ROLE OF GROWTH CENTRES IN AGRICULTURAL DEVELOPMENT IN IMPHAL VALLEY

ABSTRACT

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N E H U

SUBMITTED
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ABSTRACT

Agriculture is the main sector of economy in Imphal valley and most of the farmers produce foodgrains at their subsistence level which characterises its low level of production resulting in poverty and underdevelopment in many parts of the valley. The rapidly increasing population pressure worsens the situation of food requirements and provides unlimited supply of labourforce which is to be absorbed in economic activities in the area. As a result, labour productivity in agricultural as well as non-agricultural sectors is recorded low with low level of its operation of production processes and productive work. Agriculture in the valley suffers from stagnent conditions of slow rate of agricultural growth with its low level of production and productivity, inspite of its favourable agro-ecological conditions especially fertile soils, well-drained topography and good climatic conditions. In fact, functional nodes of the growth in the area are helping in diffusing the agricultural innovations to their surrounding areas with accelerating the processes of development and growth in agricultural landscape. In this connection, an attempt has been made here to examine the validity of the facts whether these growth points of the area influence the agricultural landscape in their optimal way or there is a need of strengthening them further.

The main research problems on the integration of the functioning of growth centres for agricultural development is analysed by forwarding the main objectives related to the present theme as (i) to study the distributional patterns of agricultural attributes, (ii) to identify the growth points emerging on agricultural landscape and (iii) to examine the locational characteristics and agglomerations of agro-based activities prevailing in the growth centres of Imphal valley.

Keeping these aspects in mind, a few important research questions are put forward, how the modern technology is being radiated through the growth centres and how is the structural transformation in the spatio-functional organisation is taking place for the development of agricultural landscape in the area.

In Chapter-I, an introductory note on the research problems with the geographical personality of the study area is interpreted by carving out the main geographical features of Imphal valley (Fig-1).

Physiographic conditions of the valley are homogeneous in its character. It is almost a flood-plain topography of a geographical area of 1,843 sq.km. with the elevation ranging from 760m in the South to nearly 1000m in the Extremely Northen part of the valley above the m.s.l. Therefore, average slope of the surface is recorded only 0.60 percent which indicates a flat-land topography surrounded by the mountain ranges and hillocks. The enjoys sub-tropical climatic conditions which are favourable for crop cultivation and for human settlements. As a result, it

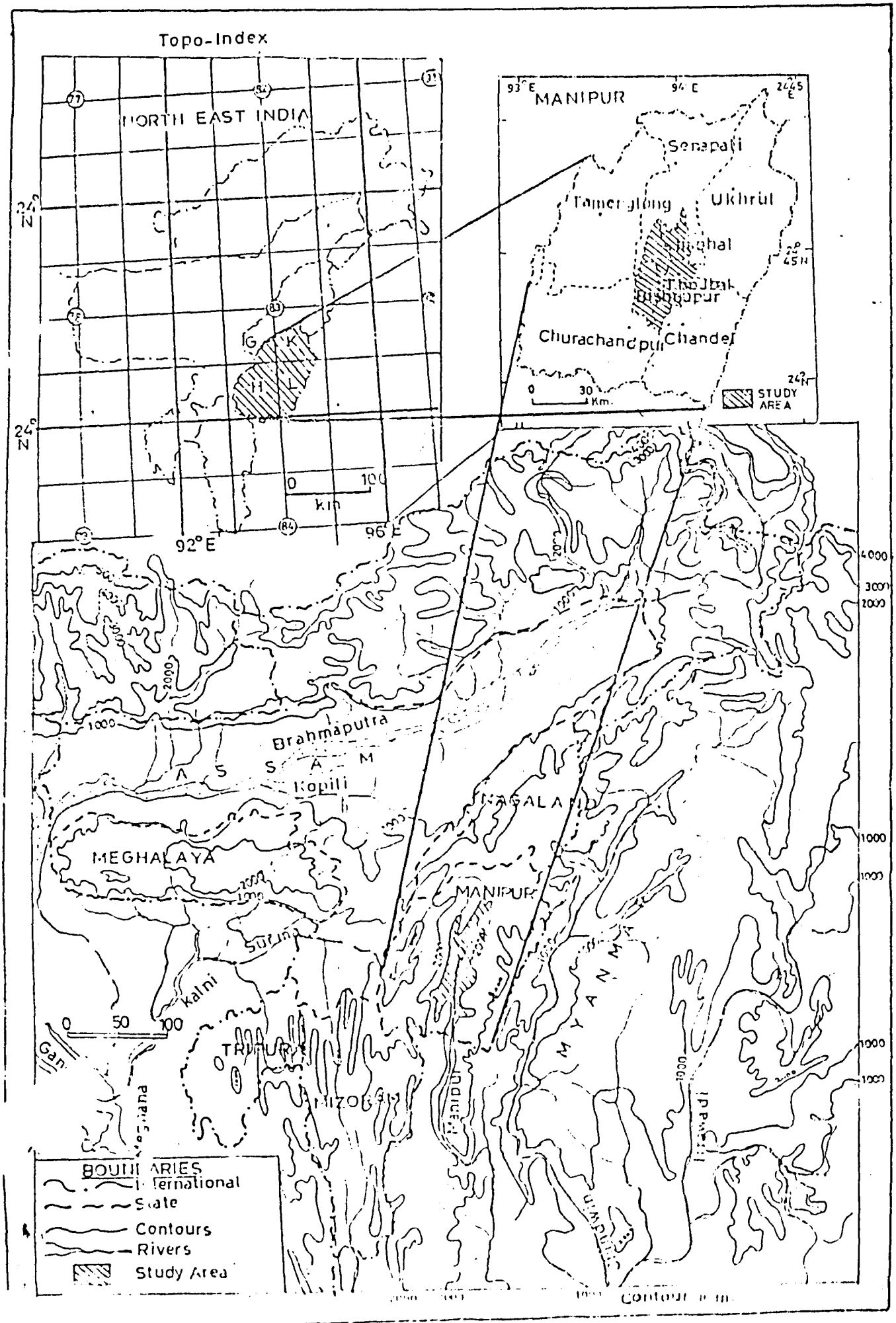
Topo-Index
NORTH EAST INDIA
MANIPUR
Senapati
Tamenglong
Ukhrul
Imphal
Thoubal
Bishnupur
Churachandpur
Chandel
STUDY AREA
Brahmaputra
ASSAM
Kopili
NAGALAND
MEGHALAYA
MANIPUR
Surma
Kalni
TRIPURA
MIZORAM
MYANMAR
BOUNDARIES
International
State
Contours
Rivers
Study Area

Fig-1

follows intensive farming system with a high degree of population density (628 persons/sq.km.). Therfore, paddy is dominated in the cropping pattern in the valley. However, the farming intensity is recorded very low because of its mono-culture cropping system and insufficient infra-structural facilities for agricultural growth and productivity. In the general landuse pattern, the share of waste land is recorded larger which can be converted into cultivable land by accelerating the expansion processes of agricultural landuse.

So far as infrastructural facilities for agricultural development are concerned, Imphal valley has a noticeable record of road-length intensity of about 1.28 kr./sq km. which is marginally higher as compare to the other parts of North Eastern states and even the Northen states of the country. Furthermore, the census statistics of increasing urban population during the last two decades show that the urbanisation has also taken place fast in the valley by increasing the share of urban population of 27.1 percent in 1971 and 36.4 percent in 1991, which is higher than the other of the North Eastern states. It is accounted largest urban population in the valley next to Mizoram state and larger than the national average (25.71 percent in 1991).

Inspite of higher degree of road intensity as well as fast urbanisation, there is still stagnant conditions of agricultural activities prevailing in the valley. It denotes that the infrastructural facilities related to agricultural develop-

ment may be weak in its spatio-functional organisation. These conditins are highlighted in different Chapters in the present research work.

The main theme of the present research is closely related with the patterns of agricultural growth and productivity because they are directly related to agricultural development as well as the growth centres' functional structure and their integrated influence on agricultural activities. The analysis of these aspects is summerised in the following paragraphs.

The general trends of agricultural production growth and its areal patterns (as described in Chaper-III) are worthwhile to note. The important salient features of agricultural growth are:

(i) There is a gradual increase in production specially in foodgrains but the general tendency of increase is based on paddy production from 1953-54 to 1993-94.

(ii) During the periods of time taking into consideration (1953-54 to 1993-94) for visualising the trend of agricultural production, it is clear that there is a fluctuating tendency of production increase especially for foodgrains. For example, during early and late 1980s, there is a record decline in the food production especially in 1982-83 and 1989-90 which fluctuate the tendency of its increase. It might be due to the irregularities observed in the climate conditions of the area during the corresponding years.

(iii) Overall, there is a gradual increase in the food production

from 66 thousand tonns (1953-54) to 363.5 thousand tonns (1992-93). Therefore, there is a gradual increase of food production as an annual rate of 16.3 percent during twenty two years of time of pre-green revolution (1953-54 to 1975-76). However, the annual rate of increase in foodgrains was recorded lower (2.9% annually), during post-green revolution period of 19 years from 302.8 thousant tonns in 1975-76 to 468.5 thousand tonns in 1993-94. It reflects that there is no impact of green revolution (seed-fertilizer technology) on the agricultural landscape in Manipur state.

(iv) Compraring tendecies of population increase as well as foodgrain increase, it has noted that the increase in population is still faster than the increase of total amount of foodgrains. Therefore, there is a still record deficiency of food which has been required to be transported from the outside of the state. It is not the symbol of well-balanced development in agricultural activities. It is the symbol of low growth with very low productivity of agricultural sector as well as the underdeveloped conditions of agricultural activities (Fig-2 & Fig-3).

Agricultural productivity is a main attribute of agricultural development which has two major aspects of study: the land as well as labour productivities. The areal patterns of land productivity index and the causes of its regional variations are studied by distinguishing the village-wise productivity value into seven categories from Extremely High (above-60 qu./ha.) to Extremely Low land productivity index(below-35qu./ha.) with an average of 44.7qu./ha. in the valley. Nearly one third of the

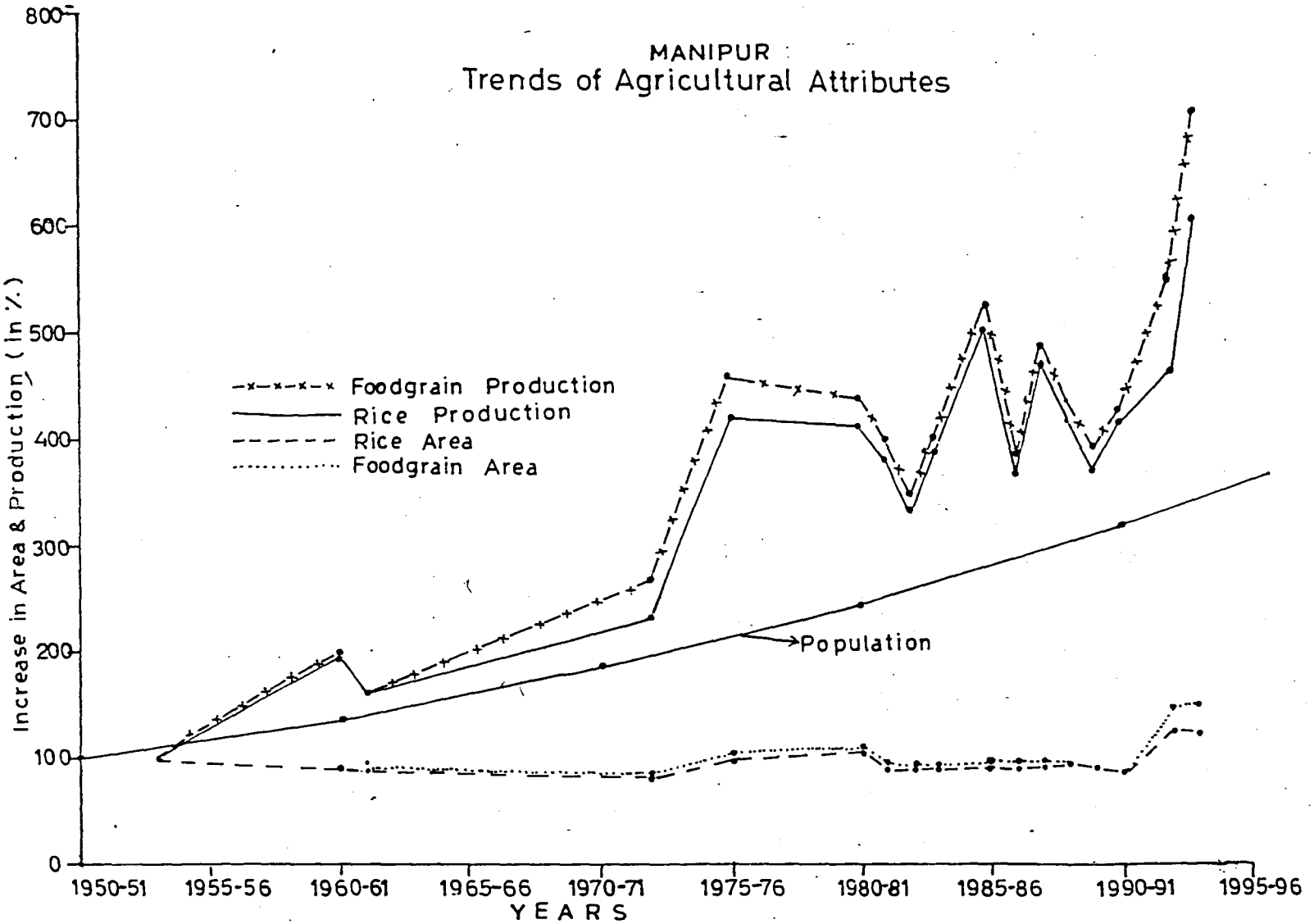
MANIPUR
Trends of Agricultural Attributes
Increase in Area & Production (In %)
800
700
600
500
400
300
200
100
0
Foodgrain Production
Rice Production
Rice Area
Foodgrain Area
Population
1950-51
1955-56
1960-61
1965-66
1970-71
1975-76
1980-81
1985-86
1990-91
1995-96
YEARS

Fig.-1

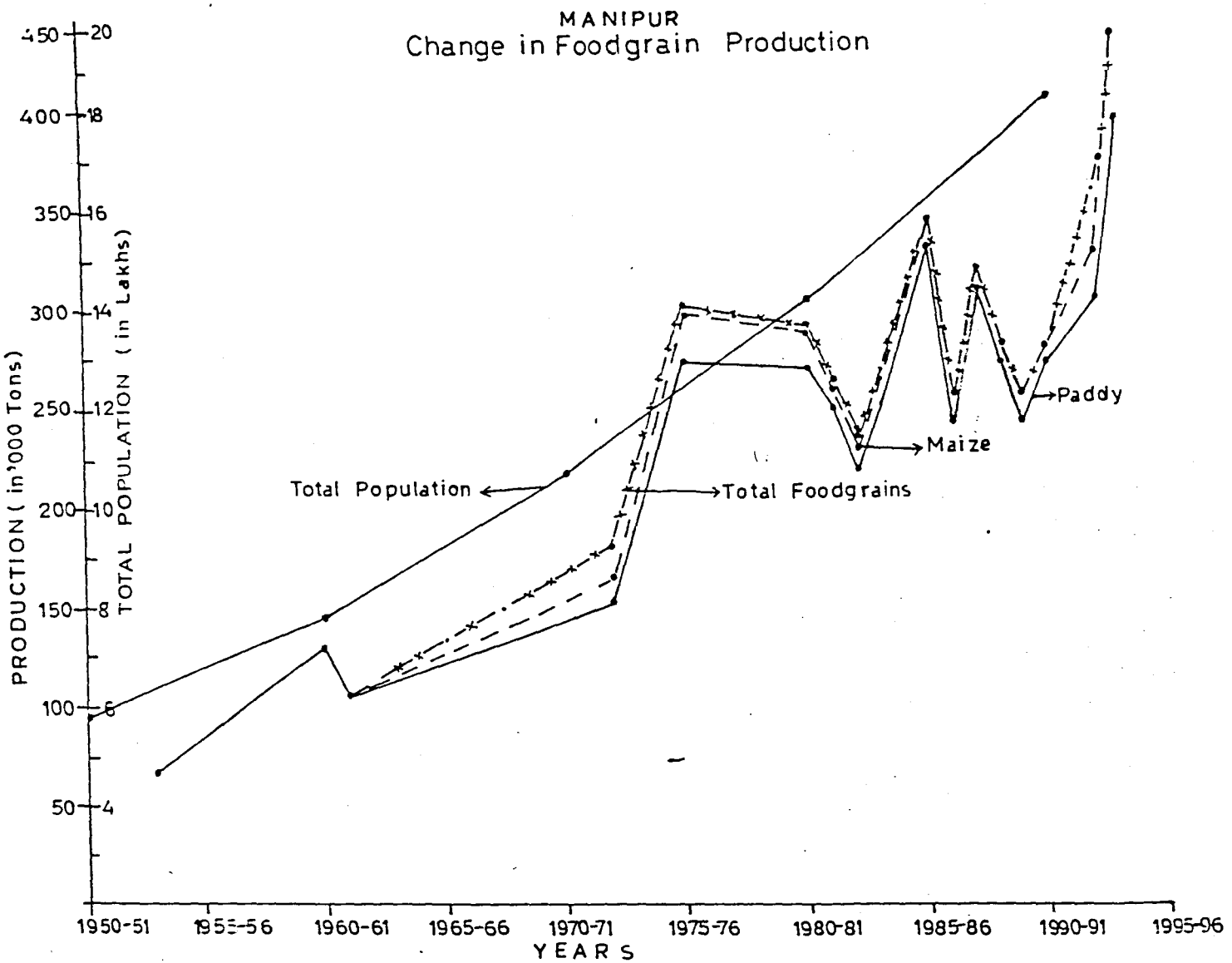
MANIPUR
Change in Foodgrain Production
PRODUCTION (in '000 Tons)
TOTAL POPULATION (in Lakhs)
450
400
350
300
250
200
150
100
50
20
18
16
14
12
10
8
6
4
Total Population
Total Foodgrains
Maize
Paddy
1950-51
1955-56
1960-61
1965-66
1970-71
1975-76
1980-81
1985-86
1990-91
1995-96
YEARS

