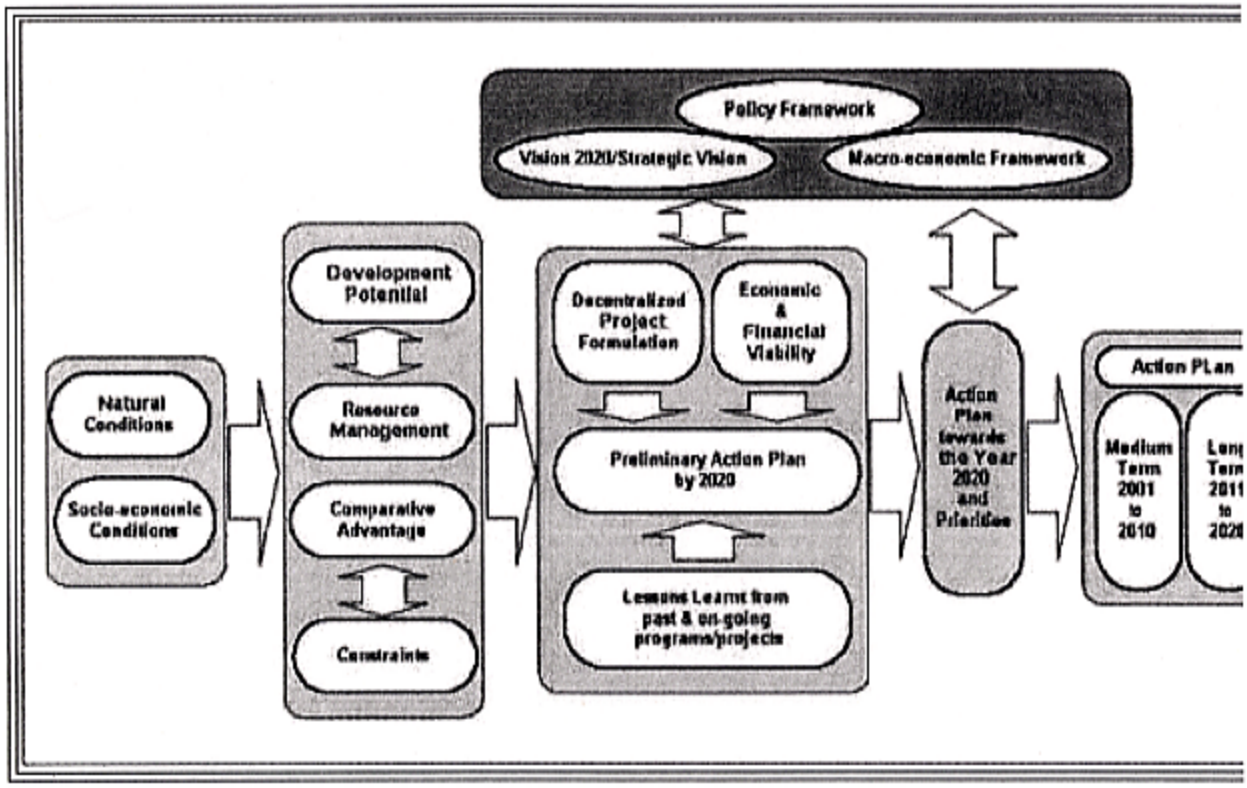
Master Plan Study on Integrated Agricultural Development in Lao PDR
Procedure of Formulation of Action Plan



