as High, while 34 blocks are Low:

Table 3.6.4 Categorization based on Further Potential of Crop Diversification

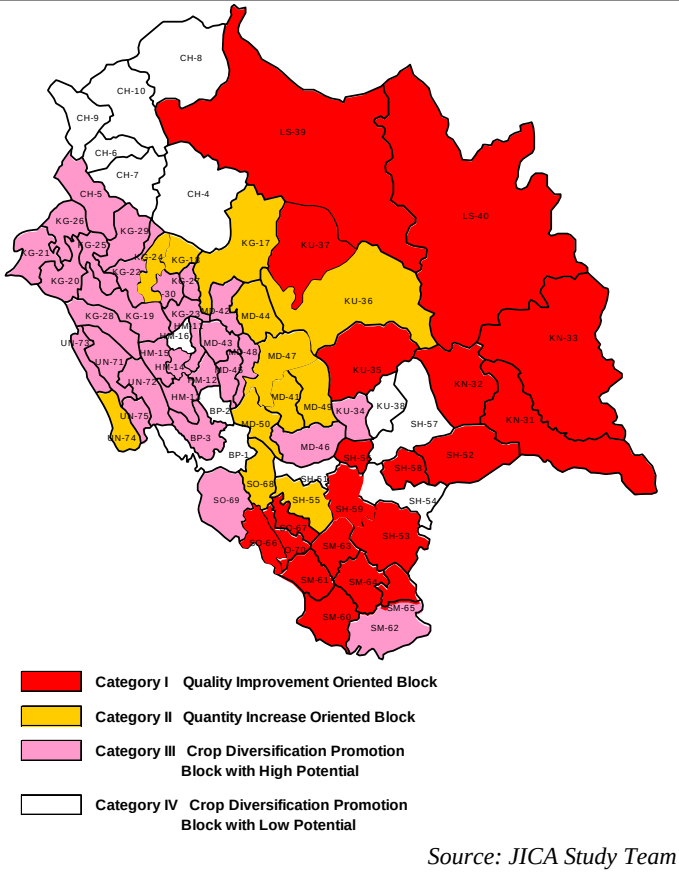
High			Low	
41 Blocks			34 Blocks	
BP-3 Ghumarwin	KG-24 Nagrota Bagwan	SM-62 Paonta Sahib	BP-1 Bilaspur Sadar	SH-51 Basantpur
CH-5 Bhatiyat	KG-25 Nagrota Surian	SO-69 Nalagarh	BP-2 Geharwin	SH-52 Chhohara
HM-11 Bamsan	KG-26 Nurpur	UN-71 Amb	CH-4 Bharmour	SH-53 Chopal
HM-12 Bhoranj	KG-27 Panchrukhi	UN-72 Bangana	CH-6 Chamba	SH-54 Jubbal
HM-13 Bijhri	KG-28 Pragpur	UN-73 Gagret	CH-7 Mehla	SH-56 Narkanda
HM-14 Hamirpur	KG-29 Rait	UN-74 Haroli	CH-8 Pangi	SH-57 Rampur
HM-15 Nadaun	KG-30 Sulah	UN-75 Una	CH-9 Salooni	SH-58 Rohroo
KG-17 Baijnath	KU-34 Ani		CH-10 Tissa	SH-59 Theog
KG-18 Bhawarna	KU-36 Kullu		HM-16 Sujanpur Tira	SM-60 Nahan
KG-19 Dehra	MD-41 Chachyot		KN-31 Kalpa	SM-61 Pachhad
KG-20 Fatepur	MD-42 Chauntra		KN-32 Nichar	SM-63 Rajgar
KG-21 Indora	MD-43 Dharampur		KN-33 Pooh	SM-64 Sangrah
KG-22 Kangra	MD-44 Drang		KU-35 Banjar	SM-65 Shillai
MD-46 Karsog	MD-45 Gopalpur		KU-37 Naggar	SO-66 Dharampur
MD-47 Mandi Sadar	MD-49 Seraj		KU-38 Nirmand	SO-67 Kandaghat
MD-48 Rewalsar	MD-50 Sundernagar		LS-39 Lahaul	SO-68 Kunihar
KG-23 Lamba Gaon	SH-55 Mashobra		LS-40 Spiti	SO-70 Solan

Source: JICA Study Team

(3) Categorization based on Progress Pattern and Expansion Potential of Diversified Agriculture

All the 75 administrative blocks were categorized from Category-I to Category-IV by combining two results, i.e.: 1) progress pattern and 2) expansion potential as explained above. The results are shown in Table 3.6.5 and illustrated in Fig. 3.6.2

The characteristics of blocks categorized into 4 categories in the above can be summarized as follows,



Source: JICA Study Team

Fig. 3.6.2 Classification of Blocks by Category

Category-I: Diversification is advanced, but limited potential for more expansion. Further improvement of farm income is planned by quality improvement.

Category-II: Diversification is accelerated, and there is potential for area expansion. Further improvement of farm income is planned by Crop Conversion to diversified crops.

Category-III: Dominant in food grain production, and still challenging in diversification. There is large potential in area expansion. Further improve of farm income is planned by crop diversification.

Category-IV: There is limited potential area expansion. However, crop diversification, especially to vegetable cultivation, is introduced where possible, followed by integrated farminng consisting of horticulture, animal husbandry or fishery.

Table 3.6.5 Categorization based on Present Status and Expansion Potential of Diversified Agriculture

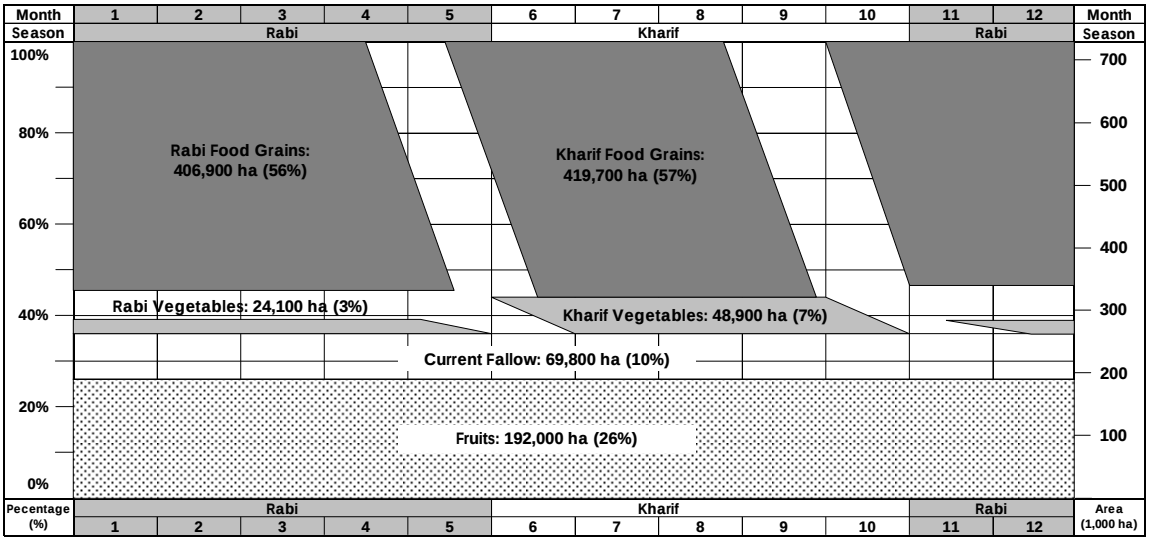
Category	Number of Blocks	Name of Blocks
Category-I	21	KN-31 Kalpa KN-32 Nichar KN-33 Pooh KU-35 Banjar KU-37 Naggar LS-39 Lahaul LS-40 Spiti SH-52 Chhohara SH-53 Chopal SH-56 Narkanda SH-58 Rohroo SH-59 Theog SM-60 Nahan SM-61 Pachhad SM-63 Rajgar SM-64 Sangrah SM-65 Shillai SO-66 Dharampur SO-67 Kandaghat SO-68 Kunihar SO-70 Solan
Category -II	11	KG-17 Baijnath KG-18 Bhawarna KG-24 Nagrota Bagwan KU-36 Kullu MD-41 Chachyot MD-44 Drang MD-47 Mandi Sadar MD-49 Seraj MD-50 Sundernagar SH-55 Mashobra UN-74 Haroli
Category -III	30	BP-3 Ghumarwin CH-5 Bhatiyat HM-11 Bamsan HM-12 Bhoranj HM-13 Bijhri HM-14 Hamirpur HM-15 Nadaun KG-19 Dehra KG-20 Fatepur KG-21 Indora KG-22 Kangra KG-23 Lamba Gaon KG-25 Nagrota Surian KG-26 Nurpur KG-27 Panchrukhi KG-28 Pragpur KG-29 Rait KG-30 Sulah KU-34 Ani MD-42 Chauntra MD-43 Dharampur MD-45 Gopalpur MD-46 Karsog MD-48 Rewalsar SM-62 Paonta Sahib SO-69 Nalagarh UN-71 Amb UN-72 Bangana UN-73 Gagret UN-75 Una
Category -IV	13	BP-1 Bilaspur Sadar BP-2 Geharwin CH-4 Bharmour CH-6 Chamba CH-7 Mehla CH-8 Pangi CH-9 Salooni CH-10 Tissa HM-16 Sujanpur Tira KU-38 Nirmand SH-51 Basantpur SH-54 Jubbal SH-57 Rampur

Source: JICA Study Team

3.7 Present Farming and Farm Economy

3.7.1 Present Farming System

The cultivation area and cropping pattern for the entire State have been summarized on the basis of cropping data and farming practices collected in the Study as shown in Fig. 3.7.1



Category	Season	Food Grain		Vegetables		Fruits		Current Fallow		Year Total (ha)
		(ha)	(%)	(ha)	(%)	(ha)	(%)	(ha)	(%)	
All State	Rabi	406,900	56%	24,100	3%					730,400
	Kharif	419,700	57%	48,900	7%	192,000	26%	69,800	10%	

Source: Data of Department of Agriculture, Himachal Pradesh. Collected by JICA Study Team. (Data in 2005-2006 season)
Note: Current Fallow; Presently Fallow Land for one year, but used for cultivation in the previous year.

Fig. 3.7.1 Cultivation Area and Cropping Pattern of Himachal Pradesh

The food grains area in kharif and rabi seasons are about 57%, and 56% respectively. Meanwhile the areas under vegetables are 7% and 3% respectively during the said two seasons. Although some farmers grow vegetables in kharif season under rainfed condition with some water harvesting facilities (small tanks, pipes from springs etc.), farmers grow vegetables in rabi season only under assured irrigation facilities. Fruits occupy about 26% of the cultivable area. The current fallow area is about 10%.

Related major issues of present farming system are:

i) Cropping Pattern:

The food grains production area is relatively much higher than that for the vegetable. It is also essential to maintain some area for food security of the farmers, especially for the small and marginal farmers. Thus, the remaining area after maintaining such food security shall be converted for vegetable production with provision of some irrigation facilities.

ii) Best Farming Practices with Irrigation facilities:

Due to the erratic nature of rainfall and erosion of inputs such as fertilizers and chemicals, farmers use low amount of fertilizers, yielding relatively lower crop production. With the introduction of irrigation facilities, and by adopting suitable farming practices, the food grains production shall also increase further by 30-50% according to the CSKHP Agricultural University. By increasing the food grains production, the corresponding area can be converted for vegetables production.

iii) Group Farming:

Group farming is needed not only for production, but also for marketing. This is already initiated in different regions with the formation of organizations such as Lahaul Potato Society, Kullu Fruit Farmers Society, Karsog Exotic Farmers Society etc. In crop diversification, group farming is highly essential for various activities starting from production, post-harvest grading, sorting, and marketing.

iv) Farm Mechanization:

Due to the small land holding sizes and steep topography, farm mechanization is not popular in the State, especially in the higher zones. It is necessary to identify portable machineries which can be used for cultivation in small farm plots or green houses. In this regard, experimental trials should be conducted to identify the farm machinery suitable for hilly regions.

v) Advanced Farming Technologies:

Vegetable production can be increased further by adopting advanced farming technologies such as protective cultivation. Therefore, these are also required to be promoted in crop diversification.

The potential yields of major vegetable crops of the State depend on varieties, required growing duration (short or long), etc. Researches have been done both at the CSKHP Agricultural University, and Dr.Y.S.Parmar University of Horticulture and Forestry. The potential yields reported by the universities, and as evaluated by the Study Team are mentioned below.