Fig.-3

entire valley area (i.e., 33.6 percent) have been incoporated in the categories of High level of land productivity (45-50qu./ha). It shows that most of the areas of narrow river valleys of Northen upland areas have been found in these categories of High value of productivity index. While, Extremely high productivity index is observed in and around Imphal city. On the other hand, Low land productivity areas are observed in the low lying areas of the South (Fig-4) .

Similarly, labour productivity patterns are also shown by preparing the village-wise labour productivity index (i.e., total agricultural production per agricultural labour). It has been classified into seven categories ranging from Extremely High (above-60 qu./person) to Very Low labour productivity level (belw 20qu./person) (Fig-5).

The map of areal variations of labour productivity shows its diversified patterns in the valley. Say for example, the areas of extreme high labour productivity are found in the Central parts of the valley especially the patches/ obliterating in the surroundings of Imphal city. On the other hand, extremely low and very low labour productivity (below-20qu./person) are dispersed specially in the entire southern parts of the low lying marshy lands surrounded by Loktak Lake.

Visualising the patterns of labour productivity, it can be concluded that agricultural labour intensity might be one of the causes of its regional variations. Therefore, labour intensity is noticed one of the important attributes of labour

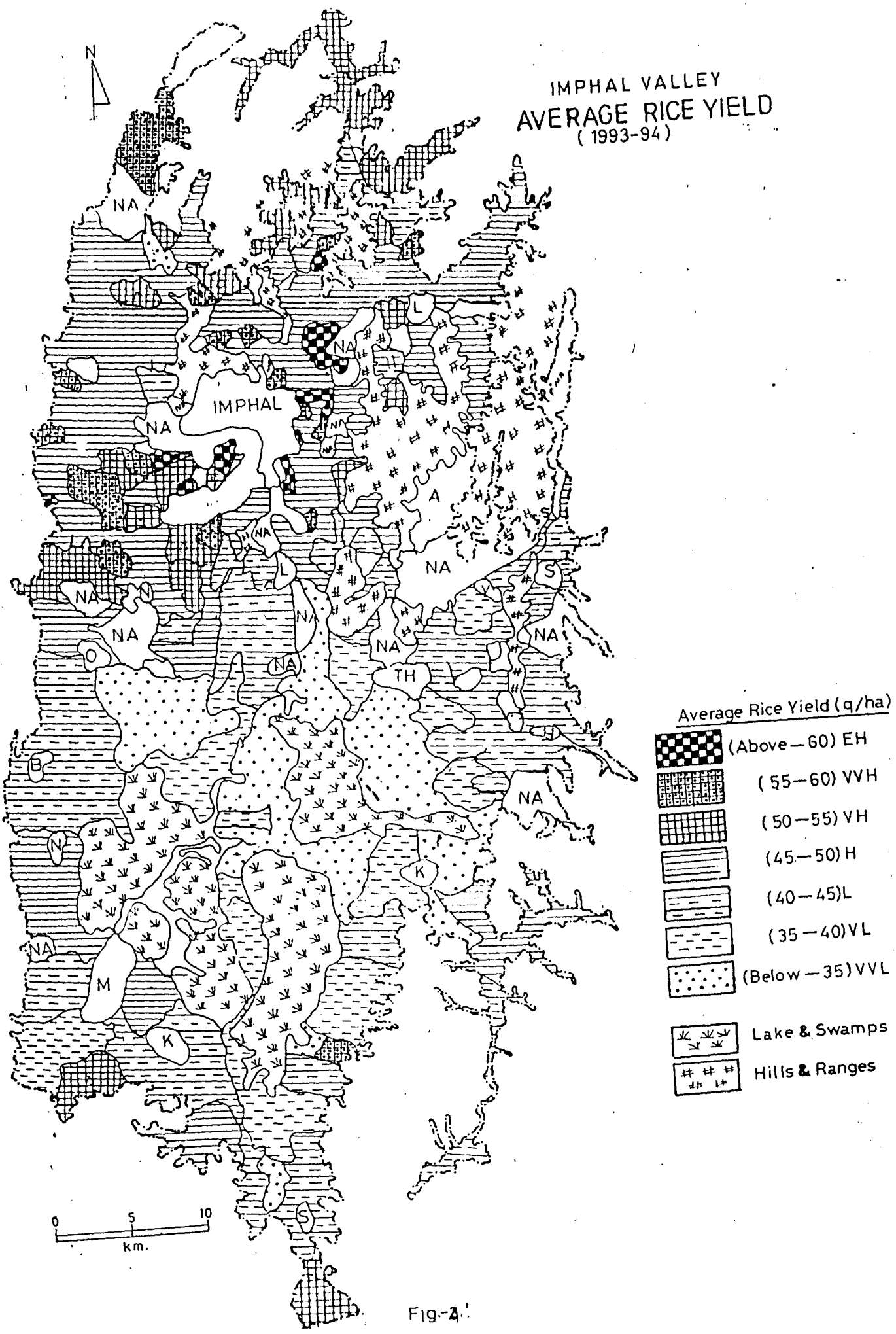
IMPHAL VALLEY
AVERAGE RICE YIELD
(1993-94)
N
IMPHAL
NA
L
A
S
V
O
B
N
M
K
TH
0
5
10
km.
Average Rice Yield (q/ha)
(Above — 60) EH
(55—60) VVH
(50—55) VH
(45—50) H
(40—45)L
(35 —40)VL
(Below — 35) VVL
Lake & Swamps
Hills & Ranges

Fig-4

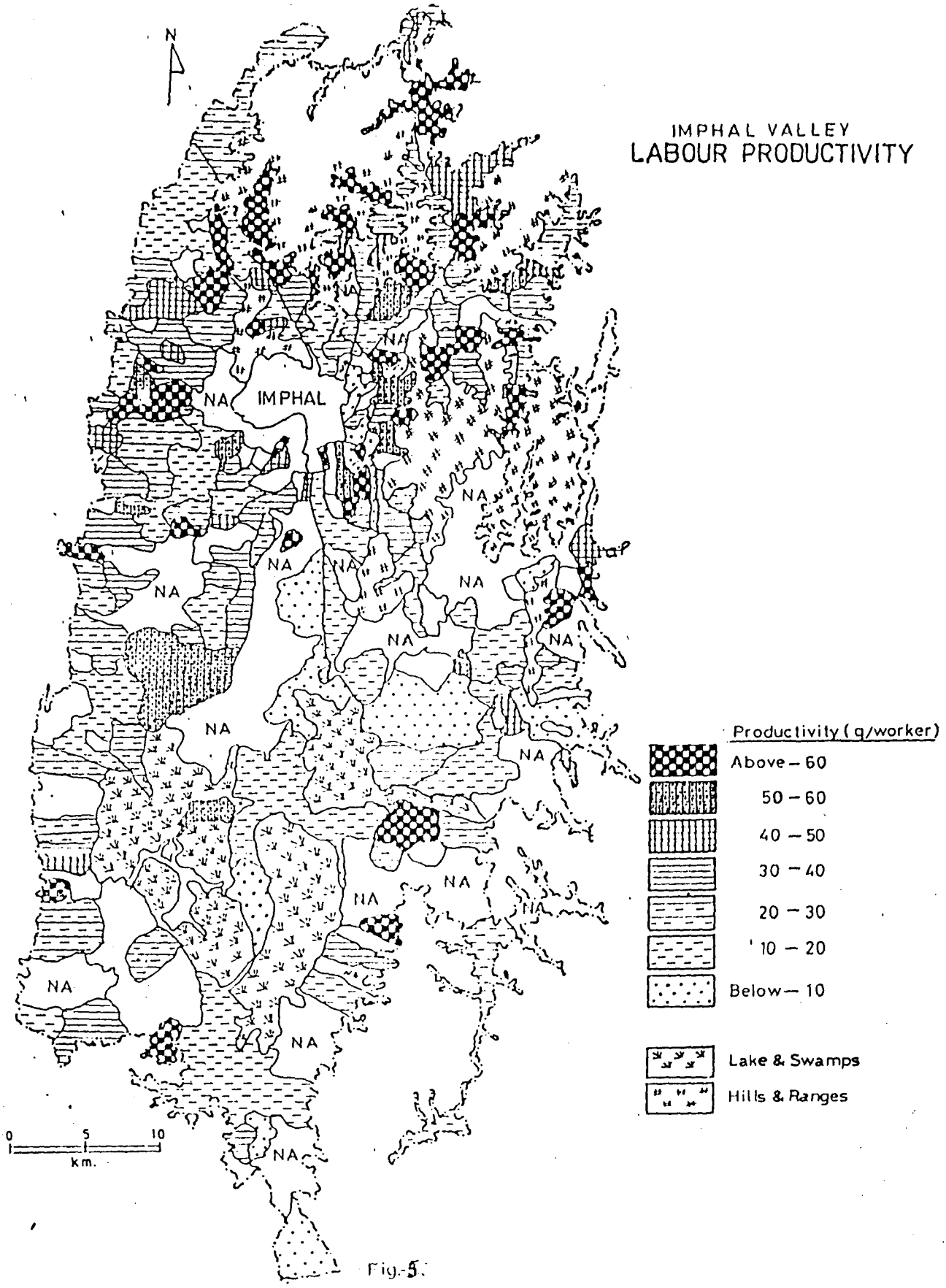
IMPHAL VALLEY
LABOUR PRODUCTIVITY
N
IMPHAL
NA
Productivity (q/worker)
Above – 60
50 – 60
40 – 50
30 – 40
20 – 30
10 – 20
Below – 10
Lake & Swamps
Hills & Ranges
0
5
10
km.

Fig.-5.

productivity.

The scatter diagram of labour productivity versus labour intensity shows a negative relationship in Imphal valley. It reveals that the higher intensity in agricultural activities establishes the conditions of production and productivity. Therefore, the marginal rate of labour productivity with respect to change in labour intensity is recorded very high in a few pockets in the area where the agricultural production processes are accelerating in its initial stage.

The distributional patterns of land as well as labour productivity show the diversified features in Imphal valley. It may be because of faster growth of growth points which are playing a significant role in the development activities. The distributional patterns and their locational characteristics of functions/facilities related to agricultural development show a balance and primacy in their role in the valley which is described in Chapter-IV. As a result, the spatio-functional organisation is observed weak and contribution of growth points/ centres is not significant in agricultural development. In Chapter-IV, the identification of growth points/centres and their locational characteristics and functional strength of the functions/facilities are highlighted. The spatio-functional organisation of agricultural functions and facilities is not working in its normal manner in the valley.

The growth points /centres emerging in the areas of

surplus production, have a different functional structure rather than the areas of growing faster in the food deficiency areas which are interpreted in Chaper-V. If the growth points/centres are considered as 'collection as well as processing centres of surplus production', the enterprises/facilities related to agricultural development namely wholesale and retails shops, stoŵage, and agro-based manufacturing enterprises are noted in the functional structure of the growth points/centres. These enterprises/functions are closely related to diffusion of the food requirement. It has been concluded in the Chapter that the intensity and accessibility of road network is closely related to and influencing the locational patterns of infrastructural facilities/ enterprises in the area.

In the main findings of the research work, it has been suggested that the functioning of the spatio-functional organisation for the agricultural landscape in the valley can only be strengthen by changing the functional structure of existing spatio-functional organisation working in the valley. For instance, the four tier hierarchie system of spato-functional organisation which is working in Imphal valley for agricultural development, does not have perfact regularities in its existing conditions. Increasing the number of growth points from higher to lower orders with the decrease of their average population size is the main regularity of spatio-functional organisation. The attributes related to locational characteristics of the system is neither working on market principle(K=3) nor following the norm of administrative principle

(K=7) of its spatial organisation. But the working of the existing spatio-functional organisation in the valley follows the transport pricipile (K=4) with some weakness (Fig-6). Second order centres are only two in existing conditions instead offour in normative case. Out of these two, Bishnupur town is having comparatively low population size, and therefore, there are irregularities in average population size and the number of growth points of next higher order served. As a result, there is a need of fast transformation of functional organisation from middle to higher order growth points in the area.

IMPHAL VALLEY

Spatial Arrangement of Locational System

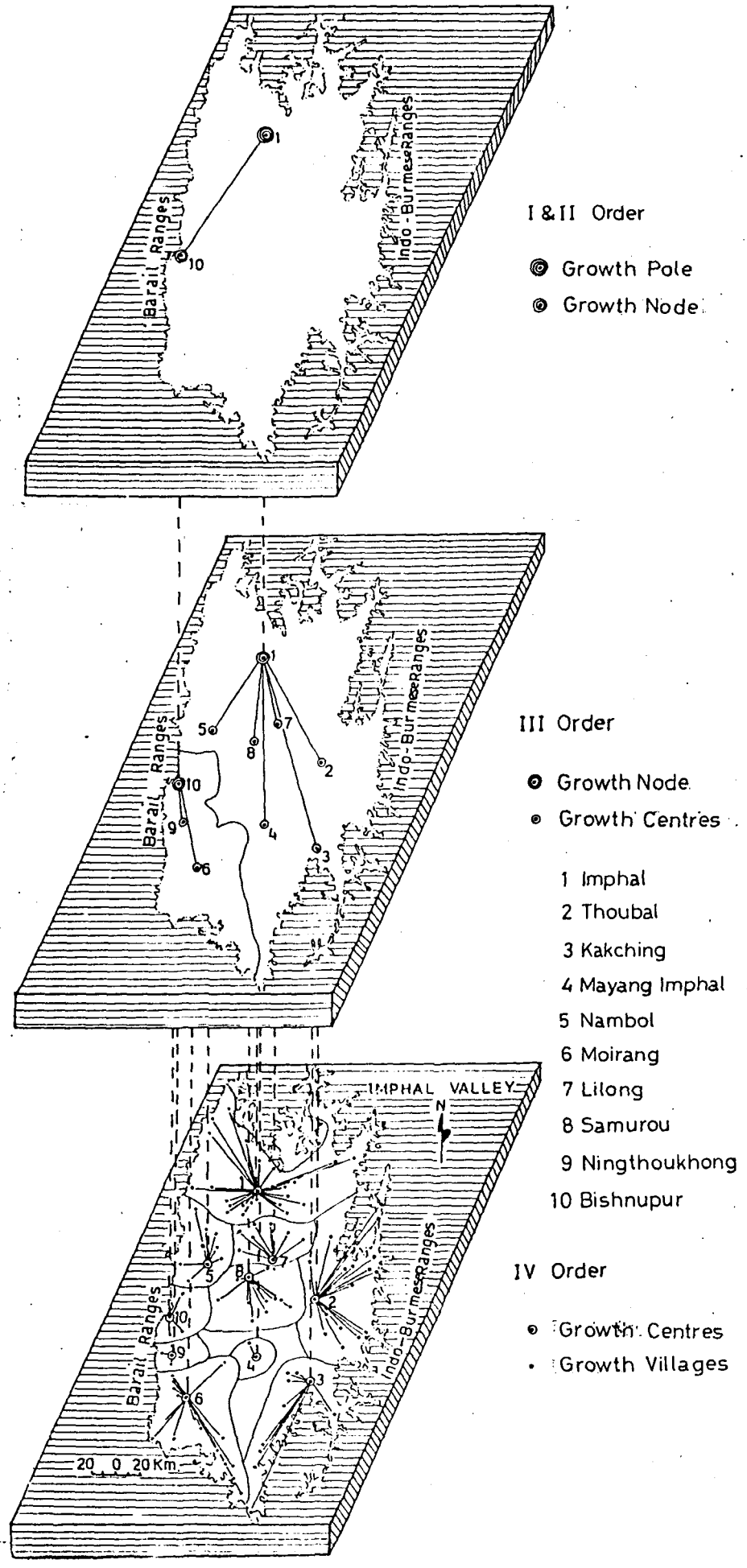

Fig. 6

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The North Eastern Hill University
April 1998

I, Lisam Sunil Singh, hereby declare that the subject matter of the thesis is the record of work done by me, that the contents of this thesis did not form basis of the award of any previous degree to me or to the best of my knowledge to anybody else, and that the thesis has not been submitted by me for any research degree in any other university/institute.