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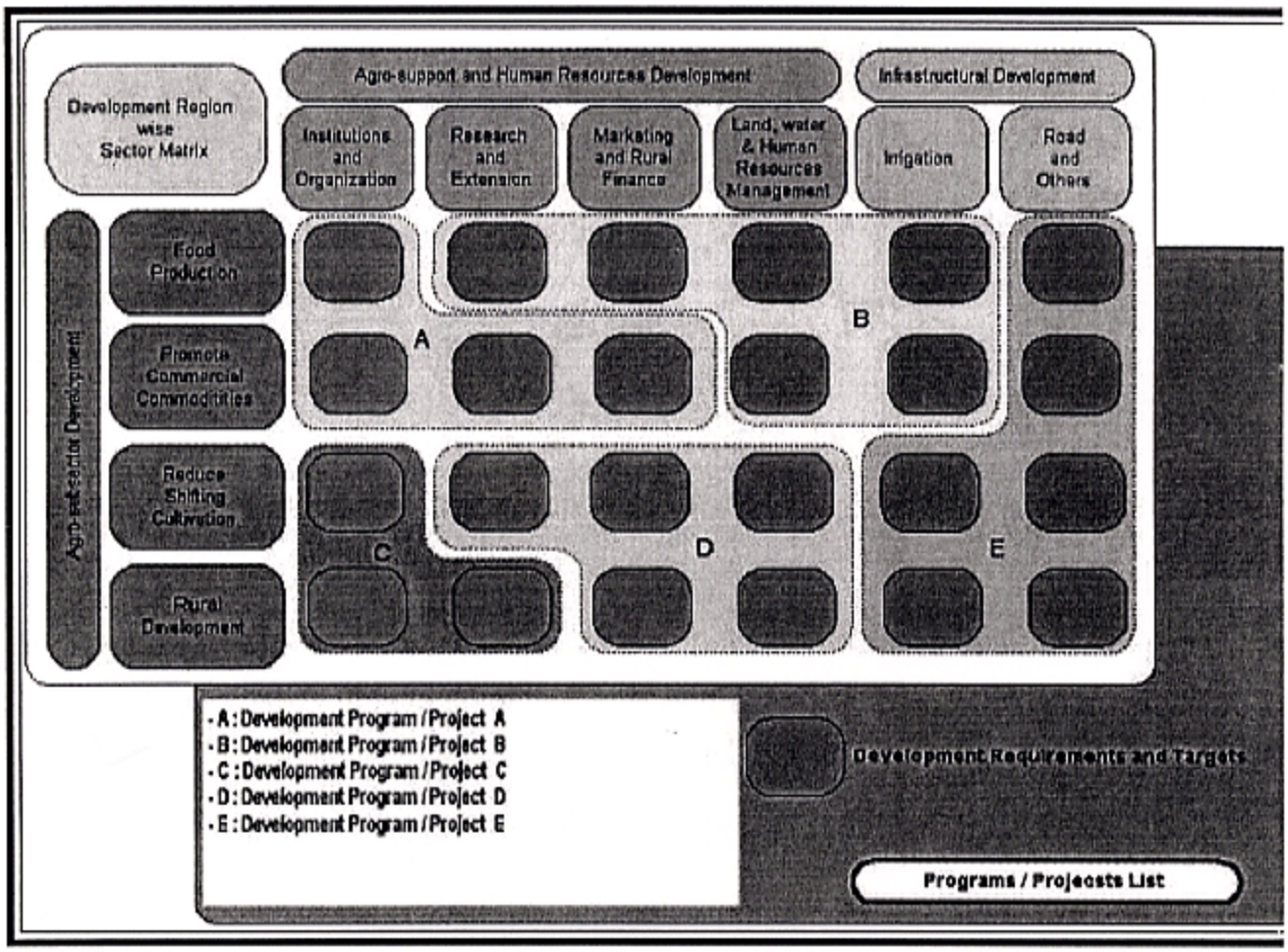
Master Plan Study on Integrated Agricultural Development in Lao PDR
Concept of Sector Matrix Based Development Approach



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Assessment of Agricultural Setting in Lao PDR

The assessment of agricultural setting is carried out with the objective of identifyin present condition of agriculture in Lao PDR by classifying the 141 districts into se groups based on agro- and socio-economic conditions in each district. It is intended t the results of assessment for formulating area-wise rural and agricultural development together with the results of assessment of agricultural potential in Lao PDR. With th is expected to make realistic and area-specific projects/programs.

The agricultural setting of Lao PDR was assessed based on two sets of census (Agriculture Census 1998/99 and Population Census 1995) and GIS data. Both census and GIS data (polylgon, polyline or grid data) were compiled at the district level and al 141 districts in Lao PDR were analyzed. The following files present the details of assess of agricultural setting.

Assessment of Agricultural Setting in Lao PDR

Analytical Procedure

1. Introduction

The agricultural setting of Lao PDR was assessed based on two sets of census (Agriculture Census 1998/99 and Population Census 1995) and GIS data. Both census and GIS data (polylgon, polyline or grid data) were compiled at the district level and al 141 districts in Lao PDR were analyzed. As a first step, the collected data were compile analysis using computational software. Secondly, a Principal Component (PC) analysis carried out after data compilation. Thirdly, the 141 districts were classified into 10 gr based on the result of PC analysis by applying a technique of cluster analysis. computational software used in the second and third steps of analysis was " Multivariate Analysis Version 4.0". The grouping results were then presented on map us software of "ArcView GIS Version 3.2".