Table 3.7.1 Potential Yields of Major Vegetable Crops of Himachal Pradesh

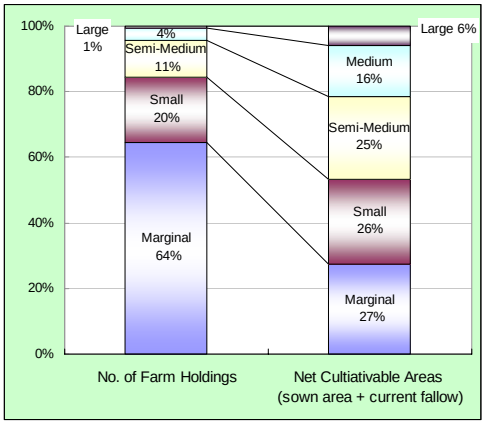
Crop	Potential Yield (*1) (2004) (t/ha)	Yield Range (*2) (2006) (t/ha)	State Average Yield (*3) (2005-06) (t/ha)	Potential Yield Evaluated by Study Team (t/ha)
Maize	3.5-4.6 (*4)	No data	2.5	4.6
Rice	3.0-4.0 (*4)	No data	2.1	4.0
Wheat	2.5-3.5 (*4)	No data	1.9	3.5
Peas	13.8	10-13	10.4	13.0
Potato (Table)	25.0	No data	11.5	20.0
Tomato	50.0	30-40	30.0	40.0
Cauliflower	22.5	12.5-21.0	15.9	21.0
Cabbage	30.0	20-30	24.4	30.0
Capsicum	20.0	15.0-30.0	12.8	20.0
French Beans	No data	10-13	9.4	13.0
Garlic	No data	17-25	12.2	25.0

Note:
*"(*1) - Potential yield to be obtained by using Package of Practices recommended by University*
(Ref: A Study of Cost of Cultivation of Major Crops, CSKHP Agricultural University, 2004)"
*"(*2) - Yield ranges of different vegetables based on different varieties. These potential yields can be obtained by using recommended package of practices*
(Ref : Approaches for Marketing and Crop Diversification of Commercial Vegetables in Himachal Pradesh, Dr.Y.S.Parmar University of Horticulture and Forestry, 2006)"
*(*3) - State Average Yield (2005-06) by the data from Block Officers of Dept. of Agriculture*
*(*4) - Potential yield range to be obtained by using Package of Practices recommended by CSKHP Agricultural University for different varieties of food grains*

3.7.2 Socio-economic Condition and Farm Economy

(1) Farm Holding and Farm Size

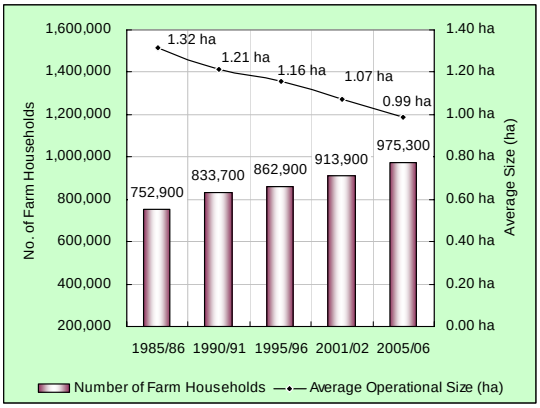
According to the Agricultural Census 1995-96 (Department of Land Records, Himachal Pradesh State Government, April 2005), total farm households in the State were estimated at 863,000 with total net cultivated area of 652,700 ha. About 85% of farm households are categorized as marginal and small farmers with operational size of less than 2.0 ha. This proportion is almost the same as the national average of 86%.



Source: Agricultural Census 1995-96

Fig. 3.7.2 Size and Operational Land Distribution

As shown in the right figure, marginal and small farmers (85%) are operating 53% of the land, while large farms (15%) occupy 47% of the land. Since farm households have been increasing and the extent of land is limited due to equal succession of farm land to the next generations, the average farm size shows the tendency of decreasing from 1.30 ha in 1985/86, to 1.21 ha in 1990/91, and to 1.16 ha in 1995/96. This tendency is expected to continue in the future.



Note: Data in 2005/06 are projected based on the trend.
Source: Agricultural Census 1995/96, Statistical Outline

Fig. 3.7.3 Number of Farm Households and Average Farm Size

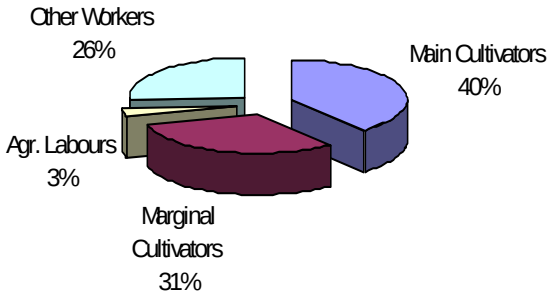
The average farm size of operational area of 1.16 ha includes such non-cultivated area as lands not available for cultivation. This is slightly higher than the national average of 1.06 ha. Practically, the net cultivated area comprising of 1) net sown area and 2) current fallow land, is estimated at 0.73 ha, as mentioned in the left figure.

(2) Family Size and Work Force

Majority of the population in the State resides in the rural areas, and their main sources of incomes are from agricultural activities. According to the Population Census 2001, rural population is 5,482,000 or 90% of the total population, and rural households consist of 1,080,000 households corresponding to 88% of the total in the State. Average family size of rural households is 5.1 members, which is larger than the urban households with 4.2 members.

Farm households have been increasing from 752,900 in 1985/86 to 914,000 in 2001/02, corresponding to 75% of the total households in the State. This is due to succession of generation, and the tendency is likely to continue in the near future. At the same time, farm land has remained at the same level fluctuating between 980,000 ha and 1,010,000 ha. This trend caused the constant decrease in farm operational size from 1.32 ha in 1985/86 to 1.07 ha in 2001/02. Based on this trend, number of households and average farm size in 2005/06 is estimated at 975,300 and 0.99 ha, respectively, as shown in the above figure. According to the block level data collected in the Study, the total number of farm households is 979,600, which is almost same as the above projection with a slight difference of 0.4%.

Out of the 2,993,000 workers in the State in 2001/02, 68% or 2,049,000 are cultivators and agricultural labors working either full or part time in the agricultural sector. In the rural areas, this proportion increases to 74% of the total workers, as shown in the right figure.

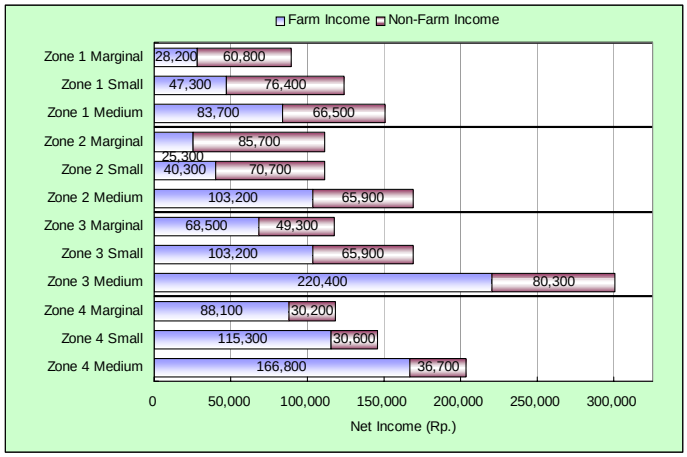


Source: Population Census 2001/2002

Fig. 3.7.4 Proportion of Workers by Status in the Rural Area

Average workers of the farm households according to Population Census 2001/02 are estimated at 2.20 persons, consisting of 1.19 main cultivators, 0.95 marginal cultivators (working for less than 6 months in a year), and 0.06 agricultural labors. In addition, other marginal workers would be available to work in the farm households on part time basis which may be either a family member or as labor during the busy season.

(3) Farm Household Budget



Source: Production & Marketing Survey, JICA Study Team, June 2007.

Fig. 3.7.5 Farm Income & Non Farm Income by Farm Size and Zones

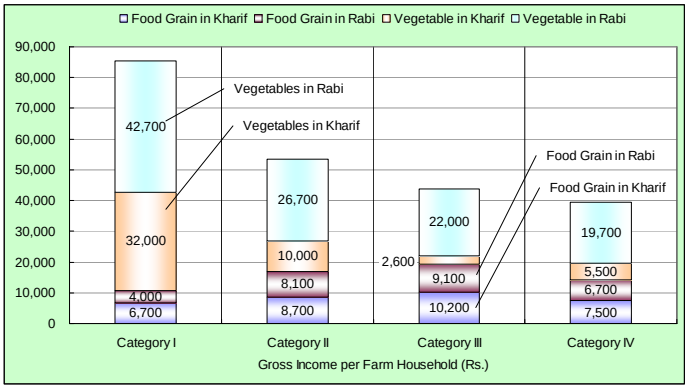
Farm household budget is estimated based on the result of the production survey carried out in the Study which shows the general tendency by the farm scale and the agro-ecological zones.

Total income composed of farm and non-farm incomes is shown left figure according to farm size and agro-ecological zone. In every zone, total income as well as farm income increase according to the farm operational scale.

Marginal and small farm households in zones 1 and 2 seem to depend on non-farm income due to the limited earnings from grains and livestock, and hence, farming is likely their supplementary source of income. On the other hand, farm households in zones 3 and 4 obtain larger income from vegetables and fruits than non-farm income. Particularly, off-season vegetables and apple which are suitable for zones 3 and 4 provide better income to marginal and small farmers. Taking into account the fact that the sample villages do not represent all the situations in the State but only particular cases for farm households, the results are interpreted as sample cases for crop diversification to increase farm income.

According to the NSS Report No. 523 (Household Consumption Expenditure, NSS 62nd Round conducted July 2005 to June 2006), monthly per capita consumer expenditure (MPCE) over all item in the State is estimated at Rs.896 (equivalent to annual expenditure of Rs.51,900 per household with 4.83 members) in rural area and Rs.1,686 (Rs.66,600 per households with 3.29 members) in urban area. This shows large disparity of livelihood expressed by the consumption expenditure between rural and urban areas. In order to fill the gap of living standards, crop diversification is one of the best solutions since majority of rural households obtain incomes from crop farming.

Block level information is available to estimate the total net production value of food grains and vegetables except fruits. Net farm income is calculated for the average farm households in each spatial category. The result is shown in the right figure. Farm household in Category I obtained Rs.85,400 as the highest income, of which 87% of its net is from vegetables. Similarly, farm income is estimated at Rs.53,500 in Category II, Rs.43,900 in Category III and Rs.39,400 in Category IV. In each case, more than half of the income is generated from vegetable. The result suggests that production volume and quality of vegetables are one of the key factors in increasing farm income in the rural area.



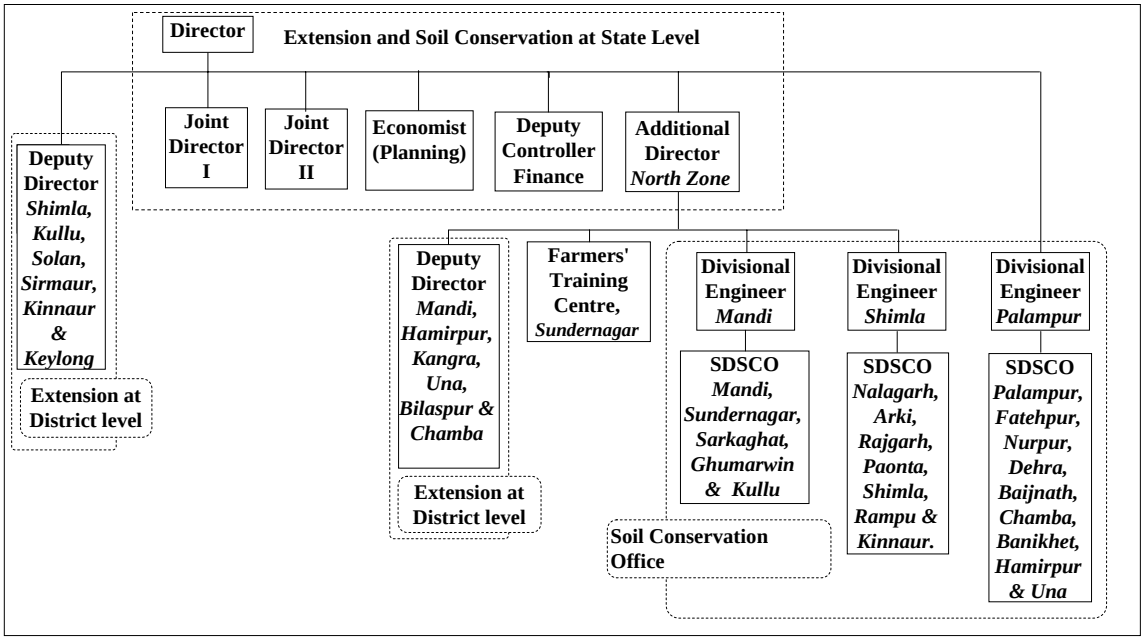
Source: estimated by the JICA Study Team, June 2007.

Fig. 3.7.6 Net Crop Production Value of Food Grains and Vegetables by Category

3.8 Agricultural Supporting Services

3.8.1 Agricultural Extension Organization and System (DOA)

Department of Agriculture (DOA) is responsible for the planning and implementation of agricultural programs and schemes in the State DOA is broadly classified into two sections i.e. Extension Section and Soil Conservation Section as shown in the following Fig. 3.8.1.



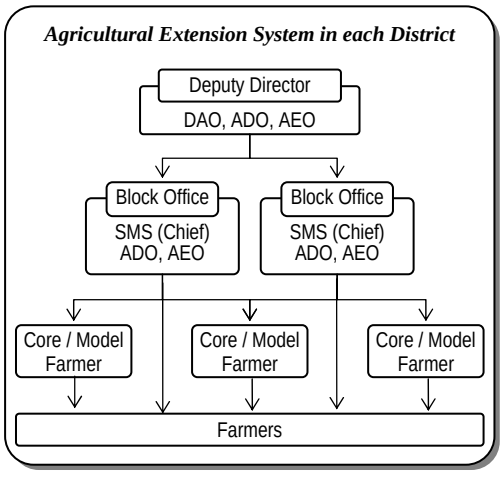
Source: Department of Agriculture

Fig. 3.8.1 Extension System at the State and District Level

Regarding extension activities, the Director is supported by Joint Directors at the State level and Deputy Directors at the district level. The development units consist of block offices managed by Subject Matter Specialist (SMS), and supported by Agricultural Development Officers (ADOs) and Agricultural Extension Officers (AEOs).

The extension activities at the block level are carried out for cereals, vegetables, pulses, and oil seeds related to fields such as i) production technology, ii) protection technology, iii) post-harvest and marketing management, and iv) pest management.

The number of extension officers in the Department DOA is shown in the next page.