This is being submitted to the North Eastern Hill University for the Degree of Doctor of Philosophy in Geography.

29/4/98.

Lisam Sunil Singh

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Department of Geography
North Eastern Hill University

Dr. Surendra Singh 5/5/98
Supervisor

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19/4/98

Lisam Sunil Singh

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Chapter - I

INTRODUCTION

Agriculture is the main sector of economy of the country as well as the state of Manipur. It provides a major share of employment, contributes largely the Net Domestic Product (NDP) and means for the livelihood of people in the state. It also contributes a large share to the agro-based industrial set up by providing raw material.

Manipur is an agriculturally dominated state because its 72 percent share of the population is living in the rural areas even nearly two-third share of workforce is engaged in agricultural activities. But the share of employment in agricultural sector is slightly lower in Imphal valley which accounts for nearly 53.7 percent of the total workforce. It might be due to slight diversification of economic sectors in the valley.

Infact, Imphal valley, the study area, is situated at the central part of Manipur state occupying nearly one-tenth share of total areal extent of the state with a very high concentration of population (i.e., 625 persons per sq.km). The density of population in the valley is recorded higher than the state of Assam (248 persons per sq.km.) as well as the other parts of the North-Eastern Region. Therefore, economy as well as the socio-economic development of the state is reflected prominently from the varieties of activities emerging in the valley. As stated earlier that the valley is agriculturally dominated, there, therefore, might be the direct impact of agriculture on the development of socio-economic activities of the area.

Imphal valley is also referred to as Manipur valley by many geographers because of its location in the Central part of the state (Singh 1981 and 1982, Ansari 1985, Singh and Singh 1988, Devi 1990, Devi 1991, and Singh and Singh 1997). But this nomenclature is not geographically sound. It reflects political identity. However, in geographical point of view, the name of Imphal valley is more appropriate and sounds better personality because it is bounded by complete physiographic features in the state excluding and therefore, the Jiribam sub-division which is physiographically as well as locationally separated from the main part of the valley. Imphal valley has been considered as a laboratory for testing the validity and answering the questions which have been posed

in the present research on signifying the role of growth centres for the development of agricultural landscape in Manipur state.

1.0: Geographical Personality

1.1: Location and the Areal Extent

Imphal valley, is situated between the transition of Torrid and Temperate climatic zones on the globe and is extended between 93° 45' to 94° 15' E longitude and 24°20'to 25°50'N latitude on the North of the Tropic of Cancer. It is interesting to note here that the study area is greener than the other areas of the world which are situated on the same latitudes. These areas lying within this transitional zone of 25°to 30°N latitudes are having the driest part of the world with desert topography, namely, the Thar desert of Western India, Syrian and Nafud deserts of Arabian Sub-continent of South-West Asia, the Eastern deserts of Egypt and Nubian and Libyian of Great Sahara. However, because of the specific location of Imphal Valley in the extension parts of Eastern Himalayan and Central Arakan Yoma mountains which affect the climatic conditions and physiographic features of the valley, it is predominated as the agricultural landscape which is different from the other parts of the world. Its interpiedmont features surrounded by mountain ranges and ridges, are locally influencing the climatic conditions as well as its geomorphological features (Fig.-1.1).

On account of availability of flat-land topography with a perfect drainage system of Imphal river and its tributaries which supply water to the Chandwin-Irrawadi river system of Myanmar and its political situation bordering with Indo-Myanmar in the South-Eastern corner of the valley, Imphal valley has a diverse socio-cultural characteristics of its population. The valley covers a geographical area of about 1,843 sq.km approximately with a population of 11,51,946 persons. According to Census of India 1991, it comprises three districts, namely, Imphal (677,215 persons), Thoubal (293,958 persons) and Bishnupur (180,773 persons) districts in 1991. But now, Imphal valley is enjoying with four districts, namely, Imphal East, Imphal West, Thoubal and Bishnupur districts. There are 8 sub-divisions, 9 C.D. Blocks, and 512 villages and 28 towns (Fig.-1.2)

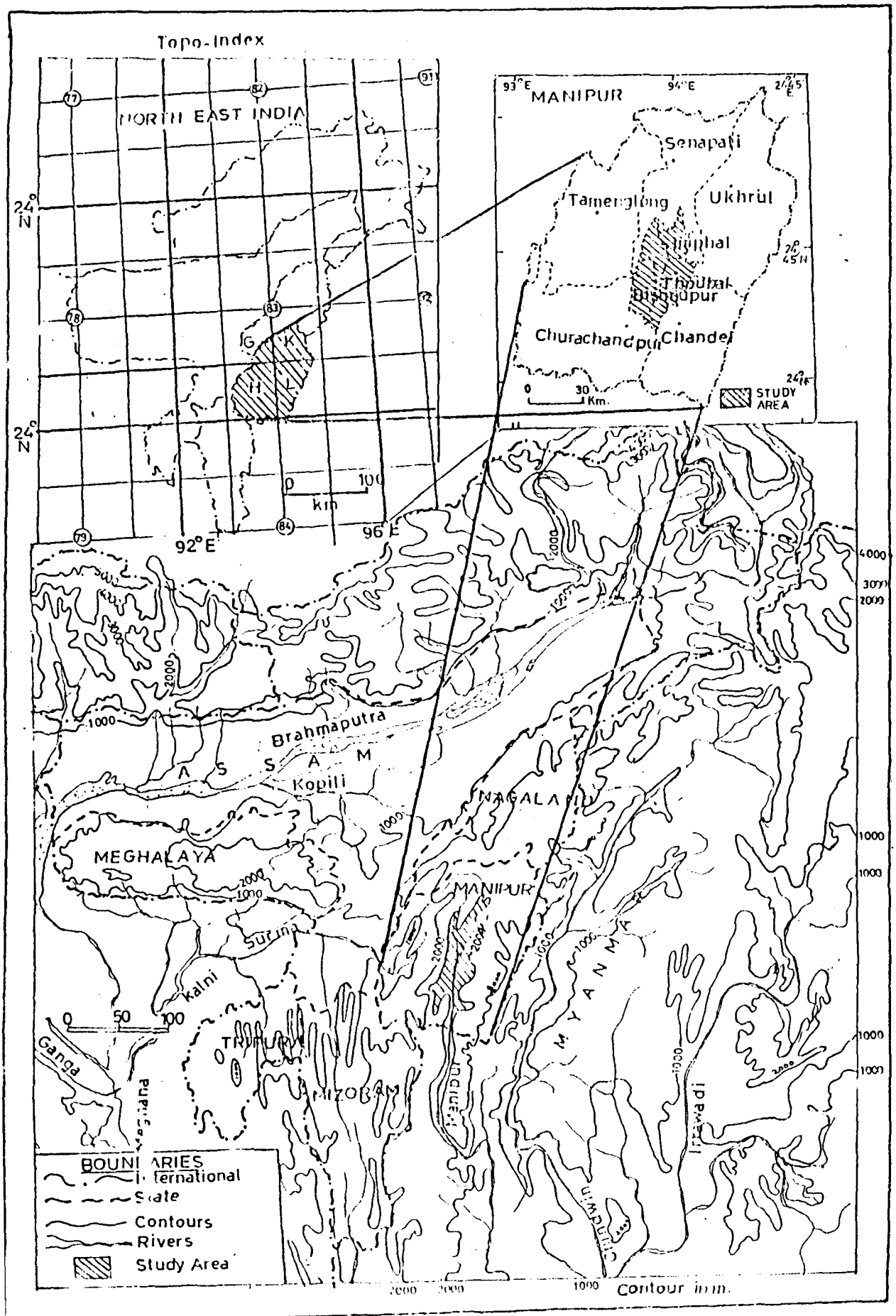
Topo-Index
NORTH EAST INDIA
MANIPUR
Senapati
Tamenglong
Ukhrul
Imphal
Thoubal
Bishnupur
Churachandpur
Chandel
STUDY AREA
Km.
24° N
92° E
96° E
Brahmaputra
ASSAM
Kopili
NAGALAND
MEGHALAYA
MANIPUR
Surma
Kalni
Ganga
TRIPURA
MIZORAM
MYANMA
Irrawadi
Chindwin
BOUNDARIES
International
State
Contours
Rivers
Study Area
Contour in m.

Fig-1.1

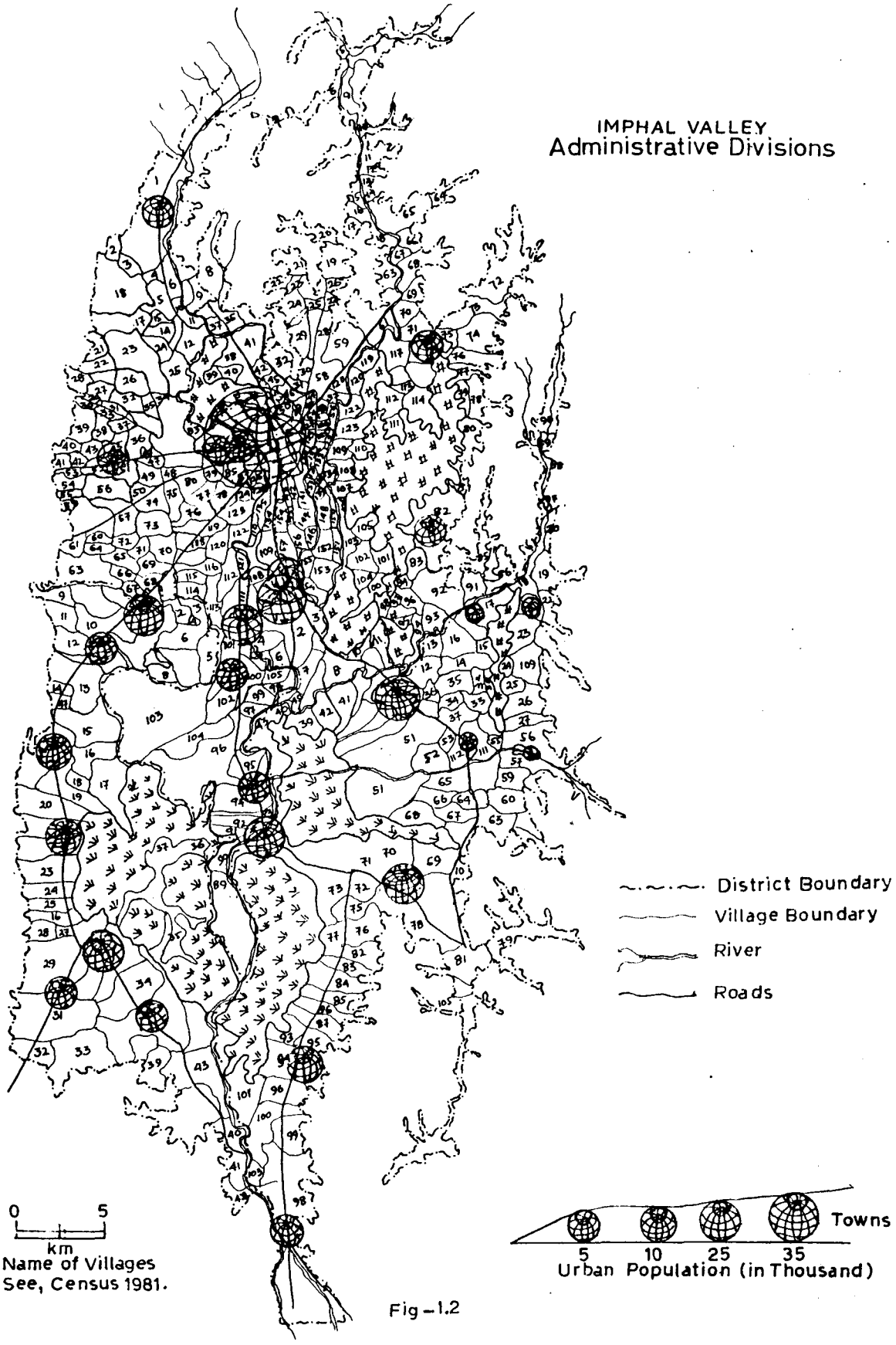
IMPHAL VALLEY
Administrative Divisions
District Boundary
Village Boundary
River
Roads
Towns
5 10 25 35
Urban Population (in Thousand)
0 5
km
NB: Name of Villages
See, Census 1981.

Fig – 1.2

1.2: Physiographic Conditions

Imphal valley is an elongated oval shaped valley extending nearly 45 Km long in the North to South and 20 km wide in the East to West side of it. It is almost flat-plain valley with the elevations ranging from 760m in the South to nearly 1,000m in the extreme North, which is sloping down towards the South and South-Eastern sides. Therefore, the slope of the valley is recorded gentle-flat with an average slope of 6.0m per km of distance from North to South (i.e. nearly 0.6 percent). On account of mountain ranges, escarpments and ridges of the Manipur hilly regions, Imphal valley is formed by the alluvial deposits brought by the mature drainage system of the Imphal river and its tributaries: Iril, Kongba, Thoubal, Nambul, Nambol and Khuga. The Imphal river which forms the main drainage system of Manipur state, rises from the Northern mountain and passes through the main heart of Imphal city joining with Iril and Kongba rivers at Lilong and Thoubal at Mayang Imphal before passing through the Loktak lake and marshy lands of its Southern part. The Khuga river which is rising from the Shinghat hills to the South of the valley, also joined with Imphal river at Ithai and is flowing down towards the Chindwin-Irrawady system.

Geological, the purvanchal region of the extension part of Eastern Himalayas where Imphal valley is situated is a part of Assam-Myanmar Geological province of the young folded mountain which was a part of the Tethys sea in the Archean era. During the Paleozoic and much of Mesozoic eras, the sea continued to receive sedimentary deposits in the form of conglomerates, shales, sand-stones and limestones eroded from the Archean rocks. A final orogenic phase in the early pleistocene age raised the upland to its present status of Manipur hills (Singh 1997 p.496), Imphal valley is formed by alluvial deposits by the rivers and streams as stated earlier, after the tertiary period which covers the area of thickness of 200-300m overlying the Disang shalls, and contain clay, sand, sandy clay and silt of fluvio-lacustrine origin with thin normal characteristics (Singh 1981, Devi 1990 and Devi 1991). The valley is developed in the lineament and thrust of the Arakan Yoma mountain and Purvanchal hills of the Eastern Himalayas. Therefore, it has a fertile soils of new alluvium with sand, clay and clayey loams which are most favourable for the cultivation of crops especially for paddy crops.