2. Data Used in Assessment

A large number of data produced by several agencies were collected for the assessme tabulated in the next page. In the data compiling process, all the data in a form of abs figures (e.g. number of farm households) were converted into relative figures (e.g. perce of farm households by group out of the total farm household number).

Data Type	Description of Data	Data Source	Dat
Agricultural Data			
District level digital data from 1998/99 agriculture census	· Average area of holding and number of parcels, land use and land tenure conditions · Cropping pattern and major crops cultivated · Purpose of production · Use of production inputs · Average number of livestock raised by livestock type · Number of holdings with aquaculture · Others	Ministry of Agriculture and Forestry (MAF)	Data
Social Data			
District level digital data from 1995 population census	· Population density · Percent distribution of population by sex · Urban and rural population · Percent distribution by place of birth · Household size by urban and rural · Population by education level and literacy rate · Economically active population by occupational classification and unemployment rate · Children born and deceased persons · Electricity and domestic water supply conditions and availability · Others	National Statistical Center, State Planning Committee (SPC)	Data
	Natural Data		
Topographical data	· Roads in 4 classifications	Forestry Inventory Center	GIS data
Elevation and slope	· Digital Elevation Model (DEM) of 50 and 250 m grid in all Laos · Slope of 50 and 250 m grid in all Laos	NAFRI	GIS data
Administrative boundary of provinces and districts	· District boundary containing 141districts · Province boundary containing 18 provinces	National Geographical Department	GIS poly data

3. Principal Component (PC) Analysis

The PC analysis is a statistical technique applied to plural sets of variables to disco similarity or positioning of the variables using factors that are found following the rela between the different variables. This analysis was carried out using 136 data sets select meaningful data from a number of data sets. The selection of data sets was made i course of computation applying a structure detection method.

In the Principal Component (PC) analysis, five sets of PC that indicate the present setti agriculture in Lao PDR were discovered through a screen test. Each PC was then interp by reading the meaning of variables in order of calculated a score. The result of interpret is summarized below.

(1)PC-1: Transitional Farming

Factors on Positive Side of Axis	Factors on Negative Side of Axis
1. Many farmers who don't clear land,	1. Many farmers clear land every year
2. Many lowland rice farmers,	2. Many upland rice farmers,
3. Use of improved rice variety,	3. No use of fertilizer,
4. Higher rice production per farm,	4. Sloping land agriculture,
5. Flat land agriculture,	5. Higher elevation,
6. Use of chemical fertilizer,	6. Higher upland rice produce per far
7. Larger area for dry season rice,	7. Many cereal, root & tuber cultivators,
8. Higher literacy rate,	8. Poor supply of domestic water, and
9. Higher rate of land rent, and	9. Many subsistence products.
10. Many water pump users.	

(a) Explanation of the Positive Side

The farmers produce lowland rice on flat lowland with considerably higher level of inputs. Dry season rice is also cultivated with supply of irrigation water. Farmers' educ level is comparatively high, and literacy rate there is better.

(b) Explanation of the Negative Side

Shifting cultivation is widely practiced on highly elevated sloping land. The major prod upland rice. Farm inputs for production is considerably low. Production is mainly for consumption. Living conditions are poor.

(c) Titling of PC-1

PC-1 clarifies two distinct agriculture settings in Lao PDR, i.e. flat lowland agriculture o positive side and sloping upland agriculture on the negative side. In comparison, agricu on the positive side is considerably modernized, while that on the negative side is tradit in terms of farm input level and marketing of products. Taking these distinct settings account, PC-1 is titled "Transitional Farming" which indicates the degree of farming sy from traditional agriculture to modernized agriculture. The farming system is comparat modern in districts with higher PC-1 score, while that still at the traditional level has a l score.

(2) PC-2: Market Orientation

Factors on Positive Side of Axis	Factors on Negative Side of Axis
1. Higher population density, 2. Many livestock (except cattle) raising farmers, 3. Many non-rice production farmers, 4. Many dry season rice cultivators, 5. Larger area for vegetable production, 6. Better domestic water supply, 7. Many products for sale, 8. Many rice millers, 9.Higher application of chemical fertilizer, 10. Larger number of chicken per farm.	1. Many farmers who use animal power, 2. Dominance of wet season cropping 3. Higher per capita rice production, 4. Many rice farmers, 5. Production for household consumption, 6. Dominance of non-irrigated farmin 7. Higher agricultural population, 8. Dominance of fish catches from river, 9. Many cattle raising farmers, 10. Many organic fertilizer users.