Source: Department of Agriculture

Fig. 3.8.2 Agricultural Extension System in each District

Table 3.8.1 Extension Officers in DOA (As of July 1, 2008)

Position	Sanctioned Posts	Presently Filled up Posts	Vacant Posts	% of vacancy
Director & Addl & Joint Director	4	4	-	-
Deputy Director, DAO/APO, SMS	86	74	12	14%
ADO, AADO	392	227	165	42%
AEO:Agricultural Extension Officer	**820**	**313**	**507**	**62%**
Total	1,302	618	684	53%
No. of Farm Household (FHH), (from Block Data)*1	982,700			
No. of FHH per AEO	1,198	3,139		

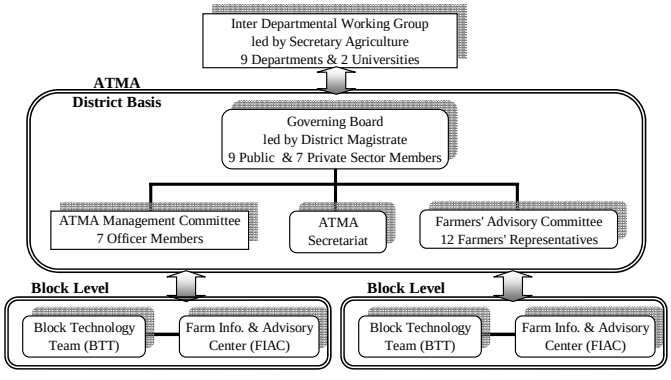
Remarks *DAO - District Agriculture Officer; SMS - Subject Matter Specialist; APO - Agriculture Project Officer; ADO - Agriculture Development Officer; AADO - Assistant Agriculture Development Officer; AEO - Agriculture Extension Officer Source: Department of Agriculture*

Note: **1: compiled from block office data collected by JICA study team, 2007*

From the above table, filled-up posts are only 618 or 47% out of the total sanctioned 1,302 posts. A total of 161 posts of ADO and 507 posts for AEO who are supposed to play vital roles in agricultural extension activities are presently vacant. It is indispensable to fill said vacant posts to strengthen the organization.

The field extension officers have to spend more time in input distribution including seeds (cereals, and vegetables), plant protection materials and equipment. In particular they will be more occupied during the beginning of Kharif and Rabi seasons. Besides, they also have to maintain the accounts regularly for the input distribution. These works occupy 40% of the working hours of the AEO at block level. However, the various extension activities including organization of training camps, field demonstration, field visits for farmers, soil sample collection and crop cutting experiments are also conducted for about 60% of their total time which is equivalent to a work volume of 492 AEOs or 60% of 820 AEOs' sanctioned posts. One AEO covers 1,198 households (FHH) calculated from sanctioned 820 posts and 3,139 FHHs from presently filled-up 313 posts. It means that it is not easy to conduct proper extension service to farmers due to shortage of AEOs.

3.8.2 Agricultural Technology Management Agency (ATMA)



Source: Department of Agriculture

Fig. 3.8.3 ATMA Structure

Agricultural Technology Management Agency (ATMA) is an autonomous institution, organized on the basis of reforms in agricultural extension raised in the National Agricultural Policy. This involves participation of all the key stakeholders involved in agricultural activities for sustainable development in the district, on the basis of raised reforms in agricultural extensions. It has been organized in all the 12 districts of the State and has the flexibility to receive funds directly (Government of India / States, membership fees, beneficiaries' contribution etc).

ATMA is mainly responsible for all the technology dissemination activities at the district level. It has

linkages with all the line departments, research organizations, non-governmental organizations and agencies associated with agricultural development in the district with a substantial representation of farmer organizations. In order to avoid overlapping of activities by line department, coordination of the activities is discussed among the members.

Management Committee of ATMA prepares integrated, Strategic and Extension Plan (SREP) which would specify short and medium-term adaptive research as well as technology validation and refinement and extension priorities for the district, then prepares corresponding annual A/P. It also coordinates with line departments, KVKs, NGOs, FIGs/FOs and allied institutions including private firms for the execution of the annual work plans.

At block level, Block Technology Team (BTT) executes the SREP in each block and move towards single window extension system, and then coordinates the implementation of the extension program. Farmer Advisory Committee (FAC) acts as an agency for providing farmer feedback mechanism and helps to set block extension priorities and recommends resource allocation across program items.

In order to disseminate agricultural technology in districts, ATMA plays key roles for agricultural diversification under the present conditions since it integrates not only agriculture, animal husbandry, fishery, and marketing sectors but also framers' groups and private sectors.

In the State, this ATMA model has covered all the districts. However, its implementation system has not yet matured in some new districts. Accordingly, it is essential to sublimate this model into the entire state system through the enhancement of structural strengthening and extension programs.

ATMA model enabled farmers to receive various extension services in a single channel under SREP. Thus, this is a promising model for efficient and effective extension by the State and Central Government. This model started in 1998 with 4 districts (Shimla, Kangra, Hamirpur & Bilaspur), and has just covered all the districts of the State. However, its implementation system has not yet matured in some newly-introduced districts (Chamba, L&S, Sirmaur & Solan in 2008/09) and will take more time to put into practice.

3.8.3 State Agricultural Management and Extension Training Institute (SAMETI)

State Agricultural Management and Extension Training Institute (SAMETI) is registered as an autonomous institute with the mandate of capacity building for related agricultural extension system to promote agricultural development. It conducts courses on participatory extension management, project management, watershed management, human resources management, information technology, etc. It also provides consultancy on agricultural extension management. It has training hall facilities well-equipped with conference system and multimedia projectors.

SAMETI has linkages with State agriculture and horticulture universities and other institutes such as MANAGE Hyderabad, NIAM Jaipur, EEI Nilokheri and DOEACC Shimla. SAMETI organizes workshops/trainings through the use of resource universities and institutes which cover field extension management, marketing management, technical/post harvest management, information technology, organic farming management, etc.

SAMETI promotes the extension and management tools for improving efficiency in extension services which cover i) extension management skills, ii) participatory approaches and PRA tools, ii) group mobilization and team building, iii) human resource management, iv) farming system approach, v)

market led extension & marketing management, etc.

Since SAMETI has facilities for trainings and workshops with resource persons in various disciplines, it is understood that this institute has potential in strengthening the existing extension functions, in cooperation with DOA.

3.8.4 Constraints in Agricultural Extension System

The major issues related to agricultural extension system are as follows:

i) **Shortage of extension staff:** The State, located in a hilly region has a difficult terrain. Each block needs a minimum of 11 extension officers including one SMS, two ADOs, and eight AEOs, which are the present standard requirements for a block. Although some blocks have relatively good strengths, most have only four or five extension officers. Thus, staffing needs be strengthened.

ii) **Extension Facilities:** The extension facilities such as transport equipment, extension visual equipment, data maintenance equipment (computers etc.) are not available in the blocks. Extension activities can not be carried out in a timely manner. Therefore, required facilities for the DOA need to be provided.

iii) **Activities of the Extension Officers:** For the crop diversification, various activities such as farm demonstration trials, organizing training camps, exposure visits etc. are needed to be carried out in a much intensive manner. In the present condition, the extension officers are occupied for 40% of their time for the input distribution and regular office works. If the input distribution can be carried out by some cooperative similar to fertilizer distribution in the State, it would save a lot of burden for the extension officers, who can then focus more on the extension activities. Time savings is estimated to be 40% of the working hours of AEO , equivalent to 125 AEO, or 40% of present total 313 AEOs.

iv) **Capacity Building Training:** Although shortage of staff is one critical reason, the block officers are also not fully familiar with the planning of crop diversification projects which included different components such as agriculture, irrigation, roads, marketing etc. Therefore, capacity building trainings should be carried out at regular intervals.

v) **Extension and Research Linkage:** It is understood that the block level extension officers do not have regular interactions with the researchers in regard to problems faced by the farmers in the field. Although there are some workshops conducted from time to time based on necessity, regular meetings and linkage has not been established. Therefore, extension and research linkage shall be made stronger.

vi) **Monitoring and Evaluation :** More importantly, a monitoring and evaluation system should be established to assess the results of the extension activities on crop diversification, considering that decision makers can not presently decide promptly and properly.

3.8.5 Agricultural Subsidy and Farm Credit Services

Agricultural Subsidy

The Government is providing various types of subsidy to small and marginal farmers, including SCs and STs, who are given preferential treatment.

Said farmers are given subsidies for the procurement of seeds, fertilizer, plant protection material and agricultural equipments/machinery such as small tractor. In addition, community irrigation schemes, tank irrigation scheme and sprinkler irrigation are subsidized to support small and marginal farmers or their groups. Rates of subsidies are around 25% - 50%. Annual expenditure on various subsidies/incentives to farmers is about Rs. 200 million.

Farm Credit Services

Access to farm credit for farmers, mostly marginal and small farmers, is provided by private banks for purchasing farm inputs. The central government instructed private banks to allocate 18% of the total finance to the agricultural sector and to apply affordable interest rates which are lower than bank's prime lending rate, subject to conditions of the Government's subsidy to the banks. Said interest rate is about 4.5 % lower than the prime rate for short term loans, and about 2% lower for long term loans in India.

In the State, there is a significant agricultural credit growth. Institutional credit is being extensively distributed. Short term loans need to be repaid within one crop season covering the period from the time of buying seeds or other inputs, to the time for selling the harvests to markets. The loan interest rate is 7% per annum only when a 2% subsidy is granted by the Government. The maximum limit of short term loan is Rs. 300,000. Loan can be sought on all agricultural crops. The amount disbursed for loan in 2005/06 was Rs. 868 million.

Term loans for a period of more than a year cover new investments such as construction of convenience stores, marketing, land development, farm mechanization, dairy, other animal husbandry activities like poultry and piggery, raising plantations (orchards), buying vehicles for transporting agricultural goods and tractors, and purchasing land.

Agricultural Insurance

National Agricultural Insurance Scheme (NAIS) was launched in the State in 1999/00. Since then, the Agriculture Insurance Company of India (AIC) has devised and implemented insurance schemes for agriculture and allied subjects through commercial banks, cooperative banks and regional rural banks. Under the current guidelines of NAIS, it is not possible to cover vegetables and fruits, since the premium rates become very high for such crops, which will increase the burden on loans taken by farmers, whose crops need to be compulsorily insured. It is required for NAIS to make suitable modifications so as to cover a large number of crops including fruits and vegetables. In the State the crop insurance covering fruits and vegetables is under discussion.

However, farmers are aware of the risks of crop damages based on their experiences. Hence, they will try to minimize the risks by resorting to methods such as multi/mix cropping, rotational cropping patterns, etc. In the State, Rs. 44.6 million is provided to 55,569 farmers during the drought year 2002/03 while Rs. 255,000 was given to 897 farmers in 2004/05.

3.9 Agricultural Marketing System

3.9.1 Agricultural Marketing Systems and Marketing Conditions

Aiming at the smooth implementation of market activities as well as promotion of farmers' benefits, the Himachal Pradesh Agricultural and Horticulture Produce Marketing Act was initiated. The act included private trading and contract farming. In the State, ten Agricultural Produce Market Committees (APMC) have been established to cover 12 districts, under the supervision of the Himachal Pradesh State Agricultural Marketing Board, in order to conduct a smooth marketing of the agricultural produce.

Vegetable and fruits are distributed to market yards in and outside the State. Farmers themselves carry their products to the market yards managed by APMC which they select in principle. Farmers are able to select market yard where their products can be sold with better price, or select commission agents

who are familiar to the farmers. Meanwhile, some farmers request traders or other transporters to transport their products to other market yards located in other states such as Punjab, Haryana, Delhi, etc.

Recently, the Government of India has been promoting the deregulation of agricultural sector and the integration of domestic markets of farm products, in order to promote competitiveness in the agricultural markets. Consequently, the State Government has amended the APMC Act in 2006, opening freely the marketing of farm products to private sectors. As a result, domestic and foreign investors have entered into the agribusiness by fully utilizing the merits from the deregulation of the market.

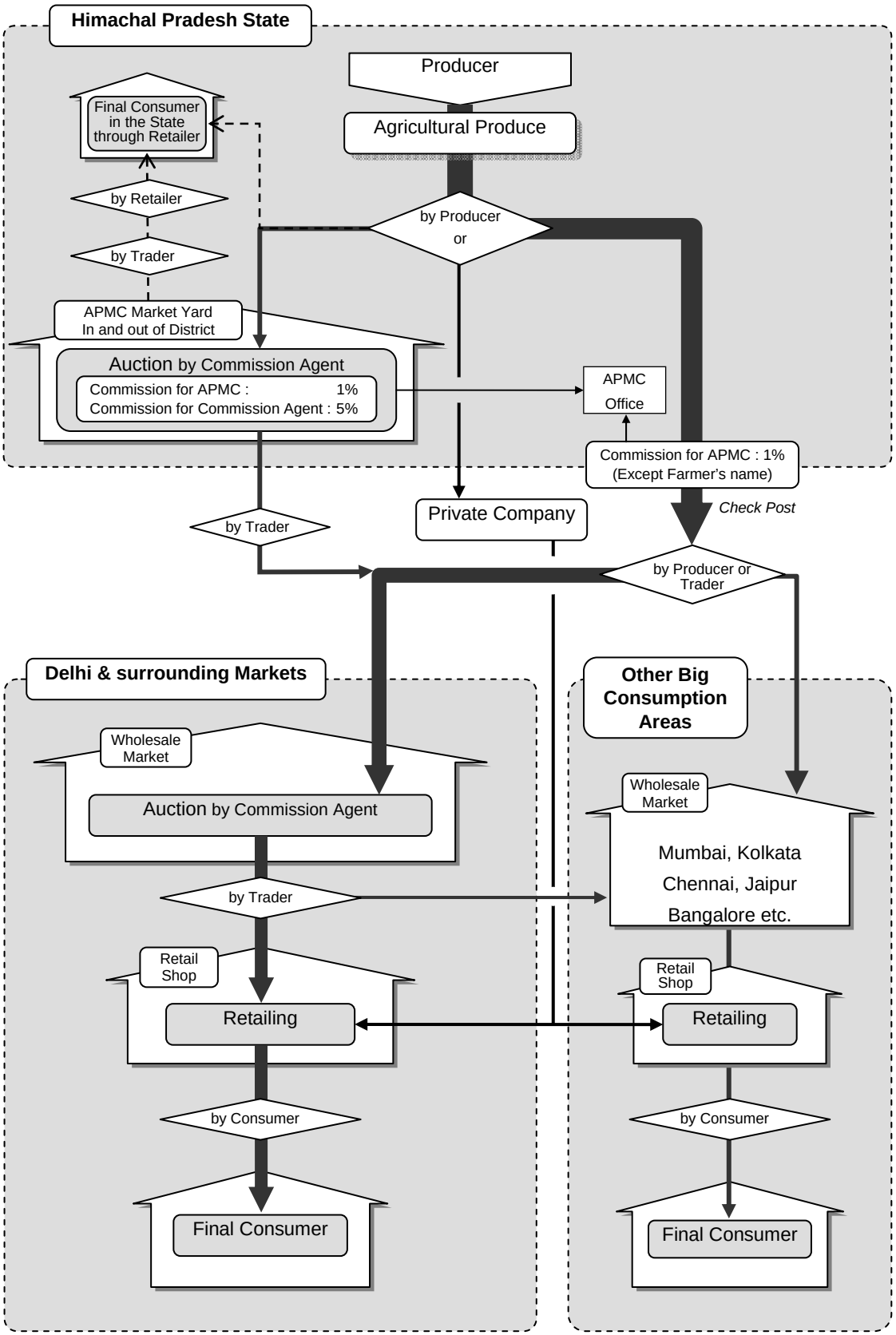
Direct purchase has been gradually disseminated, according to the amended APMC Act. Currently, some private companies such as Reliance Fresh, ADANI, ITC, etc. conduct direct purchase of vegetables from progressive farmers in Bilaspur and Hamirpur aiming to enter Himachal Pradesh in the future. Furthermore, these private companies are trying to gain some ground for marketing fruits, especially apple. Their priority areas are Shimla, Kinnaur, and Kullu, which are the main producers of apples.