Furthermore, the Imphal valley enjoys with sub-tropical monsoon type of climatic conditions which is favourable for crop-cultivation and human settlement. The climatic conditions are homogenous throughout the valley, though there is a little variation due to surface configuration, location, water bodies and intensity of forest cover. There is record seasonal variation in climatic conditions in the valley due to the influencing factors of sub-continental pressure belt of rising monsoons of the Bay of Bengal. During the summers, the valley receives highest annual average rainfall, a record of more than 75 percent share of the total rainfall of the valley (150.8cm), with a moderate temperature of 27.2°C. While during winter seasons, the valley enjoys with cold and dry climatic conditions of 37.4 cm. rainfall and 26.9 maximum mean temperature (Table - 1.1). Therefore, summer seasons (May to November) is suitable for crop growth in Imphal valley, specially for paddy cultivation. The rate of Potential Evapotranspiration is recorded relatively higher with very high rainfall during the summer seasons.

As a result, cultivation of agricultural crops is practiced intensively during the summer seasons in Imphal valley.

On the basis of physiographic conditions of the land as described above, the entire Imphal valley can broadly be divided into following three broad physiographic zones:

(a) Upland of the foot hill area where land-slopes are observed 1-3 percent with the extremely-drained conditions of gravely soils,

(b) Mid-land areas of good favourable conditions where slope is gentle flat (0.5-1.0 percent) with good drain conditions, but it sometimes causes flood with loamy sand soil texture, and

(c) The low-land zone of lake and swamps topography where slope is flat (less than 0.5 percent) and consequently, drainage conditions are poorer causing stagnant conditions of water and floods with silt and clayey loam soils (Table- 1.2 and Fig.- 1.3).

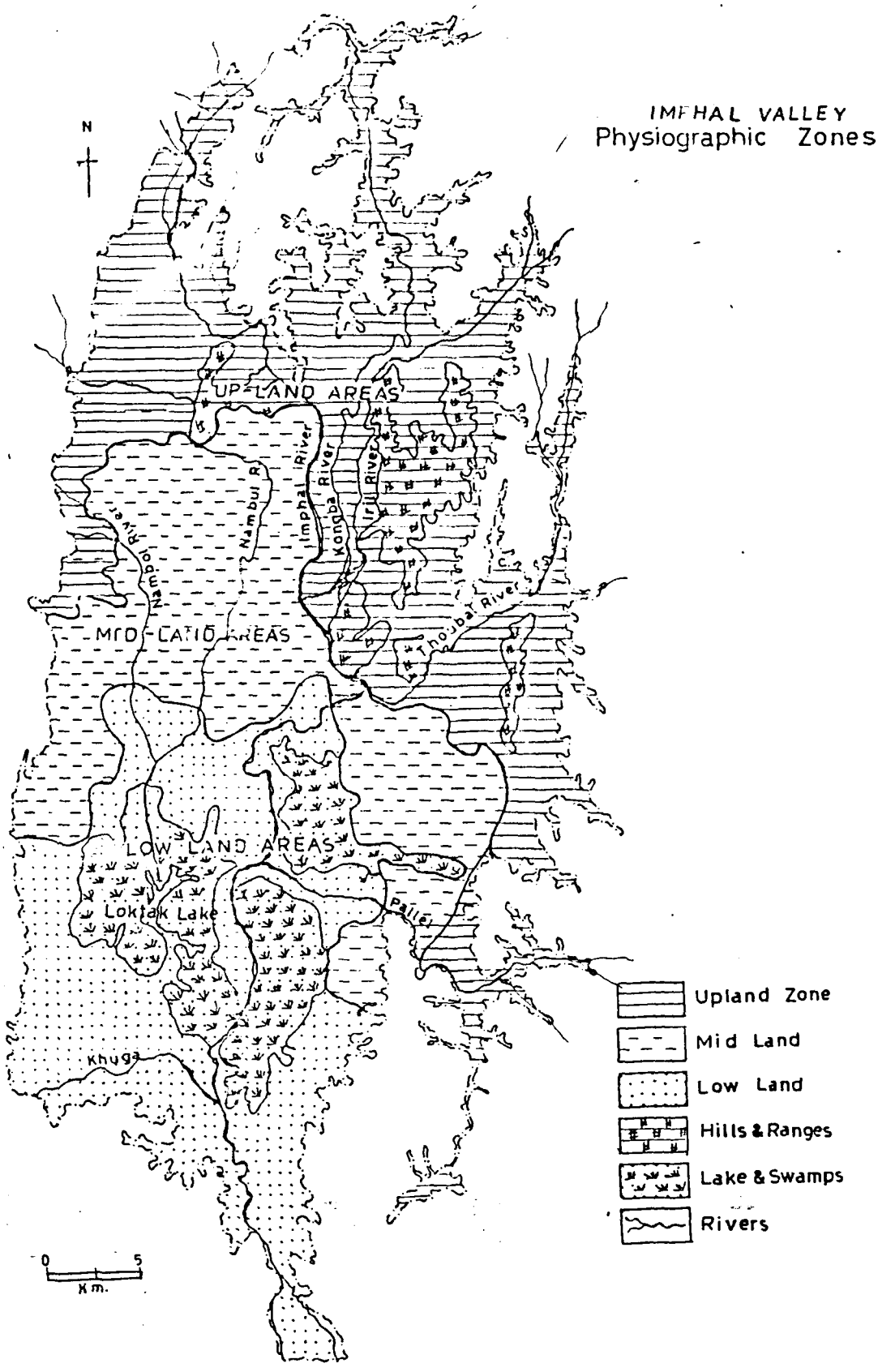
IMPHAL VALLEY
Physiographic Zones
N
UPLAND AREAS
MID-LAND AREAS
LOW LAND AREAS
Loktak Lake
Khuga
Nambul R.
Imphal River
Konga River
Iril River
Thoubal River
Pallel
0
5
Km.
Upland Zone
Mid Land
Low Land
Hills & Ranges
Lake & Swamps
Rivers

Fig.-1.3

Table - 1.1: Mean Monthly Rainfall, Temperature and Relative Humidity at Imphal Station.

Months	Rainfall (in cm.)	Mean Temperature (in °C)		Relative Humidity (in %)	
		Maxi.	Mini.	Maxi.	Mini.
January	1.18	23.45	1.89	95	17
February	4.79	25.85	3.25	95	83
March	8.40	29.30	6.15	95	35
April	17.79	31.75	11.31	96	54
May	17.05	33.28	14.20	95	47
June	23.49	32.79	18.15	96	65
July	25.99	32.34	19.60	96	76
August	17.11	31.76	19.25	96	71
September	14.34	31.40	18.55	95	55
October	13.09	30.73	12.60	95	62
November	5.24	27.78	7.15	95	53
December	2.36	24.02	2.49	94	49
Total	150.83	27.23	11.22	95	56

Note: Figures of Rainfall are based on 11 years average (1982-1993), Temperature for 20 years (1972-1992) and Relative Humidity for 1990.

Source: (i) Data for Rainfall have been collected from Annual Administrative Report (1992-93),Department of Agriculture, Government of Manipur.

(ii) Data for Temperature and Relative Humidity for State Mechanised Farm, From Economic and Statistics Department,Imphal.

Table-1.2: Soil and slope characteristics of Different Physiographic Zones in Imphal valley.

Conditions	Upland	Mid-land	Low-land
1. Slope (%)	3.0-1.0	1.0- 0.50	0.5 - 0.25
2. Drainage	Extremely Drained	Highly Drained & Sometimes Floods.	Poorly Drained with Flood Conditions.
3. Soils			
(a) Texture	Gravely	Loamy sand	Silty & Clayey
(b) Fertility Status	More Fertile	Fertile	Less Fertile

1.3: Agricultural Characteristics and Demographic Features

As stated earlier, the physiographic conditions of Imphal valley are favourable for the cultivation of agricultural crops specially for paddy cultivation. Therefore, Imphal valley is an agriculturally dominated area of the state and, hence, it accounts for more than 92 percent of total GCA under rice crops (i.e., 101.34 thousands ha.). Thus, the valley is called "Rice Bowl of the North-Eastern states" and, therefore, entire economy of the valley is based on rice-crop cultivation. Further, detail distributional pattern of cultivated land can be studied by interpreting the map of cultivated land which showing its seven categories considering the interval of 10.0 percent for the same (Table-1.3). It reveals that more than 60 percent of villages of the valley fall under the category of medium to low cultivated area (below 60 percent) which are generally situated in the foot hill areas and in the surrounding areas of main towns. The villages situated generally in the Central- mid lands occupy nearly 70 to 90 percent its areas under cultivation (Fig.-1.4).

Table-1.3: Number of Villages under Various Percentage Share of Cultivated Land Categories.

Categories(% area under various categories	No.of villages	% of villages to the total.
Extremely High(above - 90)	35	8.93
Very High (80 - 90)	26	6.63
High (70 - 80)	31	7.91
Medium (60 - 70)	60	15.31
Medium-Low (50 - 60)	87	22.19
Low (40 - 50)	63	16.07
Very Low (Below - 40)	90	22.96
Total Study area —	392	100.00

Source: SDC and SDO Offices, Government of Manipur.

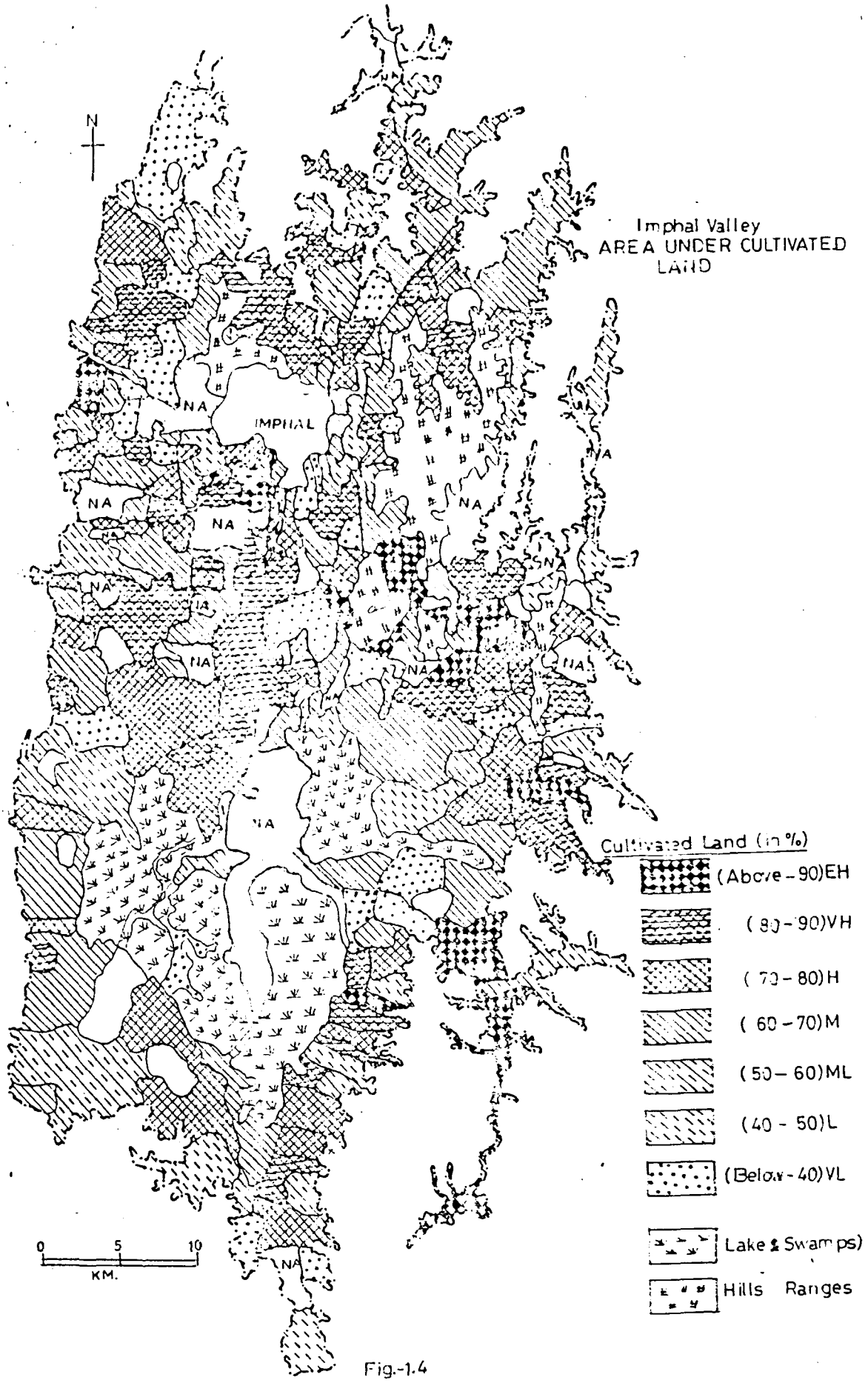
N
Imphal Valley
AREA UNDER CULTIVATED LAND
IMPHAL
NA
Cultivated Land (in %)
(Above-90)EH
(80-90)VH
(70-80)H
(60-70)M
(50-60)ML
(40-50)L
(Below-40)VL
Lake & Swamps)
Hills Ranges
0 5 10
KM.

Fig.-1.4

So far as application of modern technology in paddy cultivation in the valley is concerned, it is observed that paddy cultivation is still practiced by traditional way of farming. For example, only 50 percent land of paddy cultivation is irrigated by canals and tanks; nearly its 55.2 percent is under HYVs and improved seeds, and even the consumption of chemical fertilizer is recorded lower than the other plain areas of North-Eastern Region of the country (i.e., 156 Kg/ha) (Table-1.4). Thus, because of less application of modern technology, the agricultural growth and productivity are recorded very low. It shows the poorer performance of agricultural development. On the other hand, there are stagnant conditions in occupational structure in the valley. For instance, inspite of a significant shift of workforce from agricultural to non-agricultural sectors during the last twenty years of period of time (Singh and Devi 1996), there is still more than 53.7 percent share of total workers is engaged in agricultural practices. However, the amount of total workers as well as its share have been increasing from 29.4 percent in 1971 to 39.4 percent in 1991 with the increase of high value of its dependency ratio (i.e. 157 non-worker persons per 100 workers in 1991).The distributional patterns of percentage share of total workforce to the total population show some interesting results. The areas of foot hill zones of the Northern side of the valley have extremely and very high its values (above 45 percent) (Fig.-1.5). It means that there must be low dependency ratio in these areas. Going through the distributional pattern of dependency ratio (Fig.-1.6), it is found that the ratio is normally below 1.0. However, in some villages, the dependency is recorded slightly higher than the prediction. It means that there might be more child population in these villages. On the other hand, the villages located in the marshy lands of the South, have generally high dependency ratio in the study area. It means that non-working force dominates in the worker-nonworkers composition in the valley. It reflects that there has been an increasing pressure of agricultural labourforce on the present farming systems. On the other hand, dependency of workers specially the child population is observed significantly higher on work-structure in the valley (Table -1.5).