(a) Explanation of the Positive Side

Population density is comparatively high. A large proportion of products is produce marketing purpose. An application level of farm inputs (e.g. chemical fertilize considerably high. Private investment in processing (milling) and marketing (farm-supply) is in progress. Living standard is higher.

(b) Explanation of the Negative Side

Wet season rice production is dominant, and irrigation farming is not commonly pract Many farmers use animal draught power for crop cultivation, mainly for paddy. Product mostly for household consumption.

(c) Titling of PC-2

PC-2 distinguishes two different agriculture settings. On the positive side, agric products are produced largely for the market. On the negative side, the production syst more subsistence-oriented. PC-2 is thus titled as "Market Orientation" which indicate degree of farm produce targeted for sale.

(3) PC- 3: Water Resource Utilization

Factors on Positive Side of Axis	Factors on Negative Side of Axis
1. Larger farm land with irrigation, 2. Production for household consumption, 3. Many rice producers, 4. Higher cultivation intensity, 5. Many livestock raising farmers, 6. Dominance of wet season cropping, 7. Aqua-culture practiced on farms, 8. Larger population of livestock per farm, 9. Many machinery users for	1. Many non-irrigated farms, 2. Many perennial crop cultivators, 3. More production for sale, 4. Many non-paddy crop producers, 5. Larger land holding size, 6. Higher upland rice produce per far 7. Many farms with wet season vegetables, 8. Many forest land holders, 9. Much production for barter.

cultivation.

(a) Explanation of the Positive Side
The irrigation system is comparatively well developed. With a better supply of irrig water, rice is produced even in the dry season, but most of the production is for hous consumption. Besides rice, a considerable number of farmers practice aquaculture. A number of farmers raise livestock, mainly cattle. A larger numbers of farmers use mach for crop cultivation.

(b) Explanation of the Negative Side
Non-irrigated agriculture is practiced. Beside upland rice, many farmers cultivate pere crops and other non-paddy products. Crops are well diversified, and many products her produced for sale and/or barter. Farm size is comparatively large.

(c) Titling of PC-3
Distinct differences between the positive and negative side are the degree of irrig development, marketing of products, size of land holdings, and utilization of farm machi For PC-3, the titling is thus very difficult. However, it is titled as "Water Res Utilization" taking the highest score both in the positive and negative side into account.

(4) PC-4: Farm Intensity

Factors on Positive Side of Axis	Factors on Negative Side of Axis
1. Dominance of small size farmers,	1. Larger holding size of arable land,
2. Much organic fertilizer users,	2. Many annual crop cultivators,
3. Larger number of buffalo per farm,	3. Larger area for rice production,
4. Many large paddy land holders,	4. Larger production of upland rice,
5. Higher infection rate of disease,	5. Larger size of parcels,
6. Many lowland paddy farmers,	6. Larger non-irrigated land,
7. Dominance of flat land,	7. Larger production of other cereals,
8. Higher cropping intensity,	8. Larger size of fallow land per farm,
9. Larger area for tree crops,	9. Higher upland rice dependency.
10. Many farmers who don't clear land.	

(a) Explanation of the Positive Side
Farming size is comparatively small. Many farmers thus use organic fertilizer aimi increased crop yield. This condition is dominant in the flat lowland area.

(b) Explanation of the Negative Side
Farming size is comparatively large and extensive farming is practiced. Production i diversified, and mono-culture-type paddy production is predominant.

(c) Titling of PC-4
PC-4 is titled as "Farm Intensity" that indicates degree to which farm resources are uti for output of agricultural products.

(5) PC-5: Degree of Diversification

Factors on Positive Side of Axis	Factors on Negative Side of Axis
1. Larger number of parcels, 2. Many perennial crop cultivators, 3. Larger proportion of products for sale, 4. Larger area for vegetable production, 5. Larger number of tree crops per farm, 6. Larger area for commercial crops, 7. Many legume crop cultivators, 8. Many livestock raising farmers, 9. Larger population of cattle per farm, 10. Many paddy production farmers.	1. Many production for home consumption, 2. Larger area for paddy production, 3. Many dry season paddy producers, 4. Lower education level, 5. Larger production of upland rice, 6. Many goat raising farmers, 7. Higher population density, 8. Many small size farmers, 9. Many non-irrigated paddy lands.