Sunday markets also operate in some towns such as Shimla and Solan. In these markets, farmers are able to sell directly their fresh products to consumers, while consumers can buy fresh vegetables for prices cheaper than the usual retail price.

Sunday Market

Market Yard

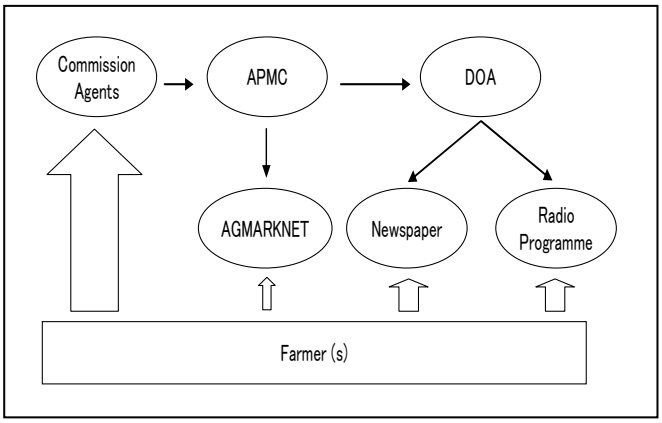
Major marketing channels in Himachal Pradesh are shown in Fig.3.9.1.



Source: JICA Study Team

Fig. 3.9.1 Current Distribution Channel of Agricultural Produce

In the market yard, farmers leave their products to commission agents (CA). Each CA auctions the farmers' products to buyers who can pay at a higher price including the 5% of commission fee to CA as well as the 1% of market fee. Meanwhile, CA pays the money to farmers without charging fees. In general, farmers can select any CA based on performance. In some areas such as Kullu, Lahaul and Spiti, Shimla, etc., farmers, who cultivate peas, potatoes, and apples, organize cooperatives (growers' society), in order to hold certain bargaining transporters as well as CA. In some cases, small traders called the mini traders, directly procure vegetables from farmers and bring them to market yards.



Source: JICA Study Team

Fig. 3.9.2 Market Price Information

Currently, market information in the State is disseminated through various media such as radio, newspaper, internet, etc. as shown in the following figure. Major market information includes market price and arrival quantity of crops. APMC's market supervisor collects the maximum and minimum daily market price as well as arrival quantity of major crops including vegetables and fruits from commission agents. This Agriculture Marketing Information System Network (AGMARKNET) envisages linking all important agricultural produce markets in the country, State Agricultural Marketing Board, State Government, and Directorate of Marketing and Inspection, Delhi for effective information exchange. Market information related to crop diversification is available in AGMARKNET. However, this system has not been used effectively. Generally it appears that small and marginal farmers do not have necessary market information or access to AGMARKNET.

3.9.2 Arrival Quantity and Wholesale Price

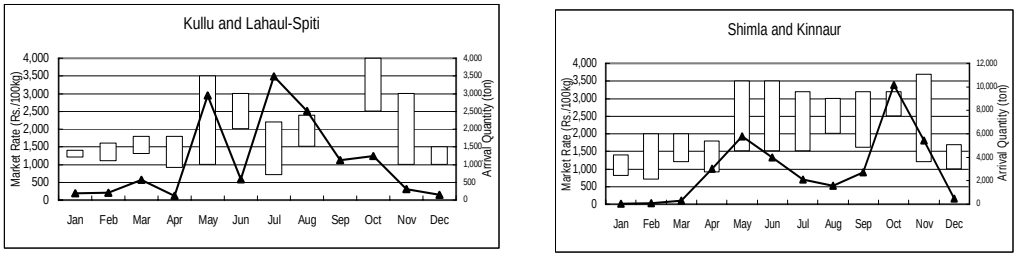
Market yards function as wholesale markets to supply products to consumers in surrounding districts and the State. The Dhali regulated market yard in APMC Shimla is the biggest and operates as export market to supply outside the State. Meanwhile arrival quantity in the market yard of APMC Hamirpur is only for local consumption, and not for sale outside Hamirpur District. Total arrival quantity at all the market yards in 2005/06 is around 160,000 tons of vegetables and around 100,000 tons of fruits.

Vegetables traded in market yards are limited to around 10 to 15% out of the total production. The remaining quantity is directly sold to other markets outside the State.

Wholesale prices are decided through auction. Those wholesale prices in market yards have been checked and recorded by an auction recorder, an APMC staff. The auction recorder checks the selling price to buyers as wholesale price (or market rate). Then, each APMC records the daily maximum and minimum prices of major crops. These wholesale prices are advertised in AGMARKNET, Directorate of Agriculture, radio station, and major news papers on a daily basis. Furthermore, wholesale price fluctuates, depending on seasonal availability, quality, quantity, requirement of buyers, source of products, etc.

Fluctuation patterns of monthly maximum and minimum market rates as well as arrival quantity of

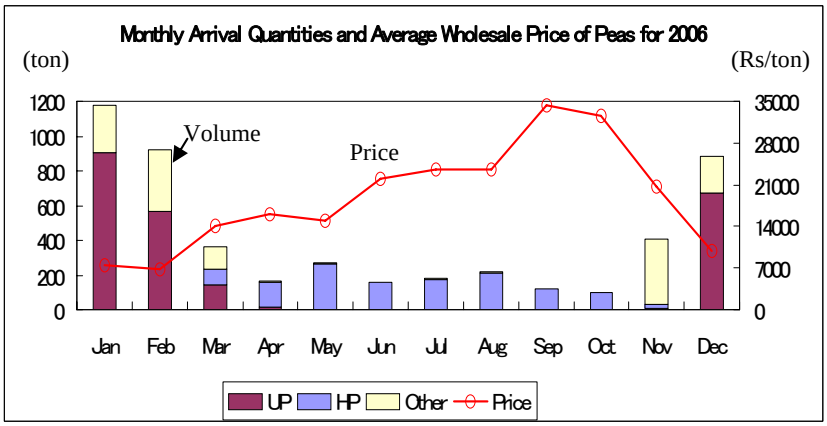
peas according to APMC during the period of 2007 are shown in Fig. 3.9.3



Source: APMC 2007

Fig. 3.9.3 Arrival Quantity and Price in Market Yards (Sample Pea)

Arrival quantity and price of peas as a sample in Azadpur wholesale market in Delhi is shown in the following figure. Uttar Pradesh and other states in the plains, supply the peas during winter until March, while the State does supply these from March to November, with a limited volume. The price goes up accordingly during March to November.



Source: Axadpur Wholesale Market 2006

Fig. 3.9.4 Arrival Quantity & Price (Sample: Pea in Azadpur Market)

Market information announced through radio station and news paper only cover major commodities. Moreover, AGMARKNET does not completely provide useful information on all market yards. Farmers have tried to obtain their preferred information from reliable CAs or from acquaintances through telephone call. Market rates supplied through media and internet only include daily maximum and minimum rates, and not the market rates by grade, quality, and region, except for big market yards such as Azadpur. Furthermore trend on market rates is also not available.

3.9.3 Grading and Packing of Vegetables

In the State, there are no authorized standards on grading and packing for vegetables to be produced.. Importance and necessity of grading and packing have been disseminated to farmers as well as other stakeholders through a series of extension activities of the Marketing Board.

Farmers and other marketers (CAs or buyers) have carried out simple grading and/or packing in order to add more value to the products. Vegetables like cauliflower, cabbage, peas, tomato are graded or sorted according to shape, color, freshness, etc. Furthermore, packing materials like plastic crates have been subsidized by the Marketing Board. Generally, grading and packing activities are conducted by CAs and/or traders in the market yards, although some farmers are actually aware of its importance and advantages. This is also intended to ensure that wholesale prices vary depending on the quality of vegetables.

Currently, the DOA and Marketing Board have periodically carried out extension activities concerning promotion of grading and packing activities for farmers. Farmers have been educated through routinary extension activities as well as special program such as awareness camps, field visits, etc. It is realized that some farmers lack motivation in improving their situation, since their products are completely sold out even if no grading is done. Therefore, they are not that willing to do grading and packing. In order to add value to agricultural products, however, it is essential to improve the quality of the products, especially for small and marginal farmers who have started crop diversification.

Furthermore, it is necessary to improve not only their quality but also the packing method. It should be noted that labeling brand names or trademarks for specified commodity assures the quality and strengthens competitiveness of the agricultural products

3.9.4 Marketing Infrastructure

Currently, there are 39 market yards in the State, including regulated and sub-market, as given below. Facilities in market yards are generally old, narrow, and crowded. Furthermore, basic infrastructures such as garbage pit, loading and unloading space, etc. are insufficient. Meanwhile, some market yards operate seasonally for trading vegetables and fruits. Some seasonal market yards have several permanent facilities, however, rehabilitation of their existing yards and new construction are still required.

Table 3.9.1 List of Market Yards

District		Market Yard	District		Market Yard	District		Market Yard
Bilaspur	1	Bilaspur	Kullu and L & Spiti	14	Patilikuhal	Simour	27	Paonta Sahib
	2	Namhol		15	Bandrol		28	Dadahu
Chamba	3	Chamba		16	Banjar		29	Sarahan
Hamirpur	4	Hamirpur	Mandi at Dhanotu	17	Dhanotu		30	Bagthan
	5	Naduan		18	Jogindarnagar	Solan	31	Solan
Kangra	6	Kangra		19	Takoli		32	Banalgi
	7	Baijnath		20	Mandi		33	Chakki ka mour
	8	Palampur	Shimla and Kinnaur	21	Dhalli		34	Dharmpur
	9	Jassur		22	Koti		35	Nalagarh
	10	Nagrota Bagwan		23	Nerva		36	Parwanoo
Kullu and L & Spiti	11	Bhuntar		24	Rampur		37	Ramshahar
	12	Chauri Bihal		25	Theog		38	Rajgarh
	13	Kullu		26	Rohroo	Una	39	Una

Source: Himachal State Agriculture Marketing Board and APMC 2008
Remark) In December 2008, Jawala Ji. (Kangra), Kkhegsu (Kullu and L&Spiti), Nahan (Sirmour), and Santoshgrah (Una) are newly functional

3.10 Post-Harvest Processing and Storage

3.10.1 General Conditions

As earlier mentioned, there are no authorized standards on grading for vegetables in the State. Importance and necessity of grading and packing have been disseminated to farmers as well as other stakeholders through a series of extension activities. In spite of this, majority of the farmers still do not conduct grading and sorting of agricultural products.

Some advanced farmers and marketers such as CAs or buyers devised their own simple criteria. Vegetables like cauliflower, cabbage, peas, tomato are graded or sorted according to shape, color, freshness, etc. Generally, grading and packing activities are conducted by CAs and/or traders in market yards. Farmers do not perform such activities even if they are aware of its importance and advantages.

Central government has provided internal standards for grading and provisions concerning size for selected vegetables and fruits such as peas, tomatoes, cabbage, cauliflower, sweet pepper, grape, apple,

mango, strawberry, pears, etc. Furthermore, it is expected that the State government establish their own standard criteria for major vegetables. Without the standard, quality of agricultural products is hardly improved and farm income of the producers will not appreciate.

Seven semi-commercial based fruits and vegetables processing industries have also started in different places during the 1970s and 1980s, and utilized the new technology on post-harvest processing. Presently, fruit canning units have affiliated with Horticulture Department. They manufacture various kinds of processed foods and sell them under the brand name “himcu”. On the other hand, the Agro Industries Corporation was established in 1971 to provide agro-industrial support to the horticulture industry. Moreover, a specialized organization named Himachal Pradesh Horticulture Produce Marketing and Processing Corporation (HPMC) was established in 1975 to handle harvest management and processing needs of the industry.

Due to the deregulation of agricultural sector in accordance with the amended APMC Law in 2006, some private companies such as ADANI have entered into the State and started direct purchase of agricultural products including temperate fruits and building store houses.

3.10.2 Post-Harvest Industry

In the State, food processing activities had started mainly for fruits and vegetables. Almost all of them process traditional and conventional products such as jams, juices, juice concentrates, squashes, purees, dry fruits, candies, pickles and fruit wines etc.

In 2005/06, about one million ton of vegetables and about 0.5 million tons of fruits, were harvested in the State. At present, about 130 units of agricultural and horticultural products’ processing plants in middle or large scale are operating in the State with annual processing design capacity of about 88,000 tons.

Assuming that above processing plants are working under full design capacity, it is calculated that about 5% of the State’s total products are processed by them.

It is a fact that the selling prices to traders at market yard, or the direct selling to consumers are generally higher than the prices of materials for processing. Therefore, farmers prefer to sell their fresh products at market yards and not as materials for processing. However, it is realized that some products are not suitable for trading in markets due to poor or damaged quality.