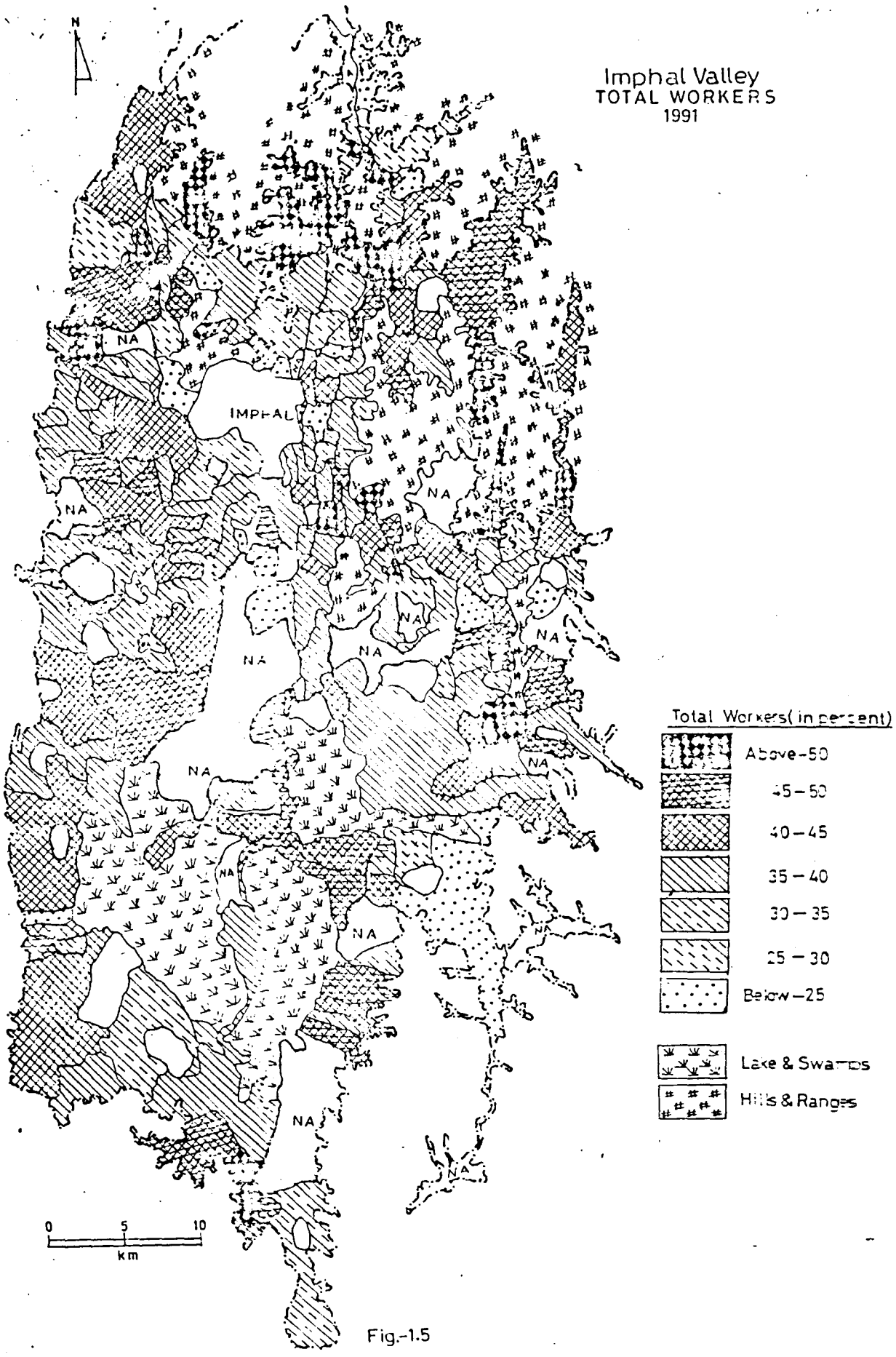
Imphal Valley
TOTAL WORKERS
1991
N
IMPHAL
NA
Total Workers(in percent)
Above-50
45-50
40-45
35-40
30-35
25-30
Below-25
Lake & Swamps
Hills & Ranges
0
5
10
km

Fig.-1.5

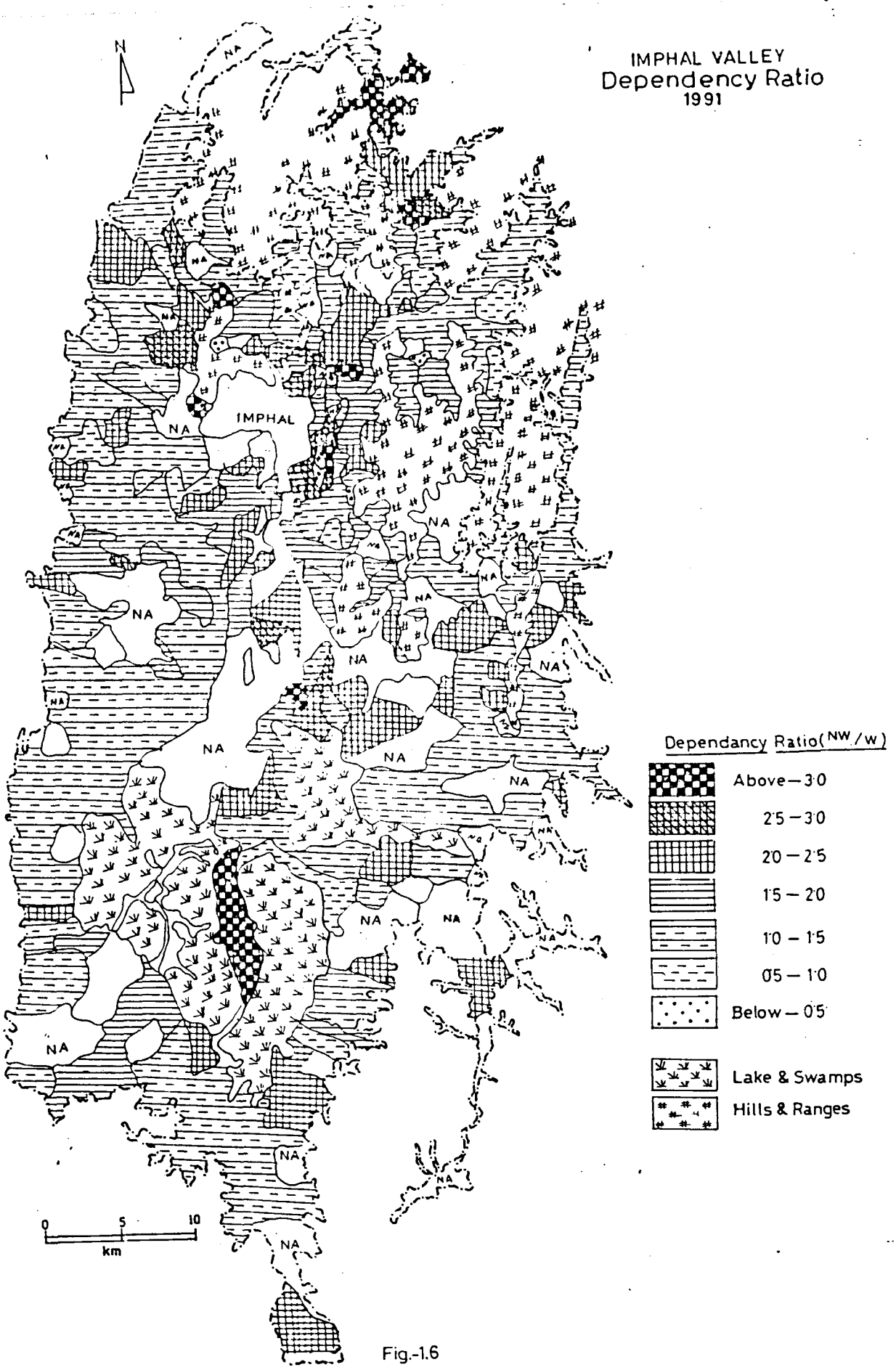
IMPHAL VALLEY
Dependency Ratio
1991
N
IMPHAL
NA
Dependancy Ratio(NW/W)
Above—3·0
2·5—3·0
2·0—2·5
1·5—2·0
1·0—1·5
0·5—1·0
Below—0·5
Lake & Swamps
Hills & Ranges
0
5
10
km

Fig.-1.6

Table-1.4: Agricultural Attributes in Imphal Valley (1991-92)

(Figures of area in hectares)

Sl. Attributes	Imphal Valley	Manipur State
1. Gross Cultivated Area (GCA)	1,09,975	1,90,000
2. Net Area Sown (NAS)	NA	1,43,455
3. Cropping Intensity (in %)	NA	104
4. Area under Paddy (Total)	1,01,340	1,54,410
(% to total GCA)	92.15	81.27
5. Area under HYVs (Total)	55,930	60,070
& Improved Paddy (% to Paddy area)	55.19	38.90
6. Irrigated area under Paddy (Total)	51,010	70,070
(% to area under Paddy)	50.54	45.38
7. Consumption of Chemical Fertiliser		
(in Tons)	17,185	18,849
(kg/ha.)	156	99

N.B: Figures are included Jiribam Sub-division statistics also due to non-availability separate data for Imphal valley.

Abbreviation: NA= Not Available.

Sources: (i) Statistical Abstract of Manipur (1992, Directorate of Economic and Statistics, Government of Manipur.

(ii) Basic Statistics of North -Eastern Region , N.E.C., Shillong.

(iii) Annual Administrative Report(1992-93), Department Agriculture, Government of Manipur.

Table-1.5: Demographic characteristics of Imphal Valley (1991)

	Imphal Valley			Manipur
	1971	1981	1991	1991
1.Geographical Area (in sq.km.)	1,843	1,843	1,843	22,327
2.Total Population	701,169	902,440	1151,946	1837,149
3.Decadal Population Growth (Absolute)	-	201,271	249,505	416,196
(in %)	-	28.71	27.65	29.29
4.Urban Population (in %)	18.94	35.29	39.61	27.52
5.Literacy (Total)	246,961	390,785	630,149	916,692
(in %)	35.22	43.30	53.13	49.90
6.Total Workers (Total)	206,267	353,909	461,785	774,904
(in %)	29.42	39.22	39.94	42.18
7.Non-Workers (Total)	494,902	548,531	724,207	1062,245
(in %)	70.58	60.78	61.06	57.82
8. Dependency Ratio (NW/W)	2.40	1.55	1.57	1.37

N.B: (i) Total geographical area of Imphal Valley is based on 1971 census. It excludes Jiribam Sub-division.

(ii) Statistics for 1991 census are incorporated for Jiribam Sub-division also except total geographical area and total population of the valley

Sources: (i) Census of India-1971,1981,1991, Manipur.

(ii) Census of India-1991,Final population Table-1,vol.i&ii, Series-1,India.

(iii) Statistical Abstract- 1992, Directorate of Economics and Statistics,Goverment of Manipur,Imphal.

Urbanisation is also taking place very fast with low literacy rate and even with weak infrastructural facilities for development. Urbanisation processes are growing fast which account for 39.6 percent share of urban population to the total population of the valley, that is the largest percentage share of urban population in the North-Eastern Region next to Mizoram state and larger than that the national average (25.71 percent) according to 1991 Census. Therefore, larger size of villages and small towns which are emerging faster in the valley might be playing an important role in accelerating the developmental processes in future which may be recognised as centres of diffusion of infrastructure for agricultural development in the valley (Singh 1997). It has already been concluded elsewhere that urbanisation and socio-economic development are positively related and areas of high urban growth have more infrastructure facilities for agricultural growth also (Singh 1994) in the valley.

1.4: Available Infrastructure for Agricultural Development

Infrastructure plays a significant role for development of any activity. The attributes related to infrastructure for overall development are road, electricity, financial institutions and social amenities. Since, we are going to discuss here the infrastructure for agricultural development only, five main attributes of infrastructure,namely; road, electricity, number of co-operative societies related to agricultural functions, commercial banks and rural development banks, post offices, educational institutions and health facilities like hospital, primary health centres and services, have been considered for the present purpose.

In Imphal valley, the total road length (surfaced and non-surfaced) is recorded 2,355 km with its intensity of 1.28 km/sq.km. It is marked slightly higher than the other plain areas of the country like Assam (1.21 km/sq.km), Maharashtra (0.78 km/sq.km), Bihar (0.49 km/Sq.km), and Punjab (0.91 km/sq.km). In spite of high road intensity, the degree of road connectivity has been observed satisfactory specially on main nodal points of the valley.

Table-1.6: Available Infrastructure for Agricultural Development in Imphal Valley (1991-92)

	Imphal Valley	Manipur
Road Length (Total in km.)	2,355	5,344
Road Intensity (km./sq.km.)	1.28	0.24
Electrified village (Toatl)	NA	1,637
(%)	NA	80.44
No. of Coporative Societies		
(a) Agricultural	150	714
(b) Marketing	6	16
(c) Consumer	120	166
(d) Farming	329	380
(e) Housing	64	92
(f) Total	2,823	4,275
Commercial Bank (Total)	29	40
Population Served	39,722	45,929
Post Office (Total)	247	623
Population Served	4,664	2,949
Educational Facility (Total)	1,835	3,792
Population Served	628	484

N.B: Statistics are incoporated Jiribam Sub-division for Imphal Valley.

Source: Statistical Abstract,1992, Directorate of Economics and Statistics, government of Manipur, Imphal.

Though the statistics regarding the rural electrification in Imphal valley are not available, however, the figures for the entire Manipur state show that there are 80.9 percent of villages electrified up to 31 March 1992. On account of big hydel projects located at the Imphal valley (Loktak Hydro Electricity Project and etc.), it is estimated that more than 90 percent of village of the valley might be electrified till that date. It means that sufficient electricity is available for accelerating the agricultural processes and processing the agro-based surplus. But according to statistics related to the consumption of electric power in the state, agricultural sector consumes only 2.0 percent share of total consumption.

Further, cooperative societies related to agricultural activities and non-agricultural activities available in the valley are enumerated 2,023 in number which create infrastructure for agricultural equipment, marketing and rural housing in agricultural sector of the economy. The farming societies are recorded a significantly higher in number (329 number). The total number of commercial banks also recorded 29 number out of 40 total number of commercial banks available in Manipur state as a whole. Likewise, total number of 247 post offices are serving the urban as well as rural people. Educational institutions are important as infrastructure for social development including all types of education institutions from primary to university. The total number of educational institution are recorded 1,835 in 1991-92. These institutions are providing skilled-labour for the development of agriculture as well as other sectors of the economy. One Agriculture University, one Agricultural and Veterinary college, 2 number of government Technical institutions are available in the valley for enriching the human resources for the development of agriculture. According to the statistics of these infrastructural facilities, it seems that they have their weak performance per unit of population segment. For example, 628 population is served by per educational institution, 39,722 persons by per bank unit. As a result, labour conditions may be seen stagnant with its low productivity (Table - 1.6).

1.2: Statement of the Problem

On account of weak infrastructure for agricultural development, there is a record deficiency of food grains production in the valley as well as in Manipur state for the fulfillment of food requirements of the local people. The fluctuating tendencies of the

curves of foodgrains production for Manipur state show some interesting results as given below (Figs.- 1.7 and 1.8).

There is a gradual increase of food grains production at an annual rate of 3.05 percent during the period of 12 years of pre-green revolution (1960-61 to 1972-73). However, an average annual rate of increase in the foodgrains was recorded almost similar as 3.04 percent during post-green revolution of 18 years of time (i.e. from 302.8 thousand tons in 1975-76 to 468.5 thousand tons in 1993-94). Thus, there is a stagnant growth rate throughout the period after independence. On the other hand, there is an annual growth rate of population of about 3.56 percent which accounts higher than the increasing rate of foodgrains. Therefore, a gap between population growth and rate of foodgrains increases which causes food deficiency in the state. However, it seems that a marginal impact of green-revolution technology has been observed on the agricultural landscape of Imphal valley.

Another phenomenon of growth trends of agricultural activities has been visualised as the fluctuating tendency of foodgrains production during the 1980s. However, a significant increase in the production of other agricultural crops like maize, sugarcane, potato, oilseed and vegetables has also been recorded specially during the same period of time. Thus, the processes of agricultural production have been intensified, but they accelerate at an initial stage with their stagnant conditions.