(a) Explanation of the Positive Side
Farm products are diversified both in crops and livestock, and a considerable amount of output is marketed.

(b) Explanation of the Negative Side
Paddy production is dominant both in the wet and dry season. Products are mostly for household consumption.

(c) Titling of PC-5
By interpretation of the above characteristics, PC-5 is titled as "Degree of Diversification which indicates the extent of diversification in cropping and livestock farming.

4. Grouping of Districts
All the 141 districts were classified into 10 groups in accordance with the 5 PC scor each district through cluster analysis. The grouping results are presented in figure Grouping of Districts. Figure Radar Charts of Groups shows the combination of 5 P scores that clearly clarifies the present agro- and socio-economic conditions of respective groups. The detailed interpretation of the 10 groups is presented in Table Grouping of Districts.

Agricultural Setting in Lao PDR by Group of Districts (1/4)

Group	Principal Components		Describe Characteristics	Find Constraints	Ci
	Components	Evaluation			
G-1	Transitional Farming	Low	Shifting cultivation is widely practiced on sloping land for production of upland paddy. In order to supplement a lower productivity, non-paddy products (including livestock and home manufacturing products) are produced and marketed to a certain extent. Expansion of irrigation area mainly for lowland paddy production is at mid to low level. Resource management is poor and depletion is high. Farming intensity is at mid to low level, and diversification is at mid to high level.	(1) Domination of unsustainable shifting cultivation which is a cause of forest cover reduction, soil erosion, etc. (2) Food crops are insufficiently produced. (3) Productivity of non-paddy crops is low, although they are important for cash income source. (4) Production and marketing infrastructure is poorly developed. (5) Degree of market orientation is still at medium level.	(1) To prev shifting cul (2) To deve production use of upla (3) To pro crops to inc both in upl (4) To prov marketing i (5) To impr lowland pa
	Market Orientation	Medium to High			
	Water Resource Utilization	Medium to Low			
	Farm Intensity	Medium to Low			
	Degree of Diversification	Medium to High			
G-2	Transitional Farming	Low	Shifting cultivation for upland paddy production is widely practiced similar to G-1. In addition, production of lowland paddy with irrigation is practiced on relatevely large area. Development of crop diversification is lower than G-1. However, access to markets is better than G-1. Farm intensity is higher than G-1, at medium level.	(1) Domination of unsustainable shifting cultivation which is a cause of forest cover reduction, soil erosion, etc. (2) Mono-culture-type paddy production is dominant particularly on lowland area. (3) Production is less diversified.	(1) To prev shifting cul (2) To deve production use of upla (3) To pro crops to inc (4) To prov marketing i (5) To impr lowland pa diversificat
	Market Orientation	Medium to High			
	Water Resource Utilization	High			
	Farm Intensity	Medium			
	Degree of Diversification	Low			

Agricultural Setting in Lao PDR by Group of Districts (2/4)

Group	Principal Components		Describe Characteristics	Find Constraints	Ci
	Components	Evaluation			
G-4	Transitional Farming	High	Agricultural setting is similar to G-3. However, it differs from G-3 in the extent of irrigated farming and marketing of products, both of which are less than those in G-3. In addition, farm intensity of this group is lower than that in G-3 at mid level.	(1) Flooding in the wet season prevents agricultural development in these districts. (2) Due to flood and topographic conditions, development of production and marketing infrastructure is still at low level. (3) Mono-culture-type paddy production is dominant, and most products are for home consumption.	(1) To assis (2) To take protection economical (3) To impr production. (4) To pro diversificat
	Market Orientation	Low			
	Water Resource Utilization	Medium to Low			
	Farm Intensity	Medium			
	Degree of Diversification	Medium to High			
	Transitional	High	Districts that belong to this group	(1) Further expansion of market	(1) To deve