Hence, agro-processing facilities will be useful and beneficial for such unsuitable products in terms of improving its freshness or in the event of over-production

Major means of fruit processing, especially fruit juice or concentrate, are managed by large or medium scale processing plants in the State, as summarized below:

Table 3.10.1 Large and Medium Scale Processing Facilities

Sector		Particulars	Approx. Capacity (Material tons / yr)	Remarks/Products Manufactured.
Governmental or Semi-Governmental Sector	**A**. Governmental Sector	Fruit Processing Units in the Department of Horticulture (himcu; 8 units)	600	Fruit Juice, Pickles etc.
	B. Corporate Sector	Horticulture Products Marketing Corporation (HPMC; 3units)	26,000	Juices Conc., Juices, Pulp, Jams, Jellies, Marmalades, Fruit Wines, Apple Cider etc.
	C. Co-operative Sector Units	(7 units)	600	Conventional Fruit and Vegetable products.
	Public Sector sub-total		27,200 ***(31%)***	
Private Sector	**D**. Independent Private Sector Units	(a) Big units (9units)	34,490	Fruit Juice, Squashes, Jams, Tomato Ketchup, Frozen Vegetables, Pickles Vinegar etc.
		(b) Other middle units (55units)	16,170	Conventional Fruit Products.
	E. Joint Ventured Private Sector Units	Himalayan Vege Fruits Ltd., Jabli, Solan	10,000	Fruit Juice Conc., Pure Fruit Juices, Canned Fruits, Jams, Jellies etc.
	Private Sector sub-total		60,660 ***(69%)***	
Grand Total			87,860 ***(100%)***	

Source: Department of Horticulture, Himarchal Pradesh. "Present Status of Fruits and Vegetables Processing Industries and Available Post Harvest Infrastructure in Himachal Pradesh"

From the table, it is understood that about 70% of the agro-processing industries is presently managed by the private sector.

It is expected that the share of the agro-processing managed by the private sectors will increase in the future, and that the task of the government will be shifted from direct operation of the plants to planning and control of the total management of the processing industry. It is necessary for the government to provide land for agro-processing plants/factories and support infrastructures such as roads, electricity and water supply etc., in order to encourage private sector to invest in the State. In addition, establishment of favorable taxation system and special financing system with low interest rates for the private sectors are also vital in motivating said investors.

It is also important to disseminate information to the investors on matters related to the promising dealings of the State and material production for processing, during Public-Private Partnership workshops or through other channels.

3.10.3 Cold Storage

The cold storage industry is required for maintaining the freshness of the fruits and vegetables to supply the fresh markets throughout the year. HPMC owns nine cold storage facilities in Delhi, Mumbai, Chennai as well as in the State, having a total capacity of 16,500 tons.

Present major cold storage facilities managed by private sectors are shown in Table 3.10.2

Table 3.10.2 Cold Storage Facilities operated by Private Sectors

Name of the Company	Location	Capacity (tons)	Products/ activities	Employee
Adani Agrifresh Ltd.	Rohru Block, Shimla District	25,000	Procurement , handling, cold storage, packing and transport of horticultural produce	185
Dev Bhumi Cold Chain Pvt. Ltd,	Theog Block Shimla District	3,000	Cold storage, grading packaging line, apple juice processing plant	50

Source: Department of Horticulture, Himachal Pradesh. List of Cold and Controlled Atmosphere Storages in the State of Himachal Pradesh

Similar to agro-processing, it is also desired that storage function will be shifted to the private sectors. Simultaneously, the public sector is required to provide appropriate investment circumstances to motivate the private sectors.

3.11 Irrigation and Farm Road

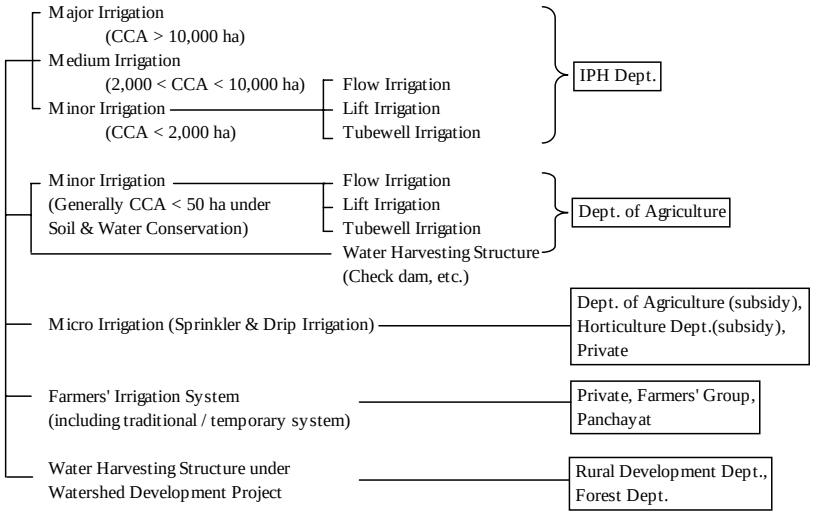
3.11.1 Irrigation Development in the State

The State is restrained in initiating large scale irrigation development due to its precipitous geography, and hence the developed irrigation system is limited to 207,000 ha. . Moreover, the actual irrigable area is further limited to 107,000 ha, which are 36% and 18% of net area sown of 583,000 ha.

Irrigation facilities have been constructed by farmers' themselves, farmers group, Panchayat and by the government. Irrigation schemes are classified into major, medium, minor, farmer's irrigation and water harvesting structures. Irrigation and Public Health (IPH) Department deals with major and minor irrigation projects, while DOA deals with minor irrigation and water harvesting projects with culturable command area (CCA) of generally less than 50 ha.

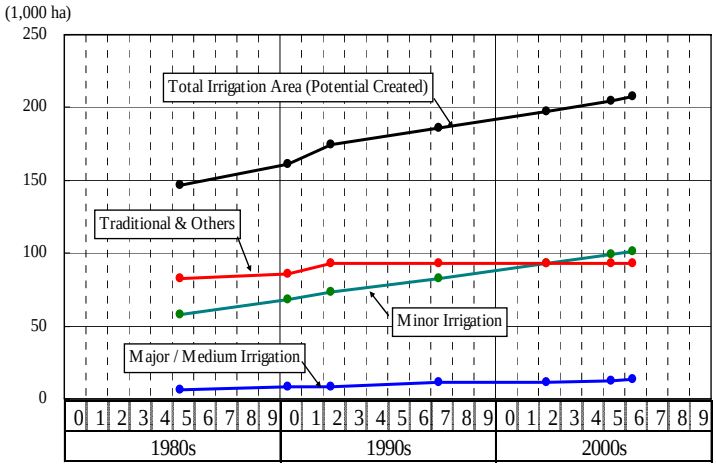
Rural Development Department (RDD) and Forest Department also deal with water harvesting structures as shown in Fig.3.11.1.

Irrigation system of 114,000 ha was developed by IPH Department. RDD and DOA meanwhile developed 93,000 ha., which includes farmers' own traditional irrigation systems. Since the irrigation development is given higher priority in five year plans and annual plans, the irrigable area has been increased by almost double during the period from 1980s to the date indicated in Fig. 3.11.2. District-wise actual irrigated area is summarized in Fig. 3.11.3.



Source: JICA Study Team

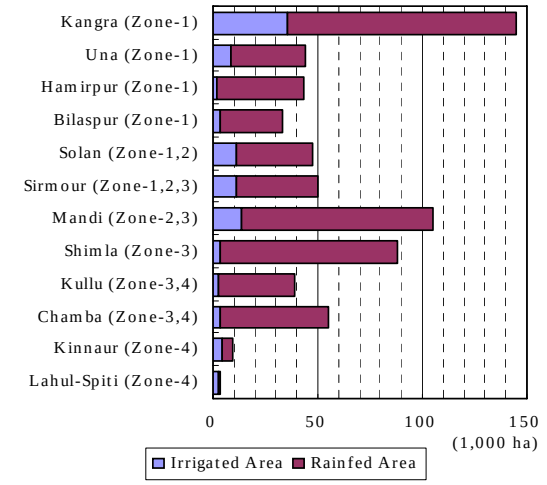
Fig. 3.11.1 Type of Irrigation Scheme in Himachal Pradesh



Source: Annual Plan 2007/08

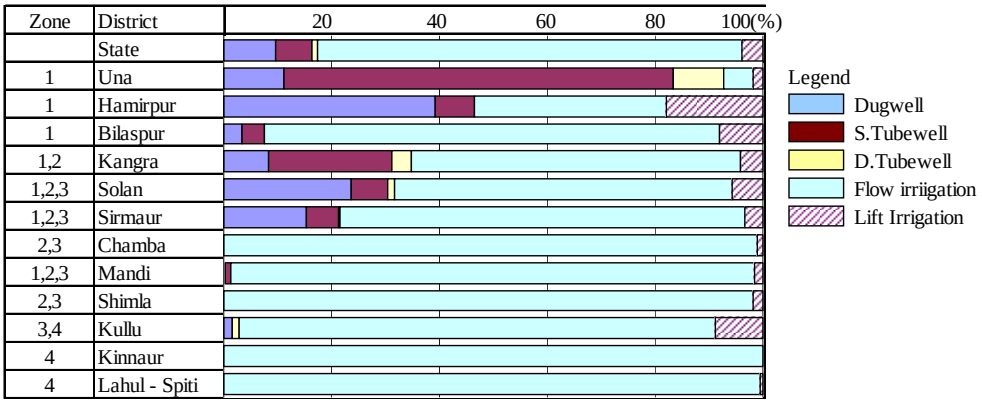
Fig. 3.11.2 Progress of Irrigation Development

According to the Minor Irrigation Census in 2000/01, minor irrigation schemes in each district, including IPH projects, DOA projects, traditional and private schemes are classified into five types such as flow irrigation (FIS), lift irrigation (LIS), deep tube well, shallow tube well, and dug well. Most of the minor irrigation schemes are FIS type. In the lower area in agro-eco Zone-1, there are many dug well and tube well schemes with higher potential of groundwater. In the case of Una district, more than 90% are groundwater irrigation schemes, and 80% of which are shallow tubewell. In the higher region in agro-eco Zones 2, 3 and 4, there are either few or nil. In agro-eco Zone-4, Kinnaur and Lahaul Spiti, almost all schemes are FIS types. Types of minor irrigation including traditional system are shown in Fig. 3.11.4. The classification of minor irrigation according to holding size, ownership, financial source, and distribution system in the State is summarized in Table 3.11.1.



Source: Annual Plan 2007/08

Fig. 3.11.3 District-wise Irrigated Area



Source: Minor Irrigation Census, 2000-01

Fig. 3.11.4 Type of Minor Irrigation Scheme in each District

Table 3.11.1 Summary of Classification of Minor Irrigation

Type	Flow	Lift	Deep Tubewell	Shallow tubewell	Dugwell
Size	Mostly > 10ha	Depend on size	> 10 ha	Depend on size	Depend on size
Ownership	Government 50% Farmers' group 40 %	Government 70% Farmers' group 25 %	Government 95%	Farmers' group 75% Framer 20 %	Farmers' group 70% Framer 28 %
Financial source	Government 5% Farmer's saving 20%	Government 5% Farmer's saving 15%	Mostly other source	Farmer's saving 90%	Farmer's saving 80%
Distribution system	Mostly open channel	Open channel 30% Pipe 35%	Open channel 40% Pipe 55%	Open channel 95%	Open channel 95%

Source: Prepared by JICA Study Team based on Minor Irrigation Census, 2000-01

3.11.2 Minor Irrigation under DOA

DOA is implementing soil and water conservation schemes which include development / improvement of minor irrigation schemes such as FIS, LIS and tube well types. Most of these schemes are covering CCA of less than 50 ha and developed by farmers themselves with participatory approach during planning, construction and operation and maintenance, under the financial and technical support of the DOA. The DOA as well as the IPH Department is participating under centrally supported Rural Infrastructure Development Fund (RIDF) programme financed by NABARD (National Agricultural Bank for Rural Development).

Minor irrigation under DOA is classified into three types, namely FIS, LIS, and tube well. Majority of which is FIS (92 %) as shown in Table 3.11.2.

Table 3.11.2 Type of Minor Irrigation under DOA

Type	Nos.		Area (ha)	
FIS	485	(95%)	9,288	(92%)
LIS	2	(0%)	51	(1%)
Tube well	21	(5%)	791	(7%)
Total	508	(100%)	10,130	(100%)

Source: DOA

As the National Water Policy prescribes the participation of farmers in water management of the irrigation systems, water users' association (Krishak Vikas Sangh, KVS or WUA) is being organized and registered in accordance with the government guidelines. The activities of KVS under the DOA include operation and maintenance of the irrigation system. Schemes under IPH Department are operated and maintained by the department, imposing minimal charge to farmers. Generally in most KVS, regular meetings are held either once a month or once in six months, wherein water supply schedules are planned.

For minor irrigations, schemes are developed based on the application filed by farmers groups. Therefore the group activities commence before construction works. Especially for the DOA schemes, farmers' participation is vital not only after taking over the system but also during planning, survey, design and construction. Construction works are carried out by KVS subject to condition that materials such as cement, reinforcement, and pipes shall be provided by the department, while local materials such as sand and gravel, and common labor shall be managed by KVS. From the total cost, 10% is deducted from the gross running bill and the same is released to the account of KVS for the operation and maintenance after completion.

3.11.3 Farm Roads

In the rural area, minor roads consist of various types, such as (1) Katcha roads (temporary earthen jeepable roads) having an average width of 2-3m, poor drainage facilities, and mostly un-surfaced (no pavement), (2) mule track having an average width of 1.8 m, partly paved by stone or concrete, but without drainage facilities, and (3) footpaths with an average width of 1 m or less partly paved by stone or concrete, no drainage facilities.

These roads are constructed mainly for a single Panchayat by the Block Office, APMC and DOA, and maintained mainly by the Block Office and Panchayat. However, most sections of these roads are not easily passable during the rainy season mainly due to severe mud. This is observed from the end of June to the beginning of September when harvests of off-season vegetable and temperate fruits are at its peak.