The stagnant agricultural conditions of the area are studied by considering the role of growth centres of the area with reference to growth and productivity of agricultural activities because it has been observed that the growth and development of agricultural activities persist and begin with the growth points/centres emerging in the agricultural landscape. It is also realised here that, at the initial stage of agricultural development, the locational aspects of agricultural activities must be strengthen optimally to radiate their effects in the surrounding areas. The growth points of the area can contribute to the growth and development of agricultural activities in four main ways as:

(a) The growth points can be considered as 'production processing centres,

(b) They may help to radiate and intensify the agricultural inputs in the rural areas,

(c) The impact of agricultural infrastructure can be expanded in the area through them, and

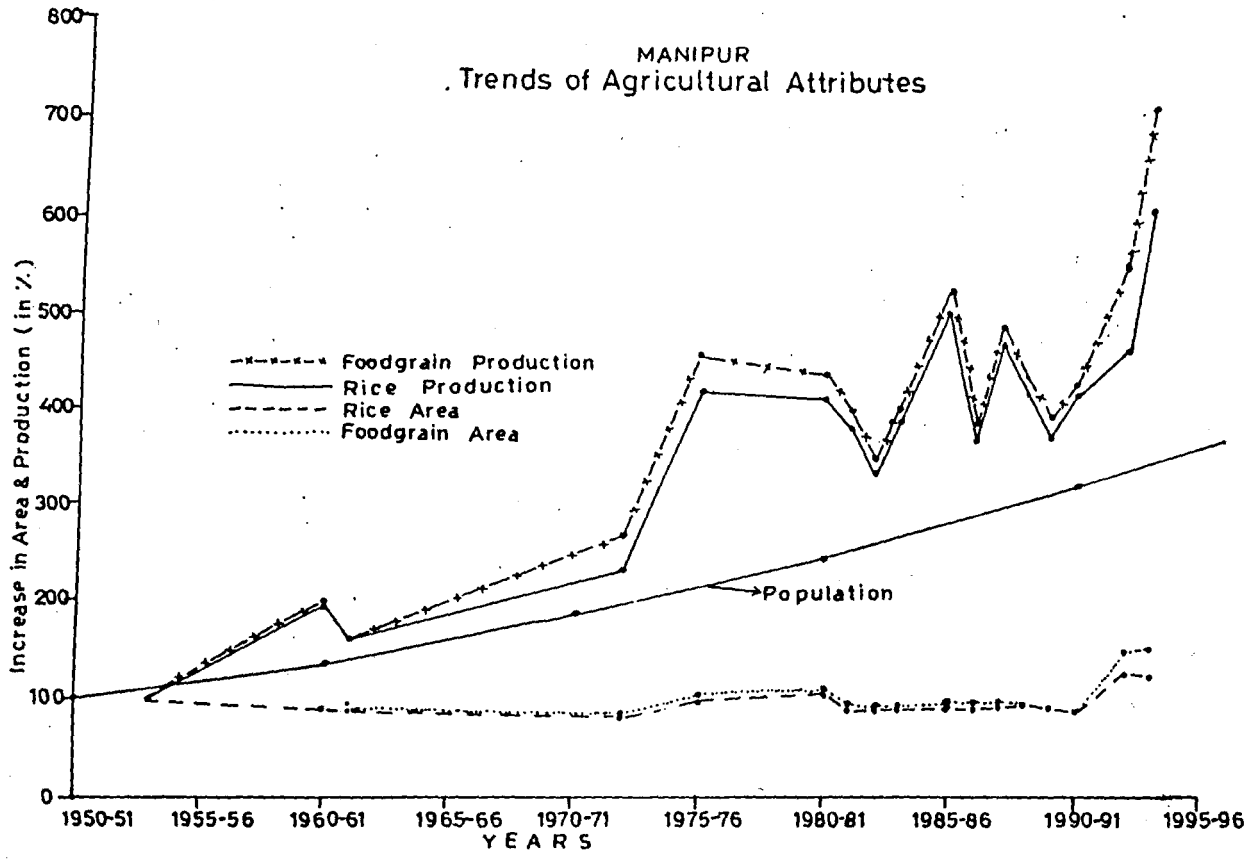
MANIPUR
. Trends of Agricultural Attributes
Foodgrain Production
Rice Production
Rice Area
Foodgrain Area
Population
Increase in Area & Production (in %)
800
700
600
500
400
300
200
100
0
1950-51
1955-56
1960-61
1965-66
1970-71
1975-76
1980-81
1985-86
1990-91
1995-96
YEARS

Fig.-1.7

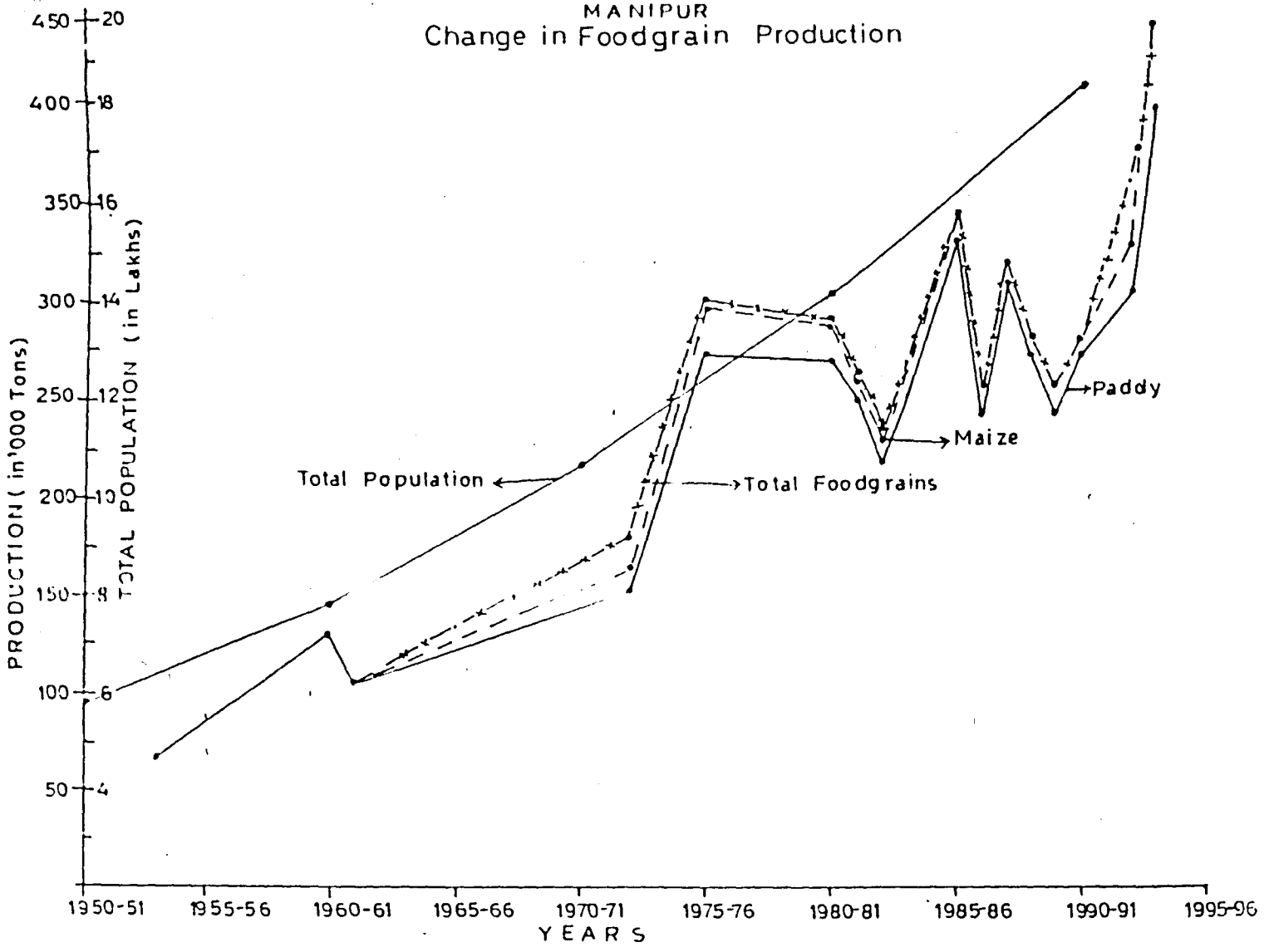
MANIPUR
Change in Foodgrain Production
PRODUCTION (in'000 Tons)
TOTAL POPULATION (in Lakhs)
450
400
350
300
250
200
150
100
50
20
18
16
14
12
10
8
6
4
Total Population
Total Foodgrains
Maize
Paddy
1950-51
1955-56
1960-61
1965-66
1970-71
1975-76
1980-81
1985-86
1990-91
1995-96
YEARS

Fig.-1.8

(d) They may be considered as the 'centre of absorption of surplus labour, available in their surrounding areas.

3.0: Objectives

The present study is a problem-oriented piece of research in which the attention is focused on the following objectives as :

(i) to study the distributional patterns of agricultural attributes related to agricultural productivity and growth,

(ii) to identify the growth centres of the study area,
(iii) to examine the locational patterns and agglomeration of agro-based activities prevailing on the growth centres and their spatial interactions, and
(iv) to suggest a normative spatial organisation of agricultural activities for accelerating the decision-making process in connection with optimising the functional as well as locational structure in the study area.

4.0: Research Questions

Infact, no hypothesis is imposed in the present context because such type of studies have not been conducted earlier for Imphal valley area. However, these are few studies which have been done in other parts of the country and interpreted the impact of locational systems on the patterns of socio-economic development (Sen 1972, Sen and other 1975 and Misra 1983) As a result, some important research questions can be forwarded in the present research.

(i) How growth centres of Imphal valley can influence the development of agricultural attributes and their patterns.
(ii) How modern agricultural technology is being radiated through the growth centres to their surrounding areas in order to their functional hierarchies.
(iii) How growth centres are helping to process the agricultural resources for increasing the growth rate of agricultural sector in the valley.

5.0: Design of the Study

Having been posed the objectives and research questions which are answerable in the present study, the entire matter and materials have been arranged in a coherent way to put the entire body of the thesis into the following Chapters.

Chapter-I includes the introductory notes, statement of the problem, objectives. While conceptual background, literature and methodological aspects are dealt with Chapter-II. For testing the validity of those facts as stated above and giving answer to the questions posed here, the pattern and processes of agriculture production, productivity and growth are required. The processes of growth with respect to emerging growth centres in the valley is the main theme of the present work. Therefore, the distributional pattern of agricultural phenomena are analysed in Chapter-III, and identification of growth centres and their functional nature are dealt with Chapter-IV. Detail study of the growth and development processes through the growth centres approach is closely related to the contribution of growth centres to the development which have been dealt with the Chapter-V. In the end, some aspects of accelerating decision-making processes in the area for balance-development are given in Chapter-VI.

In the introductory chapter of the present thesis, the objectives and research questions are posed after discussing the geographical personality of Imphal valley and considering the level of agricultural development which is recorded very low in compare with the economy of other plain areas of the country. It is also concluded here that Imphal valley is in its initial phase of development where urbanisation and nodality may play a significant role in developmental processes in future. Therefore, the emphasis would be given on growth approach in this context. Now, the concepts and methods which are related to these approaches of development should be discussed separately.

Chapter- II

CONCEPTUAL FRAME AND METHODOLOGY

1.0: Introduction

The definition and concept of development are widely described by many geographers, sociologists as well as economists considering the associated characteristics/ attributes of various aspects of resource phenomena. Therefore, it has a wide-range of concepts and definitions which only be described here by considering the present context. By describing the concepts of overall development of an area/region, our discussion should be confined to the concepts related to agricultural development. It is mentioned in the following heads:

2.0: Concept of Development

The term 'development' is broadly considered as a process of progressive change of ensuring human activities for the improvement of quality of life of the people. It involves the interaction between man and his environment for proper utilisation of the resources. It can be used in a variety of ways (Hoy 1984) and multifacet dimensions of economic, social, political and ecological dimensions (Dubey 1992). Therefore, it is closely related to geographical concept of development in which human activities are controlled and/ or influenced by the environmental conditions of land. Thus, in some areas, the interrelationship between men and his environment is different, and sometimes in other areas, it is complex. Therefore, the term 'development' also refers to the spatial dimensions of landscape in which the activities of man are observed within the specific set of environmental condition.

On the other hand, 'technology' is also related to ability of man through which man intensifies his interaction with the environment. These are different patterns of these interactions on the human landscape like social, economic and political activities of man. So, development is closely related to the dimensions of the activities of man as well as of the societies (Sharma 1989 and Sharma 1995). Further, there is another term 'growth' which is synonymous with 'development. However, it has different connota-

tion. It refers to the change in the interaction of man with nature over time. Therefore, 'change' has another important component of development which gives the historical perspective of geographical view of the landscape specially change in the geographical landscape with changing nature of environmental conditions. The term 'growth' thus refers to aggregate and strictly implied in economic and material improvement in an economy, while development is referred to conceive much wider range of varieties including especially that of a whole of economic, social and political processes which result in a perceptible and cumulative rise in the standard and quality of life for an rapid proportion of the population (Hodder and Lee 1974). In short, if it is conceived that growth is a component of development, then the term 'development' refers to a continuous process of change in the environmental features with an interaction of man for improving his standard of life in a sense of economic, social, political and environmental activities.

In fact, development is being conceived as a multi-dimensional process and using in a variety of ways. It exhibits economic, social, political and environmental dimensions. More precisely, economists use the term development in term of measuring Gross National Product(G.N.P) income, energy use and employment (Hoy 1984 and Dubey 1992). Hoy examines the process of economic development from four main principal points of view:

(i) Number, growth rates and distribution of population,

(ii) Environment - which provides the stage and material used in economic activities. Such environment is in rich resources that can be used for economic gain,

(iii) Culture - in which a society organises itself in terms of belief, custom, and life-styles which influence the direction and degree of economic development, and

(iv) History - which demonstrates a study of a evolution of economic activities and world's various culture. Therefore, concept of development, according to Hoy,has an integrated view of geographical landscape.

Sociologists conceive development as a change and improvement of social activities in relation to the economic development. It brought to the structural changes in

the social structural and economic activities of the society. In political view, it can be referred to political charges, power and political mature systems which accelerate the processes of development of an area or state.

If we consider the geographical point of view of development, it can be referred to a spatial dimensions of regional systems. It can be used to improve the functional system of a region in terms of social improvement, economic progress, political maturity and environmental conservation (Gosal and Krishnan 1984 & Berry 1967). Gosal and Krishnan observe that development in geographical view is the improvement of the quality of functioning of a regional system working over geographical space. Berry conceived the diffusion of innovations from the urban areas to the surrounding rural areas to accelerate the process of development in an integrated urban hierarchy. The improvement in regional systems and/or locational processes is, thus, closely related to the growth of geographical landscape. In the end, it can be said that development and growth have an integrated view of geographical landscape in relation to its phenomenal attributes with their changes. A geographical view of agricultural development must be put forward here in present context.

2.1: Concept of Agricultural Development- A Geographers'view

As it has been discussed earlier, the conceptual frame of development in general which has a multi-dimensional features and structures in different references, the geographical aspects of development has a great significance in integrating and understanding various structures and patterns of human activities interacting with nature. Similarly, it is forwarded the same for agricultural development which refers to the changes of agricultural phenomena with a variety of its influencing factors. Therefore, 'process - form' is the main approach by which a geographer can explain the causes and controlling factors of regional differentiation and changes occurring in the structural pattern of agricultural activities. Therefore, production patterns and changes there in are the main aspects of the development of agricultural activities in any area.

Geographers have considered agricultural productivity as a main component of evaluating development of agricultural activities (Shafi 1960, 1974, 1983, Singh and Chauhan 1977, Singh and Dhillon 1992, and Singh 1994). The pattern of agricultural productivity with special reference to agro-ecological conditions can be interpreted in relation to find out the causes of its regional variations. Agricultural economists might

also give the different views on the agricultural activities pressing emphasises on technological and institutional dimensions (Nath 1969, Gupta 1982 and Raju 1987). But these dimensions are only the factors of agriculture, not the components of agricultural structure. They might be integrating and correlating the structural features of agricultural activities in which a few are highly recognizable attributes for bringing out the change in the structural features of agricultural activities.

Geographers have an integrated view of agricultural development by correlating and comparing the structural features of agricultural activities and this can be studied in understanding its regional systems of production processes for planning purpose (Fig.-2.1). By using the same criteria, Whittlesy (1936) also defined the agricultural systems of the world emerging on geographical landscape. Because of the views of agricultural development, Tewari and Singh (1985) consider the following indicators assessing the structural features for agricultural development:

(i) the values of agricultural products per hectare of NSA,
(ii) consumption of fertilizer,
(iii) irrigation coverage,
(iv) irrigation intensity,
(v) number of agricultural workers per ha. of NSA,
(vi) consumption of power,
(vii) intensity of cropping and
(viii) percentage of commercial crops to GCA.

Further more, Rao and Sarma (1980) and Raju (1987) emphasise specially on the indicators namely: (i) the levels of inputs used, and (ii) resource-base, and infrastructure available. Sau (1990) observe that productivity of rice varies structurally across the rice producing states of India and explains its causes as intensification of infrastructural facilities like irrigation, power and literacy.