G-5	Farming		are located near to Vientiane city, and production of market oriented crops are considerably well developed. Irrigation system is also well developed and supports crop diversification. However, farm intensity is relatively low.	oriented crops are becoming difficult due to small domestic market. (2) Quality of marketing crops is still at a low level for export. (3) Paddy productivity is still at a low level.	proper crop production produce hi throughout (2) To impr products so competitive (3) To assis developme (4) To impr paddy by u inputs takin account.
	Market Orientation	High			
	Water Resource Utilization	High			
	Farm Intensity	Low			
	Degree of Diversification	Medium			
G-6	Transitional Farming	Medium to Low	Agricultural production is practiced both on sloping land and lowland. Development of irrigation system and access to market are comparatively poor. Since paddy production is insufficient for home consumption, farmers usually diversify into non-paddy products such as fruit and small animals in order to earn cash income. Some degree of soil erosion.	(1) Expansion of shifting cultivation on sloping land. (2) Lower productivity of agricultural products both on sloping land and lowland. (3) Marketing accessibility is generally poor.	(1) To prev shifting cul (2) To deve production use of slopi (3) To pro crops to inc (4) To prov marketing i (5) To impr lowland pa
	Market Orientation	Medium to Low			
	Water Resource Utilization	Medium			
	Farm Intensity	High			
	Degree of Diversification	High			

Agricultural Setting in Lao PDR by Group of Districts (3/4)

Group	Principal Components		Describe Characteristics	Find Constraints	Cl
	Components	Evaluation			
G-7	Transitional Farming	High	Districts belong to this group are located at the suburbs of Vientiane city. Crops produced are well diversified and marketed to the largest market of Vientiane city. Irrigation facility is comparatively well developed. However, farm intensity is at medium level.	(1) Further expansion of market oriented crops are becoming difficult due to small domestic market. (2) Quality of marketed crops is still at low level for export.	(1) To deve proper crop production produce hi throughout (2) To impr so as to inc competitive
	Market Orientation	High			
	Water Resource Utilization	Medium to High			
	Farm Intensity	Medium			
	Degree of Diversification	High			
G-8	Transitional Farming	Low	Agricultural setting of this group is similar to that in G-1. However, products are more diversified than those in G-1. Most of products are for home consumption and they are rarely marketed. Farm intensity is comparatively low.	(1) Domination of unsustainable shifting cultivation which is a cause of forest cover reduction, soil erosion, etc. (2) Subsistence agriculture is predominant. (3) Food crops are insufficiently produced.	(1) To prev shifting cul (2) To deve production use of upla (3) To pro crops to inc (4) To prov
	Market Orientation	Low			
	Water Resource Utilization	Low			

	Degree of Diversification	High		(4) Development of production and marketing infrastructure is poor. (5) Marketing accessibility is poor.	marketing i
G-9	Transitional Farming	Medium	Paddy production is practiced both on sloping land and lowland. However, shifting cultivation area is smaller than that in other groups. On the other hand, the extent of irrigation land is relatively large in this group. Products are not diversified, but some are marketed with certain market competitiveness. Farm intensity is comparatively low.	(1) Domination of unsustainable shifting cultivation on sloping land. (2) Market oriented crops are not fully developed in spite of their development potential. (3) Products are not diversified.	(1) To prev shifting cul (2) To deve production use of upla (3) To pro developme crops and d products.
	Market Orientation	Medium to High			
	Water Resource Utilization	High			
	Farm Intensity	Low			
	Degree of Diversification	Low			

Agricultural Setting in Lao PDR by Group of Districts (4/4)

Group	Principal Components		Describe Characteristics	Find Constraints	Cl
	Components	Evaluation			
G-10	Transitional Farming	Medium	Only one district of Pakxong in Champasak province is classified as G-10. In this district, market oriented coffee and vegetables are intensively cultivated on plateau highland mostly under rainfed condition. Irrigated agriculture is limited. Farm intensity is comparatively high.	(1) Products are not diversified and farmers' economy mostly depends on international market movements. (2) Production system is unstable under rainfed conditions.	(1) To esta strengthen manageme (2) To impr products so competitive internation (3) To pro for improv infrastructu (4) To impr
	Market Orientation	High			
	Water Resource Utilization	Low			
	Farm Intensity	High			
	Degree of Diversification	Low			

Definitions:
Transitional Farming; Farming system is in transition from traditional to modernized agriculture.
Market Orientation;Degree of farm produce targeted for sale.
Water Resource Utilization;Degree to which water resources are utilized for agricultural production.
Farm Intensity;Degree to which farm resources are utilized for output of agricultural crops.
Degree of Diversification;The extent of diversification in cropping and livestock/aquaculture farming.