(1) PWD Village Roads

Source of Fund	The source is sponsored by PMGSY (Pradhan Mantri Gram Sadak Yojana: Prime Minister's Village Road Programme) assisted by Bharat Nirman Yojana (Indian Rural Development Scheme, time bound by 2009), World Bank and the State.
Road Category	Category is under all weather passable roads (for 42-seater busses). Habitations within a distance of 500 m (1.5 km in case of hills) from the all-weather road or the habitation is considered as connected. The carriageway width of the village roads is 3.75m, however, 3.0m is dominantly applied in hilly area. Standard pavement is pre-mix bituminous carpet (asphalt).
Annual Progress	In fiscal year of 2006-07, 3767 km of the new roads and improvements were completed, which is equivalent to1334 km per annum in average since 2000 (improvement is 12.5% of the new construction). Vision 2025 issued by Ministry of Rural Development (MORD) stipulates complete connection of habitation with a population of more than 250 by 2021/22, however, the State sets it to 2012, and that connection for all 17,449 habitations shall be completed by 2020.
Implementation & Maintenance	For village roads, Panchayat is responsible for land acquisition, determination of approximate alignment and application. Survey is done by PWD. The construction contract is concluded between 106 executive engineers and contractors. For maintenance, PWD is responsible for the sub-division office and mechanical section.

(2) Rural Roads by Block Office (Panchayat road)

Source of Fund	The source is Rural Development Department (RDD) under 70/30 Program (30% shared by Panchayat), District Deputy Commissioner Fund, MLA Fund (member of legislative assembly), Panchayat Fund, etc
Road Category	Category is mostly Katcha (temporary earth) roads, concrete footpaths, and ropeways. The carriageway width is 3.0m.
Annual Progress	Estimated at about 353 km/year based on the data obtained from RDD for 12 Blocks and from Block Development Office (BDO) for 12 Blocks
Implementation & Maintenance	Panchayat is responsible for land acquisition, determination of approximate alignment and application. Survey is done by PWD in most cases. The construction contract is concluded between BDO (Block Development Office) and the contractor. Minor encroachment to the forest reserve is carried out by outsourcing to the forest department through deposit system. For maintenance, Panchayat is responsible under the financial assistance from 70/30 Program, Deputy Commissioner Fund, MLA Fund, Panchayat, etc.

(3) Market Link Roads by APMC

Source of Fund	A part of market charge (1 %) is allocated.
Road Category	Category is mostly Katcha (temporary earth) roads and partly paved road, concrete mule paths and ropeways. The carriageway width is 3.0m and the road parameters.
Annual Progress	Approximately 30 km/year which was obtained from the statistics summarized in two fiscal years (2004-2006)
Implementation & Maintenance	Panchayat is responsible for land acquisition, determination of approximate alignment and application. Survey is done by Jr. Engineers. The construction work is carried out by Panchayat and contractors that they employed.. Difficult works are sometime carried out by outsourcing to PWD through deposit system. For maintenance, Panchayat is responsible under the financial assistance from 70/30 Program, Deputy Commissioner, MLA, Panchayat, etc.

(4) Farm Roads by DOA

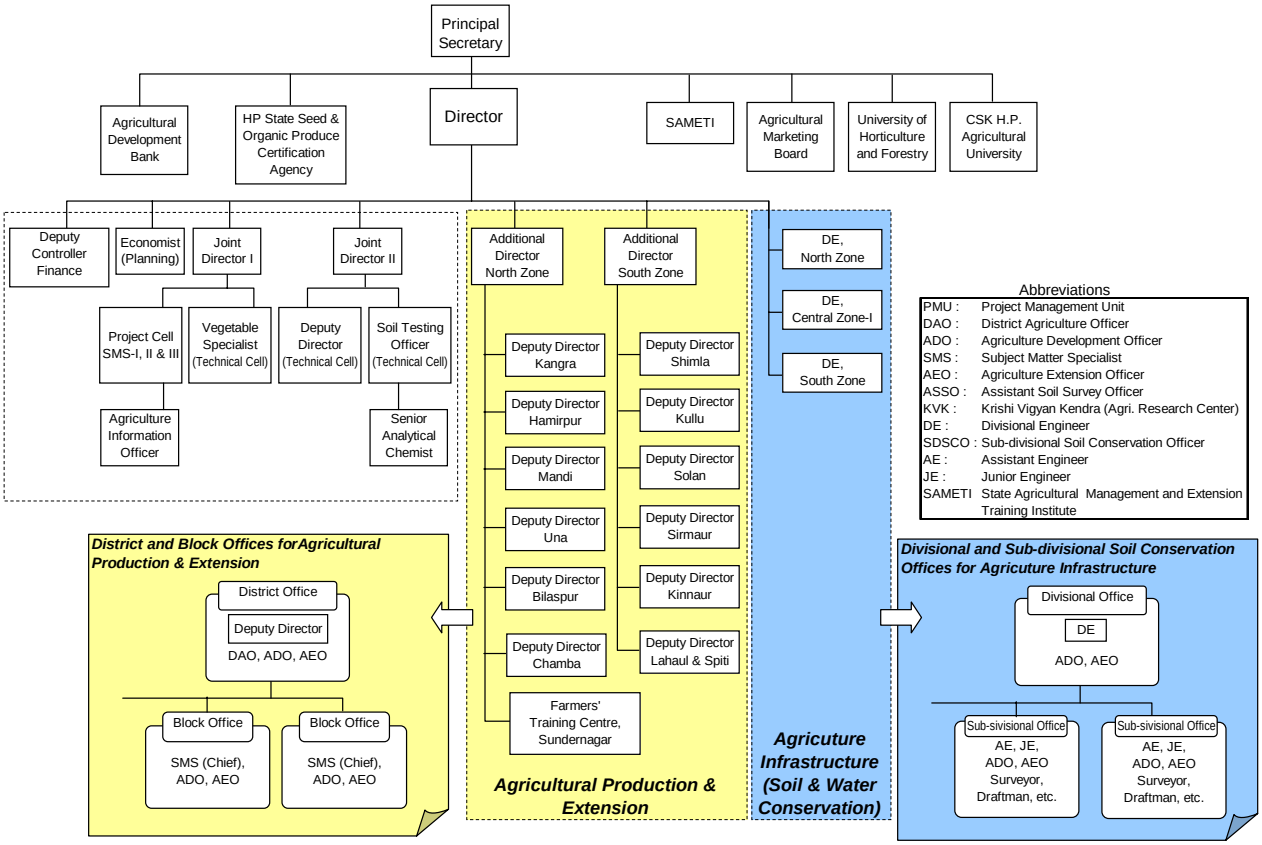
Source of Fund	Source is 100% through NABARD
Road Category	Category is Katcha (temporary earth) and canal inspection footpath.
Annual Progress	Approximately 30 km/year which was obtained from the statistics summarized in two fiscal years (2004-2006)
Implementation & Maintenance	KVS is responsible for land acquisition, determination of approximate alignment and application. Survey is done by Jr. Engineers. The construction work is carried out by KVS and contractors that they employed. KVS is also responsible for its maintenance.

3.12 Organization for Agriculture

3.12.1 Department of Agriculture

In the State, food grain crops and vegetables are under the jurisdiction of DOA, while fruits, flowers, edible mushroom, hops, olives as well as cultivated medicinal and aromatic plants are under the Directorate of Horticulture. The processing of fruits is also under the Directorate of Horticulture. Wild medicinal plants, aromatic plants and mushroom are under the jurisdiction of the Directorate of Forestry. The breeding and development of new horticultural varieties are under the jurisdiction of agricultural research institutes of the central government. The marketing of horticultural produces are managed by an independent board called as Himachal Pradesh Marketing Board, which manages marketing issues through APMC.

The organizational structure of DOA is shown in Fig. 3.12.1. While the Minister and the Principal Secretary of Agriculture are the policy making authorities of the State, the Director of DOA is responsible for the planning and implementation of agricultural programs and schemes.



Source: Department of Agriculture

Fig. 3.12.1 Organizational Structure of DOA

The Director is supported by joint directors at the State level and deputy directors at the district level. The development unit known as 'block', is managed by Subject Matter Specialist (SMS), supported by ADOs and AEOs.

Sanctioned posts and presently filled-up posts are given below:

Table 3.12.1 Staffing of DOA

Position	Sanctioned Posts	Presently Filled up Posts	Vacant Posts	% of vacancy
Director	1	1	-	-
Addl. Director	1	1	-	-
Joint Director	2	2	-	-
Deputy Director	12	12	-	-
DAO/APO	3	3	-	-
SMS	71	59	12	17%
ADO	332	171	161	48%
AADO	60	56	4	7%
AEO	820	313	507	62%
Total	1,302	618	684	53%

DAO - District Agriculture Officer; SMS - Subject Matter Specialist; APO - Agriculture Project Officer; ADO - Agriculture Development Officer; AADO - Assistant Agriculture Development Officer; AEO - Agriculture Extension Officer Source: Department of Agriculture

It is understood that there are 684 vacant posts in the department and that there is an urgent need to increase the staff.

Present information transfer in the department fully depends on telephone, facsimile, reports or paper correspondences. Accordingly, it is difficult to share information and technologies properly among the department staffs. Decision makers such as the Secretary and Director can not make proper decision promptly on the basis of accurate data from field offices. Improvement of present information system is indispensable by using recent IT technology.

Planning-Monitoring-Evaluation cycle, also called "Plan-Do-Check-Action" cycle, is not always executed in the routine works, especially the monitoring-evaluation of performance of plans which is not properly carried out. It is essential for every department staff to familiarize in the cycle and execute it as their routines by providing staff training.

Mobility of staff of the department is low due to shortage of transport equipment. Moreover, lack of instruments for extension and survey and design hampers efficient works in field offices.

3.12.2 Farmers Organizations and Cooperatives

In the State, there are various types agricultural/farmers organizations, farmers cooperatives, farmers groups, and SHGs established by different organizations under various programs mentioned below.

vii) Farmers organizations formed under National Agricultural Technology Project (NATP) of DOA

viii) Farmers cooperatives formed under Co-operatives Department

ix) Self-help Groups (SHGs) established under Social Welfare & Empowerment

x) Water Users Associations formed by DOA and IPH.

(1) Farmers Organizations under NATP of DOA

In NATP, farmers organizations are formed at the village level which evolve into CAs), cooperatives and other types of farmers' organization (FOs) at the block and district levels. The village extension workers of line departments such as AEOs/HEOs/ Vetinerary Pharmacists were instrumental in

establishing the links with the farming community at village level. These farmers' organizations and Farmer Interest Groups (FIGs) are effectively involved in the preparation of block A/Ps. These organizations coordinate in organizing on-farm demonstrations, and give their feedback to the extension and research. Their representatives are directly involved in the block level Farmer Advisory Committee (FAC) and also in the governing board of ATMA.

(2) Farmers' Cooperatives under Cooperative Department

In the State, the Cooperative Movement started way back in 1892 in Panjavar in the district of Una. This was an agricultural co-operative society. At present, there are 2086 Primary Agricultural Co-operative Societies.

(3) Self-help Groups (SHGs) established under Social Welfare and Empowerment

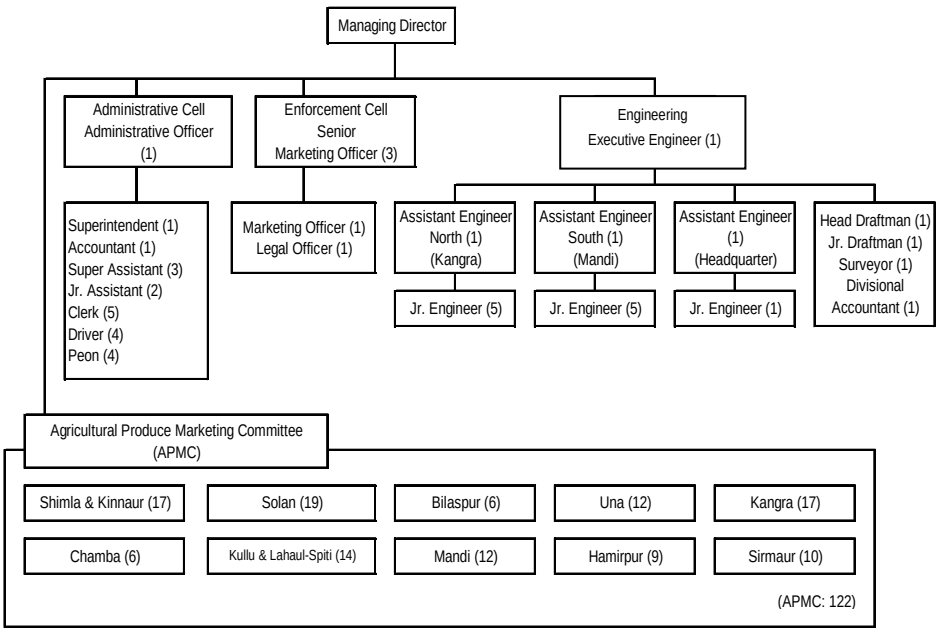
Under the department of the Social Welfare and Empowerment, 17,571 SHGs have been formed as of March 2007. Out of these SHGs, 11,708 were linked with banks for micro-credit purposes. These SHGs were involved in a number of activities which also included agriculture activities, vermi-composting, vegetable shops, dairy farm activities etc.

(4) Water Users Associations formed by DOA and IPH

National Water Policy prescribes the participation of farmers in water management of the irrigation systems. In Himachal Pradesh, KVS is being organized and registered in accordance with the government guidelines. The activities of KVS in the soil and water conservation schemes under the DOA include operation and maintenance of the irrigation system, while the schemes under IPH Department are operated and maintained by the department, imposing minimal charge to farmers.

3.12.3 Himachal Pradesh State Agricultural Marketing Board

Based on the revised Himachal Pradesh Agricultural and Horticulture Produce Marketing Act 2006, ten APMC have been established, and cover 12 Districts under Agricultural Marketing Board. Organization of the Marketing Board and the APMCs are shown in Fig. 3.12.2.