Gupta (1982) emphasises three dimensions of agricultural development: (i) productivity, (ii) technological progress and (iii) institutional changes. He observed that technological dimensions are significant for the regional disparities of agricultural productivity. Dubey (1992) also examples the level of agricultural development on the same basis of agricultural infrastructure, agricultural conditions and productivity. Furthermore, Krishnan (1984) gave a comprehensive concept of agricultural development by using productivity, crop diversification and commercialisation for land use efficiency. Banerjee (1996) emphasized on its planning criteria and says that the carrying capacity of land is the main factor controlling the agricultural development.

In order to reviewing the regional approach of agricultural development, it can be said that there are various studies on the regional disparities occurring in the rate of growth and productivity of agriculture in the context of agricultural development (Tewari and Singh 1985, Shrivastava 1983, Singh 1994 and Chand and Chandra 1994). But the areal differentiation of the levels of agricultural productivity can be explained through understanding the technological and infrastructural factors (Sau 1990).

2.2: Measurement of Agricultural Development

The concept of agricultural development is wide, and various disciplines and scientists are conceiving use it in varieties of ways. However, geographers have an integrated view of understanding and analysing componental relationships of agricultural development. There is an important question regarding the which analysis of developmental features of the agricultural activities. Since, agricultural development has varieties of components of the entire system of agricultural production, how those components are to be assessed and combined together. Therefore, the dimensions of measurement of agricultural development are important to study.

Various quantitative as well as qualitative techniques have been adopted to determine the level of agricultural development. Generally, economists have measured the economic development by using agricultural production into its money/value terms and, therefore, Total Agricultural Output (TAO) is considered as a major indicator of agricultural development. But there are various methods adopted by different agricultural scientists to assess the level of agricultural development. Since agricultural productivity and growth are two main components of development of agricultural activities, agricultural productivity may give us more realistic pattern for development. Geographers attempted it by preparing the composite index of agricultural productivity by considering crop-area and crop-yield as its main attributes(Shafi 1960,1983, Giri et.al. 1966, Bhatia 1967, Dhillon and Singh 1992, and and Dayal 1984). There are two major criteria of combining the various elements into a single composite index of agricultural productivity. First, the ranking co-efficient method - it was first introduced by Kendall (1939 and 1964) and followed by Shafi (1984). But ranking co-efficient is not providing a quantitative measurement of the composite index of agricultural productivity and therefore, Dandekar (1964) has suggested that giving the weightage of acre-yields rather than the ranks would be more logical and should give a good measure of agricultural productivity. Spare and Deshpande (1964) modified it by taking a weighted average ranks in respect of acreage crop being equal to its proportion in the total cropped

area. Another method of composite index which is based on the multiplying factors of crop-importance has been developed and used (Singh and Chauhan 1977). Bhatia (1967) used the composite index of two elements of agricultural out, i.e., crop-area and yield as a main components of assessing agricultural productivity.

On the other hand, agricultural economists gave more weightage in relation to market price/ harvest price of various commodities/crops which are grown on the commercial basis. Market prices of the commodities/ crops may influence the regional pattern of productivity (Gopalkrishnan and Rao 1964 and Vidyasagar 1980). But economists use price as factor as an element of measuring agricultural productivity. As a result, they consider three elements of agricultural activities, namely: (i) Cropping pattern, (ii) Crop-yield and (iii) Crop price as the main components of productivity (Bhalla and Tyagi 1989, Alagh 1980 and Sharma 1986). In another sense, the index of productivity which is reflected in money term instead of physical, is reliable for interpreting the changing pattern of productivity over time.

Secondly, since labour is also one of the important elements of operational system of agricultural production processes in India and specially in the study area, labour productivity has become one of the main components of agricultural development. It has been measured by various agricultural scientists by taking into consideration as output per unit of agricultural work force. In Indian conditions, even for the study area, Imphal Valley, this component has its specific significance because of its available unlimited supply of labour in the agricultural production processes.

In addition to above discussion, the overall level of development of agricultural activities has been measured by giving weightage and aggregating them into a single index of various indictors of agricultural production system. Chand and Joshi (1996) have attempted to measure the agricultural productivity in order to understand the productivity constraints and their relative role by using the 13 indicators: (i) caste (ii) working force, (iii) male education score, (iv) female education score, (v) member of occupational engagement, (vi) female agricultural population, (vii) migration, (viii) land holding size (ix) manure and consumption of fertilizer, (x) drought prone area, (xi) fragmentation of land, (xii) labour input as the independent variables, and (xiii)land productivity as a dependent variable. Banerjee (1996) advocates quantitative methods to determine the agricultural development adopting relative indices of the four indicators. they are: (i) land efficiency, (ii) agricultural mechanisation, (iii) fertilizer consumption and (iv) carrying capacity of land. Indices of agricultural development pertaining to fertilizer consumption and carrying capacity of land have been ranked in descending order and whereas land use efficiency and agriculture mechanisation have been ranked

in their ascending order and then ranks are added. The sum are divided by the number of indicators, thus, giving the index of agricultural development on the basis of ranking co-efficient. He concluded that lower the rank co-efficient, the higher is the level of agricultural development and *vice-versa*. Shrivastava (1983) assigned different weights to different indicators by using the method of standardised composite index by taking the indicators of (i) percentage of consumer utilising power for irrigation, (ii) number of villages electrified per lakh of rural population, (iii) percentage of area irrigated to Gross Cultivated Area, (iv) Gross agricultural output per ha. (in Rs), (v) consumption of fertilizer, (vi) percentage of agricultural advance to total deposits and (vii) percentage of HYV seeds to total area. Dubey (1992) examines the level of agricultural development of aggregate index of 13 indicators representing agricultural infrastructure, agricultural conditions and agricultural production.

2.3: Measurement of Agricultural Growth

Agricultural growth is also one of the major components of agricultural development. There are various criteria and methods used by various agricultural scientists for assessing the agricultural growth. In general, these are three main criteria which have been used for measuring the growth of agricultural sector.

(a) Simple Growth Rate Criteria

Under this criteria, the total agricultural output changes are measured on the basis of constant rate of growth. Therefore, the following growth formula was used.

$$r = \frac{[100(Pi - Po)]}{Po} \quad \ldots\ldots\ldots\ldots \text{(I)}$$

where r = growth rate of agricultural activities over a period of time as

Pi = current year and

Po = Base year.

Since this formula is simple and based on linear regression which is applicable for measuring agricultural growth in prevailing Indian situations, various agricultural

scientists used its statistical form by taking growth co-efficient of linear equation of agricultural production attributes as $y = a + bx$ where 'b' co-efficient of the equation is used as the constant growth of agricultural production (Dayal 1966, Kaul 1966 and Chadha 1967).

(b) Interaction Factor Criteria

Minhas and Vaidhynathan (1965) have evolved an interaction factor of agricultural growth which prevails within the interaction of main three factors of growth of agricultural attributes. They are (i) Crop-area, (ii) crop-yield, and (iii) cropping pattern. If the interaction of these three factors are significant and effective, then the growth rate may be recorded higher than the expected growth and *vice-versa*. These factors are interpreted by adopting a the mathematical form (for detail see, Minhas and Vaidyanathan 1965). Later on, this criterion was used by agricultural economists (Parikh 1966 and Vidyasagar 1980) and modified by Dharm Narain (1977).

C: Criteria of Measuring Compound Growth Rate of Agriculture

Bhalla, Tyagi and Alagh who have done research work of agricultural economies of Indian agricultural condition adopted a compound growth of measurement for agricultural production for the district-wise analysis of the agricultural pattern in India (Bhalla and Alagh 1979, Alagh 1980 and Bhalla and Tyagi 1989). They used compound growth rate based on exponental method for measuring the growth of agricultural production. Dayal (1966) also used geometric growth rate (i.e. compound growth rate) for assessing the agricultural production.

In this section of the present discussion, it is fact that above cited three criteria of measurement of agricultural growth, these criteria can be used according to the situation of the agricultural activities prevailing in the study area. Now, our discussion should be oriented towards the model building for the development of agricultural activities and its suitability for the study area.

3.0: Models Used for Agricultural Development

So far as models and theories of agricultural development are concerned, these are different criteria and factors considered for developing the models of land uses.

Say for example, some classical models are based on the physical conditions of land as controlling attributes of agricultural activities (McCarty and Lindberg 1967). On the other hand, some classical models are also based on the transport principle of market economy (Thunen1826). Further, there are some hypotheses and models developed by establishing input-output relationship of agricultural production system where economic factors are considered more important than the physical influence on a piece of land (Douglas and Cobb 1928 and Hanumanth Rao 1968). In the early sixties, an appropriate approach for the optimal growth of agricultural activities and overall development of agricultural landscape was initiated by French geographers (Perroux 1965 and Boudeville 1966) by developing growth centre strategy. It was followed, later on, by the Indian geographers.

Thus, there are four main types of the models developed for agricultural development which can be described in detail in the following manner:

(i) Optima -Limit Theory of Agricultural Development:

This theory was first introduced by McCarty and Lindberg (1967) to consider the temperature and rainfall of the main elements of climate as the principal determinants of agricultural landuse. The 'Optimal - limit' of land-use operating are controlled by these determinants.

There are optimal areas of operating the land where input costs are lesser than the economic rent which farmer is receiving after operating the piece of land. Limit of the land operations are fixed by the equilibrium of input costs with economic rent (Fig.- 2.1). Thus, optimality of the operation of landuse is determined by the application of modern technology within a specific set of climate conditions because technology is indirectly related with the operation of input costs in agricultural production system. Therefore, it can be visualised in the diversified cropping pattern in the areas where modern technology is introduced. But it is not true for the present case of area where the agricultural development and land-use pattern are changing under the control of physical factors rather than modern technology. Therefore, optimal limit of agricultural land-uses are controlled not only by climatic factors as McCarty and Lindberg suggested, but by the soil and geomorphological conditions of the area and technological factors also.

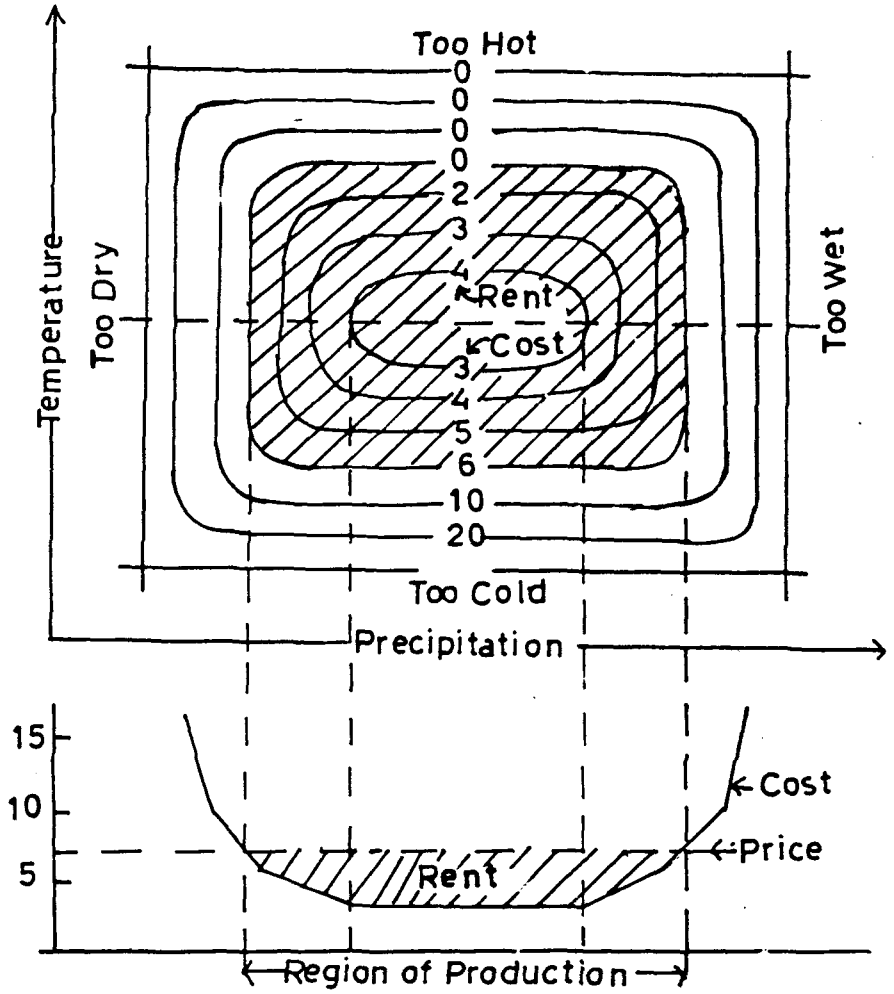

Fig.1.1: Optima-Limit Model
(After McCarty & Lindberg 1967, c.f Amedeo & Golledge 1975)

(ii) Locational Model of Agriculture Landuse:

There is another view of agricultural scientists that the modern technology may reduce the transport costs of the commodity which is surplus on farm and transported to the market. Therefore, transport costs which are part of inputs and influence the economic rent in the operation of agricultural production, is one of the important factors for agricultural production. Keeping these views of agricultural development in mind, Thunen (1826) postulated a concept of emerging market forces on the ***Isolated State*** (where the physical factors are homogenous in their characters and market forces influence the land use pattern). This classical locational model provides a sound-base for analysing the effect of transport on land-use practices. It was generalised by the model, that on account of increasing transport cost of the inputs and agricultural output extended far from the market centres, the economic rent of the piece of land decreases constantly. Therefore, there are changes occurring in the land-use. As a result, intensification of agricultural activities decreases by distant from the market centre. As the assumptions of ***isolated state*** of the model are relaxed, the land-use concentric rings will be distorted accordingly (Fig.-2.2a & b).

(iii) Productivity Enhancement Criteria

Many agricultural economists have established the relationship between input and output of agricultural production to assess the agricultural pattern. A classical work was done by Douglas-Cobb (1928) by analysing input-output relationship of industrial activities. A double log form of production function was developed by them which was, later on, used by many agricultural scientists for assessing elasticity patterns in agricultural practices in India. The relationship follows " law of diminishing return" which is applicable in agricultural activities also. Hanumanth Rao (1968) has modified this form of production function developed by Douglas-Cobb by considering the semi-log form of the established in agricultural production processes.

The established form of agricultural production shows salient features of the production processes and therefore, it is useful for understanding the optimisation of agricultural production and level of productivity. It may suggest the complementarity / substitubility pattern of agricultural inputs applying in agricultural production processes.