Source: H.P Agricultural Marketing Board 2008

Fig. 3.12.2 Organization and Staffing of Agricultural Marketing Board

Marketing Board in Shimla consist of 46 staff, including the Managing Director and 122 other staff. About 170 staffs in the Marketing Board of APMC are conducting marketing activities at present, however, there are deficiencies that need to be improved through staff training and information system improvement. These are i) poor filing of data from APMCs, ii) insufficient data collection in quantity and prices, iii) improper updating of data in AGMARKNET, iv) lack of broad knowledge on AGMARKNET including the Marketing Board.

3.13 Externally Aided Projects

3.13.1 Overview

The State had not received instructions from the Ministry of Finance, Government of India, which requires that debt sustainability of the states should be a pre-requisite condition for accessing external assistance. If any state is categorized as "debt stressed" by the Ministry of Finance, no access to externally aided projects will be provided to the concerned state.

In Himachal Pradesh, a total of nine projects externally aided projects are under execution.

These are: a) Himachal Pradesh Forest Sector Reforms Project assisted by the Department of International Development (DFID), U.K.; b) Mid-Himalaya Integrated Watershed Development Project (IWDP) financed by the World Bank; c) Hydrology Project-II aided by the World Bank; d) Water, Sanitation & Hygeine Project (WASH) financially assisted by the German Federal Ministry for Economic Cooperation and Development (BMZ) and technically supported by the German Public Corporation for Technical Cooperation (GTZ); e) Technical Education Quality Improvement Project financed by the International Development Association (IDA); f) Swan River Flood Management, Integrated Land Development and Watershed Management Project financed by the Japan Bank for International Cooperation (JBIC); g) Macro Planning at Panchayat Level assisted by GTZ; h) Rural Roads Project financed by World Bank group; and i) Strengthening Agricultural Marketing System (SAMS) aided by USAID.

3.13.2 Salient Features of Agriculture-related Projects

Salient features of Mid-Himalaya IWDP, WASH Project, and Swan River Flood Management, Integrated Land Development, Watershed Management Project, Rural Roads Project and SAMS, all of which include agriculture-related components, are summarized below:

(1) Mid-Himalaya Integrated Watershed Development Project by World Bank

The primary objective is to reserve the process of degradation of the natural resources base and to improve the productive potential of natural resources and income of the rural households in the project area. The secondary objective is to support policy and institutional development projects and policies across the State in accordance with best practices. The project area is Bilaspur, Chamba, Hamirpur, Kangra, Mandi, Shimla, Sirmaur and Solan Districts. Executing agency is Himachal Pradesh Natural Resources Management Society, newly created within the Department of Forestry. Project components include institutional strengthening, watershed development and management, enhancement of mountain livelihoods and project coordination. Project cost is Rs. 3,650 million and implementation period is 2006 ~ 2012.

(2) Water, Sanitation & Hygeine (WASH) Project by the German BMZ and GTZ

The goal of the project is to enable and empower water users, PRIs and other stakeholders to plan, implement and manage safe drinking water and minor irrigation systems in a sustainable manner. The

project area covers ten pilot sites (5,000 beneficiaries) in Shimla, Mandi and Kangra Districts. The executing agency is Central Coordination & Development Unit created within the IPH Department. Project components are awareness and training of key stakeholders, capacity building and training of key staff of the IPH Department, provision of technical assistance to the department, documentation and sharing of best practices, pilot schemes to identify and demonstrate best practices, and policy support to the department. Project cost is Rs.130 million and the implementation period is 2005 ~ 2007 for first phase.

(3) Swan River Flood Management, Integrated Land Development and Watershed Management Project by JICA (former JBIC)

The project goal is to stabilize 73 target tributaries as the project priority areas of the Swan River Watershed. This aims to mitigate flood damages from the target tributaries, and reduce soil erosion in catchments of the Swan River. The project area is in Una District. Executing agency is Project Management Unit under the Department of Forestry. Project components are afforestation, civil works, hillside works, livelihood improvement, and technology transfer. Its cost is Rs.1,450 million and implementation period is 2006 ~ 2014.

(4) Rural Roads Project

Objective of the project is to support the Government of India in rural road construction under PMGSY or the Prime Minister's Village Road Programme. It aims to connect 180,000 villages nationwide by constructing 370,000 kms of all weather roads and upgrading another 370,000 kms of existing rural road network in India. The project covers Himachal Pradesh, Rajasthan, Jharkhand and Uttar Pradesh. Subsequent phase of the project under preparation would cover a few more states, including Bihar and Jammu and Kashmir.

The target length is 9919 km in four states in India including 1308 km in the State. The project target road includes PWD village roads for village connectivity improvement which do not cover access farm roads. Executing agency is the Ministry of Rural Development at central level, and PWD at state level. Project cost is 592 million USD (IBRD portion USD 164 million, IDA portion USD 164 million US, and GOI portion USD 264 million). Implementation period is 2004 ~ 2009 for first phase

(5) Strengthening Agricultural Marketing System (SAMS) by USAID

The objective of this project is to strengthen agriculture marketing system to provide training on basic know-how on the production and marketing of agricultural products to various stakeholders. The project area and beneficiaries are apple farmers in the pilot areas of Theog, Narkandha, Rohtu, and Jubbal in Shimla District and tomato farmers in Kandaghat, Dharampur, Kunihar, and Nalagarh in Solan District. Executing agency is the Ministry of Agriculture (MOA) at central level and Agricultural Marketing Board at state level. Project components include training for government staff and farmers' groups. Project cost is Rs. 1.2 million and implementation period is 2006 ~ 2009.

3.13.3 Newly Committed Projects

The World Bank has recently approved to provide the State Government of Himachal Pradesh with USD 303.43 million loan for the State's road project in June 2007 and USD 200 million loan for the First Himachal Pradesh Development Policy Loan and Credit Project in September 2007.

The former project aims to reduce transport costs and to improve traffic flows on priority segments of

the core road network of the State. The latter supports the medium term program of the Government of Himachal Pradesh, focusing on the implementation of critical structural, fiscal and administrative reforms needed to achieve sustainable and rapid economic growth, and coupled with sustaining of the environmental heritage of the State. Its priority areas for operation will be fiscal adjustment and promotion of environmentally sustainable development, with particular reference to the development of hydropower

3.14 Himachal Pradesh among Hill States in India

The state belongs to "special category states" in India. Eleven hilly states of the Himalayas are all designated under the 'special category states'. These include the states of Himachal Pradesh, Jammu & Kashmir, the newly formed Uttarakhand and the North East- Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim and Tripura. Special category states are those having characteristics like strategic border locations, hilly terrain, inadequate infrastructure, large tribal population and limited resource bases compared to development needs. These states, having comparative disadvantage on mobilizing additional resources and with limited ability in developing a robust economic base, have received Special Central Assistance that supports the growth and development of the hilly states. Consequent to their constrained potential for economic development, the hilly states are among some of the poorest states in India.

Prepared by JICA Study Team

Fig. 3.14.1 Hill States in India

Himachal Pradesh gained full statehood in 1971. After the initial slow growth in the 1970s and 1980s, the State achieved social indices and economic growths which far exceed the other hilly states. Since 1990s the the State has achieved remarkable development and its success can be attributed largely to the following:.

i) Unlike the other hilly states of India, the State has been mostly peaceful and has a politically stable climate with a responsible government that has effectively enhanced its socio-economic development.

ii) The State had the advantage of having a relatively stable, friendly and committed government which has always supported the power of the central government and has commendably implemented various economic and infrastructural schemes with supportive policy and peoples participation

iii) Through the 1980s and 1990s, the State has successfully invested and thus developed its infrastructure facilities. Although rural connectivity still needs to be developed adequately, many part of the State is already connected and has achieved almost 100% electrification.

iv) The State's political commitment to its economic enhancement is evident from the fact that over the past decade, it has successfully restructured the economy to reduce the share of the primary sector (mostly traditional agriculture), from almost 50% to the GSDP to a mere 20%. Moreover, its tertiary sector increased contribution to over 40%.

v) The State is the second most transparent government of the country[15] and has a high level of social cohesion among its people.

[15] Transparency International India, India Corruption Report 2005.

Enhancing farm income through diversified agriculture in the State is highly desirable in terms of its wide range impact on the other hilly states, the specific advantages on developing its potential and ensuring the minimum food security needs of the majority of its rural population. The following are the factors for being the pilot sample state in the national crop diversification policy:

i) Himachal Pradesh has a particularly beneficial bio-geographical variation (altitude approx. EL:300-7,000m), making it the advantage for creating a niche for off-season vegetables.

ii) Diversification of agriculture is important for sustaining the economic success of the State and for contributing towards its fiscal self sufficiency as well as for generating employment for its large rural population.

iii) The lack of infrastructure and unstable political climate make it unviable to undertake the much needed project similar to the other hilly states. However, the successful implementation of the project in Himachal Pradesh can serve as a good example and offer lessons to the other states.

iv) The State aims to enhance the food security and reduce the vulnerability of its marginal farmers.

v) The State has the needed infrastructure for undertaking the diversification (in terms of availability of universities, good people's participation, better road connectivity and other social indicators) and the political will, as reflected in the Departmental Vision of Agriculture.

Following the national crop diversification policy stipulated in Eleventh Five-Year Plan (2007/08-2011/12) and the above situation of hilly states of India, Himachal Pradesh will be the most suitable state at present to implement the national diversification policy

3.15 Legal Framework on Environmental and Social Consideration

3.15.1 Environment Related Laws and Policies

(1) National Laws and Policies

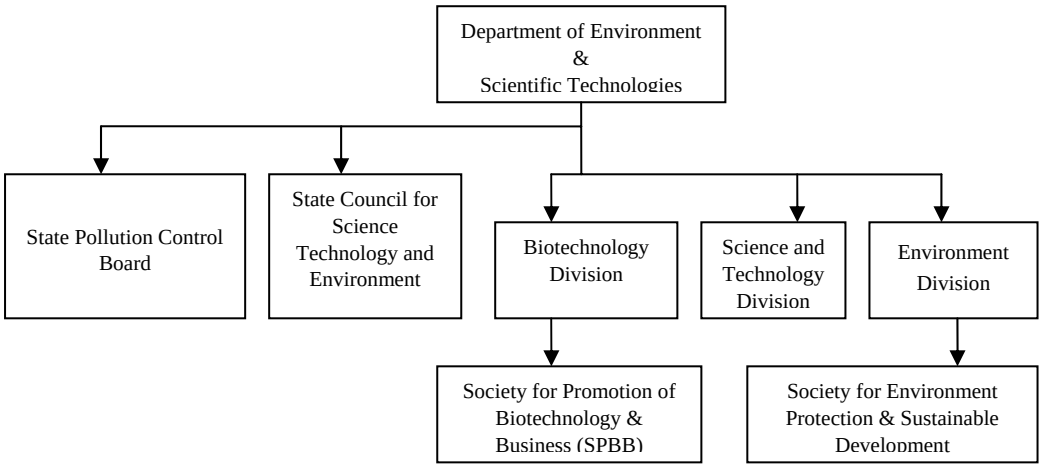
Government of India has rules and regulations on monitoring certain environmental and social considerations during the implementation of certain projects. Relevant national acts and policies in India are listed below. All the national acts apply to the state of Himachal Pradesh

i) Environment Protection Act, 1986 and EIA Notification, 2006
ii) Forest Conservation Act, 1980 (Amended in 1988)
iii) Water Prevention and Control Pollution Act, 1974 (Amended in 1988)
iv) Air Prevention and Control Pollution Act, 1981 (Amended in 1987)
v) Wildlife Protection Act, 1972
vi) Biodiversity Act 2002
vii) Bio-Medical Waste Management and Handling Rules, 1998
viii) Municipal Solid Waste Management and Handling Rules, 2000
ix) Insecticide Act, 1968
x) Fertilizer Control Order, 1985 evolved from Section 3 of Essential Commodity Act, 1955
xi) National Conservation Strategy and Policy Statement on Environment and Development, 2002
xii) National Environment Policy, 2006

One of the key acts related to environmental and social consideration is the Environment Protection Act, 1986, which is a comprehensive legislation and has been enacted to protect and improve the environment, through the preparation of manuals, codes or guides to prevention, control and abatement of environment pollution. An Environmental Impact Assessment (EIA) process is carried out pursuant to the EIA Notification of the Environment Protection Act.

(2) State Level Laws and Policies

Department of Environment and Scientific Technologies (DEST) of the State is the nodal agency for environmental clearance. Under the environment and pollution control, the DEST, on behalf of the State Government, will fully exercise its authority under all the acts and rules pertaining to protection of environment and control of pollution and implementation/enforcement of all environment legislation. Organization chart of DEST is shown in following figure.



Source: Department of Environment & Scientific Technology

Fig. 3.15.1 Organizational Chart of Department of Environment and Scientific Technologies

Environment Protection Act, 1986 enables the framing of rules to cover specific activities. The State has several rules based on the Environment Protection Act. These acts are listed below.

i) Storage and Import of Hazardous Chemical Rules 1989
ii) Chemical Accidents (Emergency Planning Preparedness and Response Rules, 1996).
iii) Recycled Plastics Manufacture and Usage Rule 1999
iv) Noise Pollution (Regulation and Control) Rules 2000
v) Municipal Solid Waste (Management and Handling) Rules 2000
vi) The Himachal Pradesh Town & Country Planning Act, 1977, Rules 1978
vii) Himachal Pradesh Non-Biodegradable Garbage (Control) Act, 1995.
viii) Notification No. STE A (3)-4/2003, dated 4-6-2004.
ix) Himachal Pradesh Non-Biodegradable Garbage (Control) Act, 1995

The State does not have a stand alone environmental policy, and is generally directed by governing central policies. However since the national policies and laws do not cover all areas, DEST has established a set of Environment Policy Guidelines. The purpose of the Guidelines is as follows:

- Taking development process pursued its beneficial as well as well adverse impacts
- Identification of remedies and interventions as may be required at institutional, regulatory and ultimately policy and implementation level

Said policy guidelines cover subjects on land use, geology, forest, agriculture, horticulture, water resources, industries, energy, tourism, health, biodiversity and pollution.

3.15.2 Environmental Impact Assessment Approval Process

Environmental clearance for new projects in India is subject to the EIA Notification 2006. All projects and activities are broadly categorized, based on the spatial extent of potential impacts into two categories. The EIA notification provides a schedule of industries and activities that will require environmental clearance. Agriculture is not included in the schedule. The areas related to agriculture

are listed as follows:

Table 3.15.1 List of Agriculture Related Area Requiring Prior Environmental Clearance

Project Activity		**Category with threshold limit**		**Conditions if any**
		A	**B**	
1. Mining, extraction of natural resources and power generation (for a specified production capacity).				
(1)	(2)	(3)	(4)	(5)
1(c)	River Valley Projects	(i)≥50MW hydroelectric power generation (ii)≥10,000 ha. of culturable command area	(i)<50MW ≥25 MW hydroelectric power generation; (ii) < 10,000 ha. of culturable command area	General conditions shall apply.
5. Manufacturing/Fabrication				
5(a)	Chemical fertilisers	All projects	-	-
5(b)	Pesticide Industry and pesticide specific intermediates (excluding formulations)	All units producing technical grade pesticide	-	-
7. Physical Infrastructure including Environmental Services				
7 (g)	Aerial Ropeways		All projects	General Conditions shall apply
8. Building/Construction projects/ Area Development projects and Townships				
8 (a)	Building and Construction Projects		≥20,000 sq.mtrs and < 150,000 sq.mtrs of built up area*	

Source: Environmental Impact Assessment Notification 2006
*Note: *built up area covered constructions; in the case of facilities open to the sky, it will be the activity area*

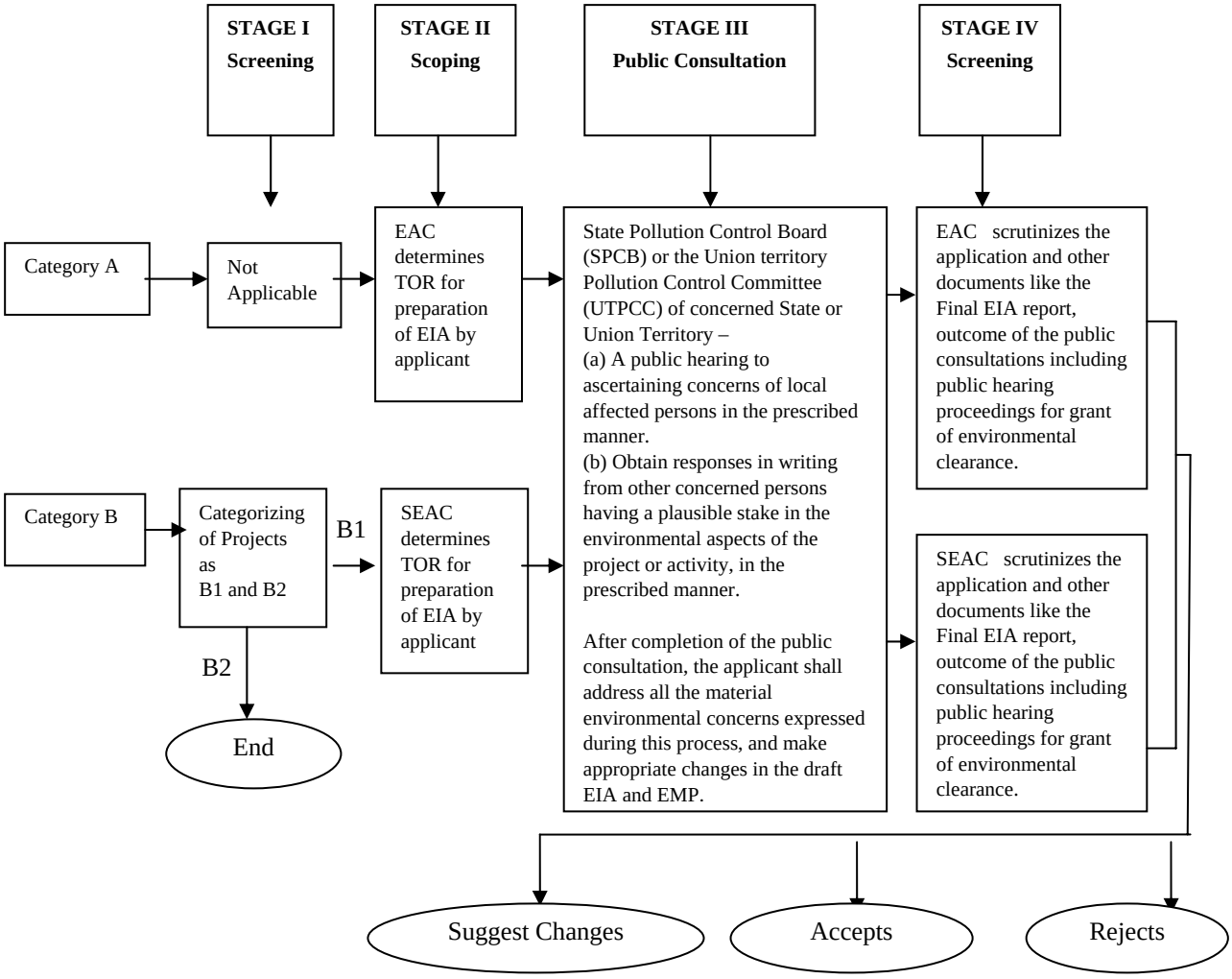
- Category A:

  All projects that fall under Category A of the schedule are expected to have high potential impacts and will need clearance from the designated central government level authorities in the Ministry of Environment and Forests (MoEF), based on the recommendations of an Expert Appraisal Committee (EAC). This shall be constituted by the central government for the purposes of this notification

- Category B:

  Category B projects of the schedule are expected to have lesser potential impacts than Category A projects and will require clearance from designated state level authorities on the recommendations of a state or union territory level Expert Appraisal Committee (SEAC). This is to be constituted in this notification.

The environmental clearance process for new projects will comprise of a maximum of four stages, all of which may not apply to particular cases as set forth below in the notification. The process of environmental clearance under the EIA Notification 2006 is summarized in the following figure.



Source: Environmental Impact Assessment Notification 2006

Fig. 3.15.2 Diagrammatic Representation of the Procedure Followed for Environmental Clearance under EIA Notification 2006

Stage I - Screening:

This applies only to Category 'B' Projects. This stage entails the scrutiny of an application seeking prior environmental clearance made in Form 1 (given in the notification) by SEAC to determine whether or not the project or activity requires further environmental studies for the preparation of an EIA. Thorough screening of the projects are further categorized into B1 and B2 Projects

- Category B1: Projects requiring EIA report belong to this category
- Category B2: Projects not requiring EIA report fall under this category.

Stage II - Scoping:

"Scoping" refers to the process by which the EAC, in the case of Category 'A' projects or activities, and SEAC in the case of Category 'B1' projects or activities, determine detailed and comprehensive Terms of Reference (TOR) to address all relevant environmental concerns for the preparation of an EIA Report. This shall be intended to the project or activity for which prior environmental clearance is sought.

Stage III - Public Consultation:

"Public Consultation" refers to the process by which the concerns of local affected persons and others who have plausible stake in the environmental impacts of the project or activity are ascertained, with a view to taking into account all the material concerns in the project or activity design, as appropriate. All Category 'A' and Category B1 projects or activities shall undertake public consultation.

Stage IV - Appraisal:

"Appraisal" means the detailed study performed by the EAC or SEAC on the application and other documents such as the final EIA report, outcome of public consultations including public hearing proceedings, which are submitted by the applicant to the regulatory authority concerned for granting environmental clearance.

3.15.3 Legal Framework for Diversion of Forest Area for non-Forest Activities

The use of some amount of forest and waste lands is required in some cases. All forest areas diverted or required for non-forest activity is regulated by the Forest Conservation Act, 1980 (FCA). FCA is essentially a regulatory act that aims to conserve the forest resources by regulating the use of forest land for non-forestry purposes. For seeking approvals for diversion of forest land under the FCA, user agencies need to make an application in the prescribed Application Form.

Table 3.15.2 Application Form for Use of Forest and Waste Land

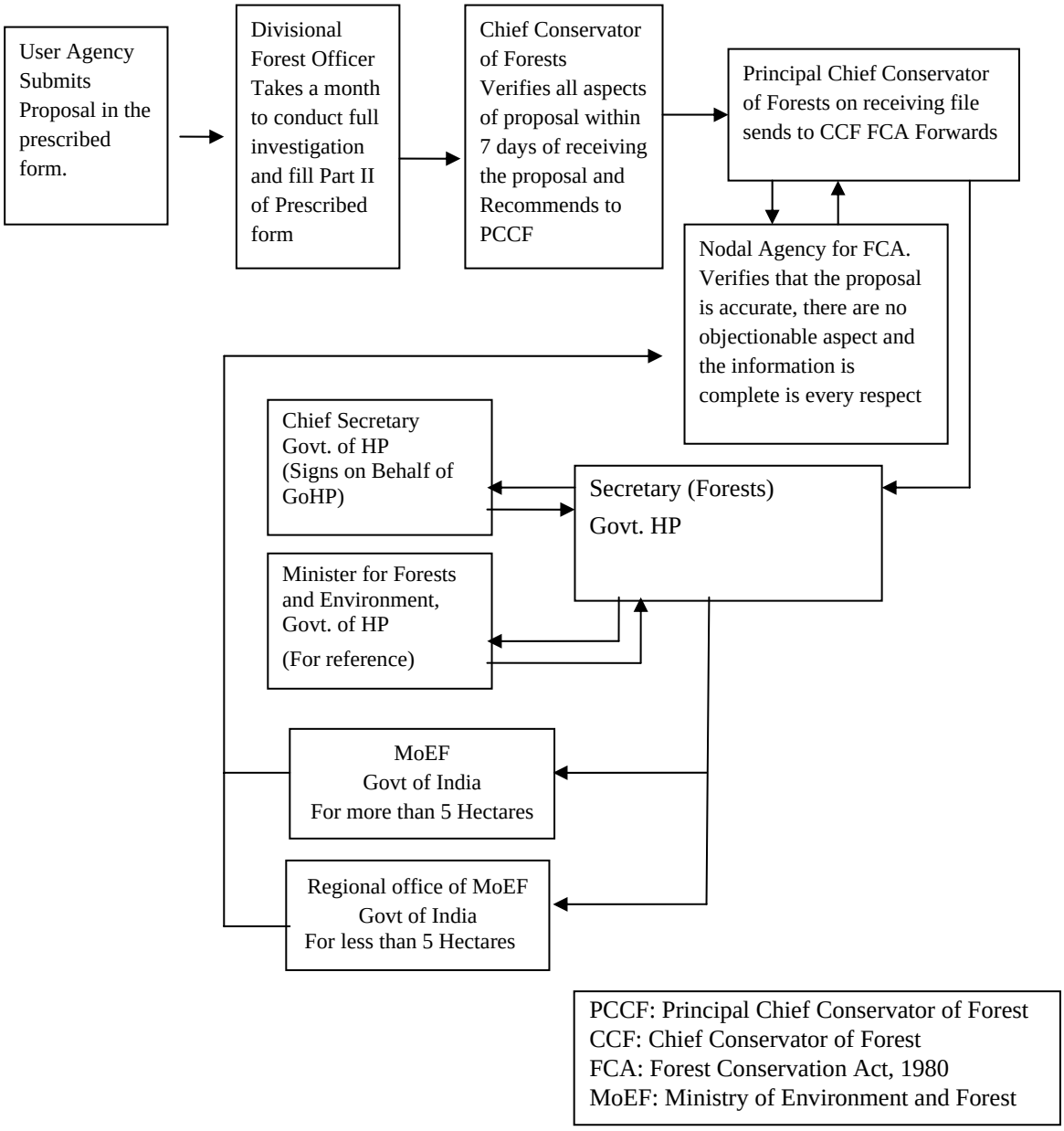
Part of I of the Application Form to be filled by the User Agency has the following requirement-

1. Project Details
    a. Short Narrative of the Proposal and project/scheme for which the forest land is required
    b. Map showing the required forest land, boundary of adjoining forest on a 1: 50,000 scale map
    c. Cost of the Project
    d. Justification for locating the project in forest area
    e. Cost-benefit analysis (to be enclosed)
    f. Employment likely to be generated
2. Purpose-wise break-up of the total land required
3. Details of displacement of people due to the project, if any;
    a. Number of families
    b. Number of Schedule Caste /Schedule Tribe Families
    c. Rehabilitation plan. (to be enclosed)
4. Whether clearance under Environment (Protection) Act, 1896 required (Yes/No)
5. Undertaking to bear the cost of raising and maintenance of compensatory afforestation and /or penal compensatory afforestation as well as cost for protection and regeneration of Safety zone etc as per the scheme prepared by the State Govt (undertaking to be enclosed)
6. Details of Certificate /documents enclosed as required under the instruction.
   In case of proposal regarding Road the following information/documents must be given:-
    a. Length and width of Road passing through forest and non-forest area.
    b. Length of road already existing/ constructed out of the total length involved in the project proposal.

Source: Forest Conservation Act 1980

Part I of the form is to be filled up by concerned user agency. Part-II, III, IV and V are to be filled up by the State Forest Department/ Government of Himachal Pradesh after receipt of the proposal, with dully filled up Part-I. The Divisional Forest Officer of the area shall scrutinize Part-I and complete part-II within one month from the receipt of the proposal in his office. The concerned Conservator of Forests shall scrutinize parts I and II within 15 days from receipt of the proposal in his office. This shall be scrutinized in the head office within seven days after receipt from the concerned Conservator of Forests. The final clearance for the use of forest land is given by the MoEF, Government of India. Application for the use of less than 5 hectares of forest area is cleared by the regional office of the central government in the MoEF, which is established as part of the ministry to deal with forest

conservation matters under the act. Clearance for use of forest area of more than five hectares is granted by MoEF directly.



Source: Forest Conservation Act 1980

Fig. 3.15.3 Procedure for Clearance of Use of Forest Land under FCA