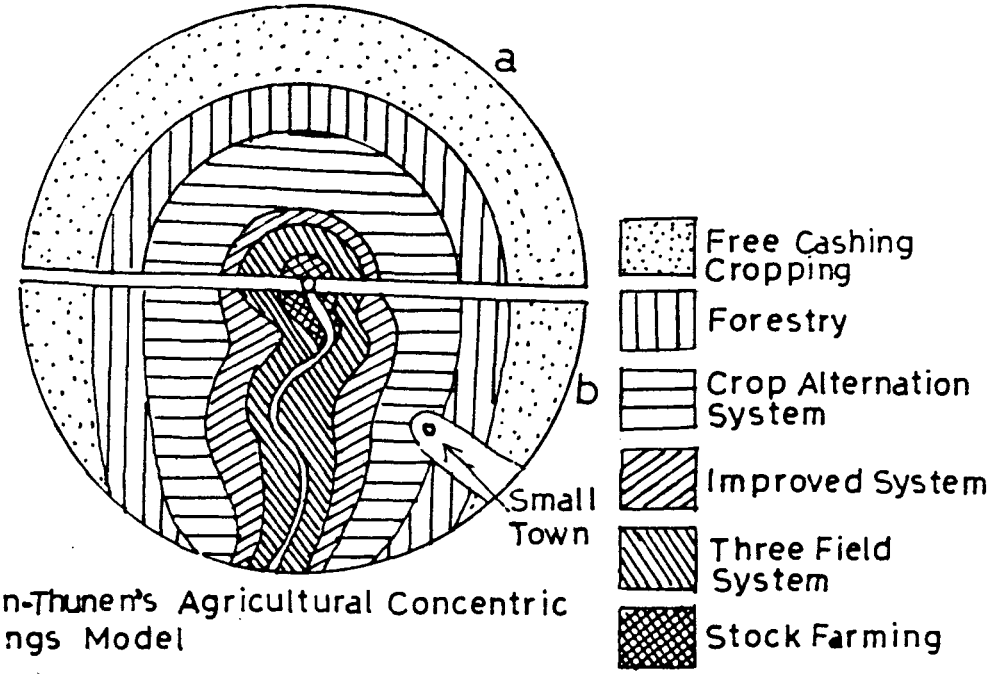

Fig:-2.2a:Von-Thunen's Agricultural Concentric Rings Model

a:General Case
b:with navigable river & a small town

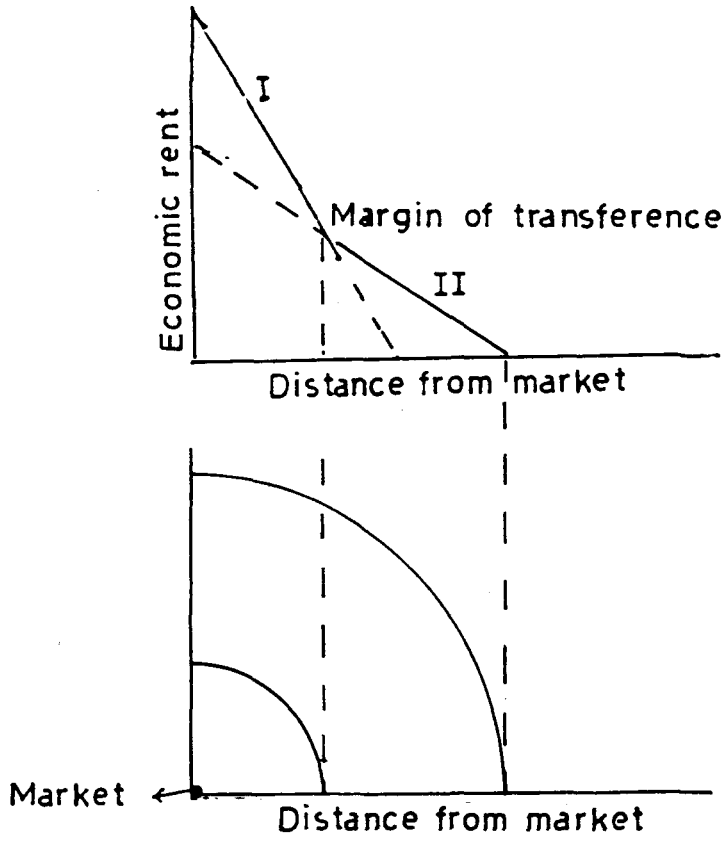

Fig:2.2b:Theoretical Situation for Two Products (I&II) Assuming Constant,but Different Freight Rates.

However, there are many other factors of production like physical factors (climate, physiographic conditions and soils), socio-economic factors (demand of market oriented economy and consumer behaviour of the products) and technological inducements like farm technology, seed-fertiliser and irrigation attributes for intensification of agricultural production processes, transport technology and modern means of communication as a factor of diffusion of innovations for accelerating the agricultural production process which influence the agricultural activities of a particular area (Fig.-2.3). Thus, one should keep those factors in mind for preparing the integrated plan of agricultural development of the area (Fig-2.3). For the same, our discussion must be proceeded towards the review of literature available on strategies for the development of agricultural activities.

4.0: Strategies for Agricultural Development

Since we are discussing here the integrated view of agricultural development especially for the choice of appropriate methods for study area which is characterised as fertile soil with favorable agro-climatic conditions of rice cultivation, it is important to note that the main strategic aspects of development and growth of agricultural activities must be reviewed and described here.

Overall, there are two broad schools of thought of agricultural scientists that pursued the criteria of productivity enhancement of agricultural production. First school of thought which pleads that landuse is the result of physical factors of land which generate land potential and determine the carrying capacity of land. The intensification of agricultural production processes can only be pursued by these ecological attributes of land, while technology helps to intensify these processes. (Stamp 1948,1958, Shafi 1974, Grosjean and Messerli 1988 and Singh 1984). Following the same criteria of assessing the 'Production Potential Units' (PPU) of a particular unit of land, Stamp (1958) prepared plan for boosting up agricultural production in England. Later on, Shafi (1984) followed the same criterion for developing the agricultural conditions in India.

The second School of thought which is based on productivity enhancement and changes in agricultural land-use with technological progress. Agricultural economists have a significant contribution on those aspects. For example, the Western countries where agricultural production processes have been accelerating by intensifying the technology for increasing the level of land as well as labour productivities, follow this

Agricultural Landscape and its Association with Growth Points

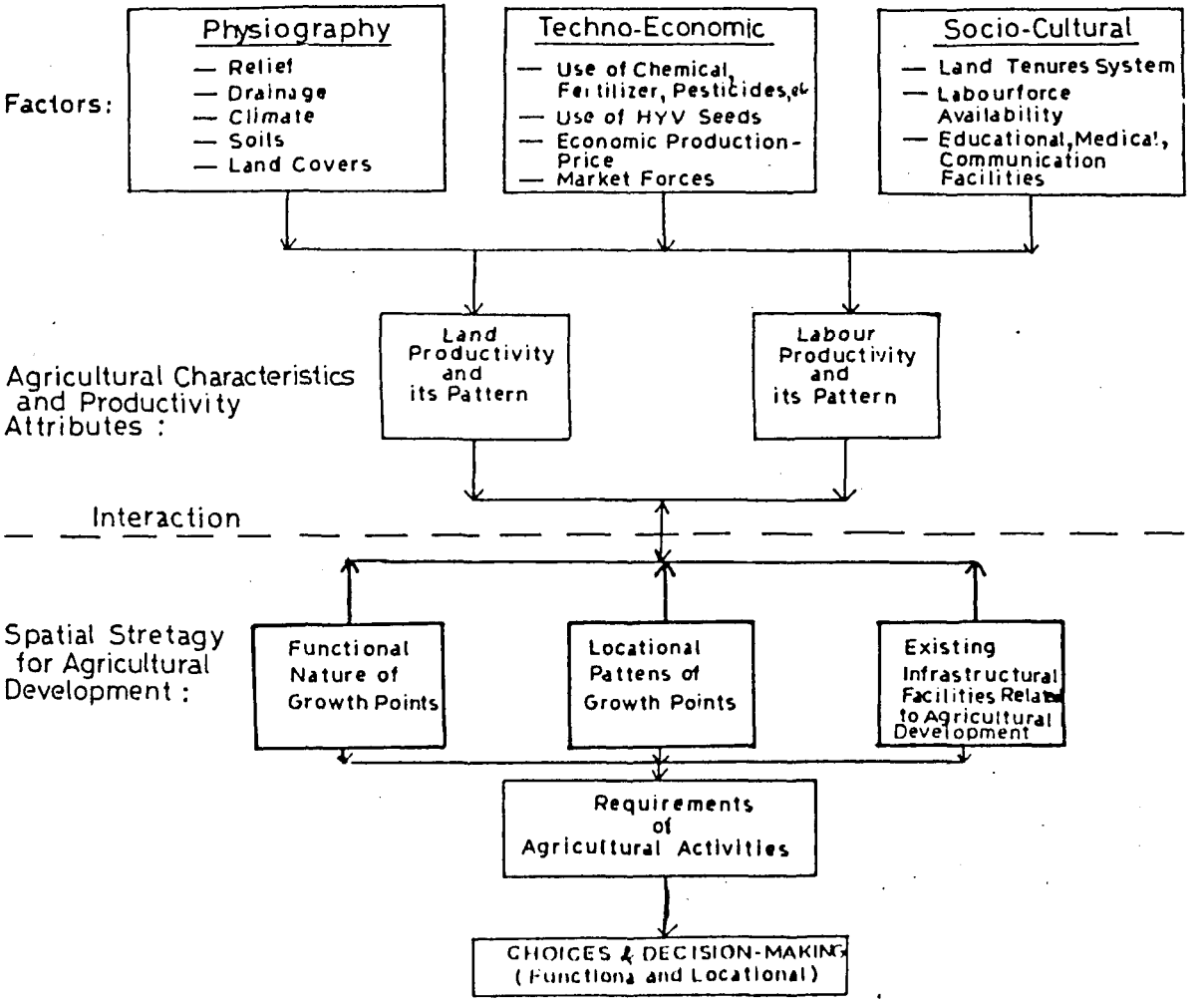

Fig-2.3

criterion on technological progress. Labour input is insignificant in agricultural production systems in these countries because of limited supply of labour to the system. But the agricultural operations have different conditions in India, where agricultural production processes are labour dominated and production is produced for local labour. Therefore, "Productivity through Technology" may not be a suitable criterion for Indian conditions. However, modern technology has been playing significant role after green revolution in the operation of farming systems in India not in its dominance form but in the form of complementary of labour.

Keeping this discussion in mind, these strategic aspects for understanding the development of agricultural activities in general and for preparing the plan at micro areal level of Imphal Valley, can be put forward here for the detail discussion.

4.1: Areal Differentiation for Agricultural Phenomena

This strategy is based on the regional analysis and phenomenal synthesis of agricultural activities for identification of homogenous characteristics of operating agricultural production process. There are numerous research works available in those aspects of delineating the areal boundaries of agro-ecological characteristics of land and its uses (Bhat 1976, Planning Commission 1989, NBSS and LUP 1989 and Singh 1994 and 1996). Many strategic aspects on these lines are dealt with the geographers. For example, a classical work of Whittlesey (1936) is recognisable on agricultural system of the world which was later on revealed by Grigg (1969). some aspects of delineating the agricultural regions especially in India are described by Ashok Mitra (1961), Ayyer (1969), Rao (1976), Hussain (1976) Sengupta and Sdasyuk (1986), Dhillion and Singh 1992 and Singh (1994).

4.2: Infrastructural Development

This is also equally important strategic aspect for the development of agricultural activities in an area as well as socio-economic development. Road, electricity, and communications are main elements of basic infrastructure for development. Power consumption for agricultural production processing the intensity and accessibility of road network and effective means of communication may be introduced as main elements of infrastructure for preparation of plans of agricultural sector of the economy.

However, irrigation and construction of dams and reservoirs are directly related to the agricultural development in any area.

If these elements of infrastructure are considered as basic elements for the development of agricultural landscape, then emerging market forces and their agglomeration may be the another important attributes of development which form the concept of spatio-functional organisation in which roads and electric grids are considered the elements of radiating the effect of market forces in the remote areas.

4.3: Spatial Organisation of Agricultural Activities

There are various strategic points which may be discussed here for organising the space of agricultural landscape. In fact, the concept of 'geo-economic space' has its significance in this context is an important to note here that it has an integrated view of the elements of space on which the strategy for agricultural development can be prepared. They are:

(i) Population of an area- which creates demand and provides labour for accelerating the agricultural activities for a particular area,

(ii) Agricultural production processes - which are related to the secondary activity of agricultural landscape. But these activities require proper location and organisation for processing the agricultural surplus of the area or supplying the modern technological inputs to the agricultural intensification, and

(iii) the location of these agricultural activities. Location is an important element of space through which agricultural production surplus is distributed to the local people, transported to market centres and processed for generating extra income in the area.

The development of agricultural activities through this strategy is suggested by adopting 'market oriented development approach' for maximizing profit of agricultural activities by choosing of its optimal locations. Infact, pooling of agricultural activities (the concept of agglomeration of agricultural activities) and settlement hierarchy of those activities developed a concept of 'agro-space development' through which the functional nodes and their interactions are studied to strengthen the weak links of spatial organisation activities (Philbrick 1957,Perroux 1965, Boudeville 1966, Misra 1968

and 1983, Subramaniam and Pal 1977, Singh 1979, Whyte 1982, Hermansen 1971, Kumaran 1983 and Srivastava 1992)(Fig.-2.4 a&b). Thus, the growth centre approach to the development of agricultural activities are equally important for strengthening the locational processes and optimal features of geo-agro space. In brief, it can be said here that the 'distance - location relationship' and intensity of spatial interaction of agricultural activities must be studied to understand the weak point of stagnant conditions of agricultural productivity and low growth. A device for spatial system of agricultural activities can be also suggested for future planning. Infact, one can suggest an appropriate and optimal working of the systems prevailing in agricultural landscape through this strategic approach specially for micro areal unit like Imphal valley.

5.0: Methods Used and Data Collection

Following the conceptual background and research questions imposed earlier for pursuing the present research work, it is fact that the methods used here are to be discussed in detail because some important observations can be highlighted and main findings have to be drawn.

5.1:Measurement of Agricultural Characteristics

Influence of the growth points on agricultural landscape can be visualised only when the patterns and processes of the agricultural development are studied. Therefore, the measurements of three main attributes of agricultural development, namely, (a) the growth of agricultural production, (b) The land productivity and (c) The labour productivity, and their regional variations, must be studied. For the same purpose, the following methods have been used:

(i) There are various methods to measure the growth of any organism like simple growth measurement, compound growth and Exponental growth rate. According to the trends and stages of agricultural development in the valley, the sample growth rate method may provide the appropriate result for the analysis. Therefore, simple method as given earlier in Equation - I in this Chapter is used here.

(ii) Land productivity is a simple expression of total agricultural output per unit of cultivated area. It has been formulated as:

$$Pl = O/A \quad \ldots\ldots\ldots\ldots\ldots\ldots \quad (II)$$

where, Pl = Land productivity per hectare of cultivated land, O = agricultural output of all crops which has been expressed in physical term i.e., production in quintals, A = area in hectare under farming practices.

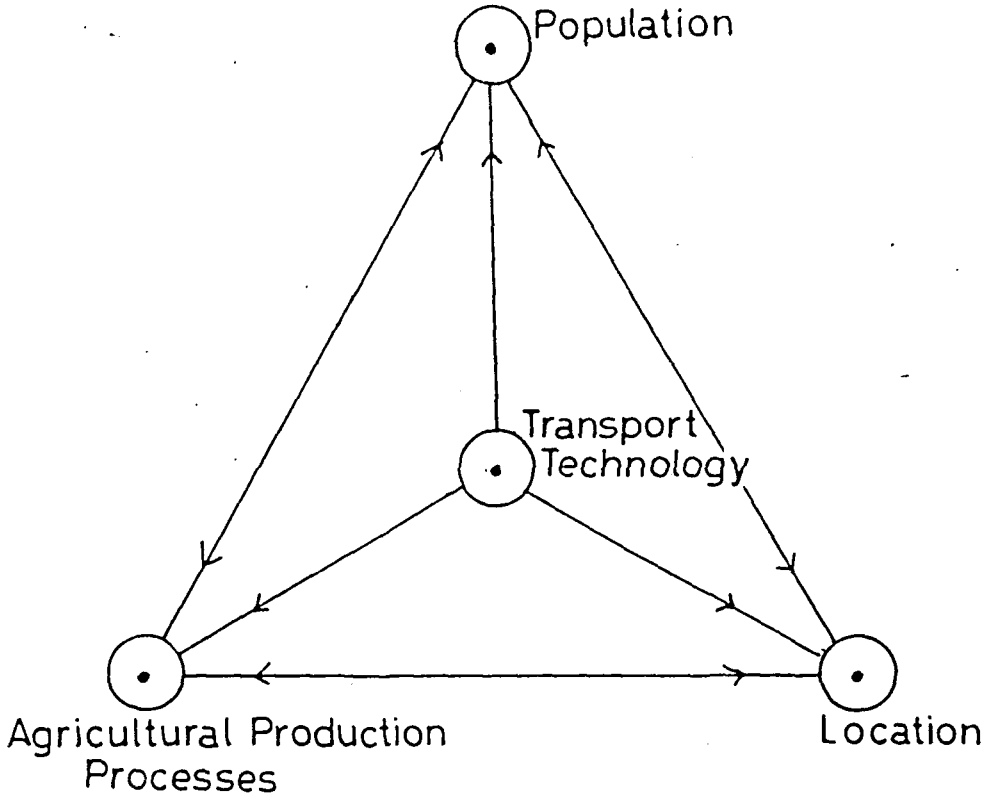

Fig.-2.4a: Interaction Space Attributes

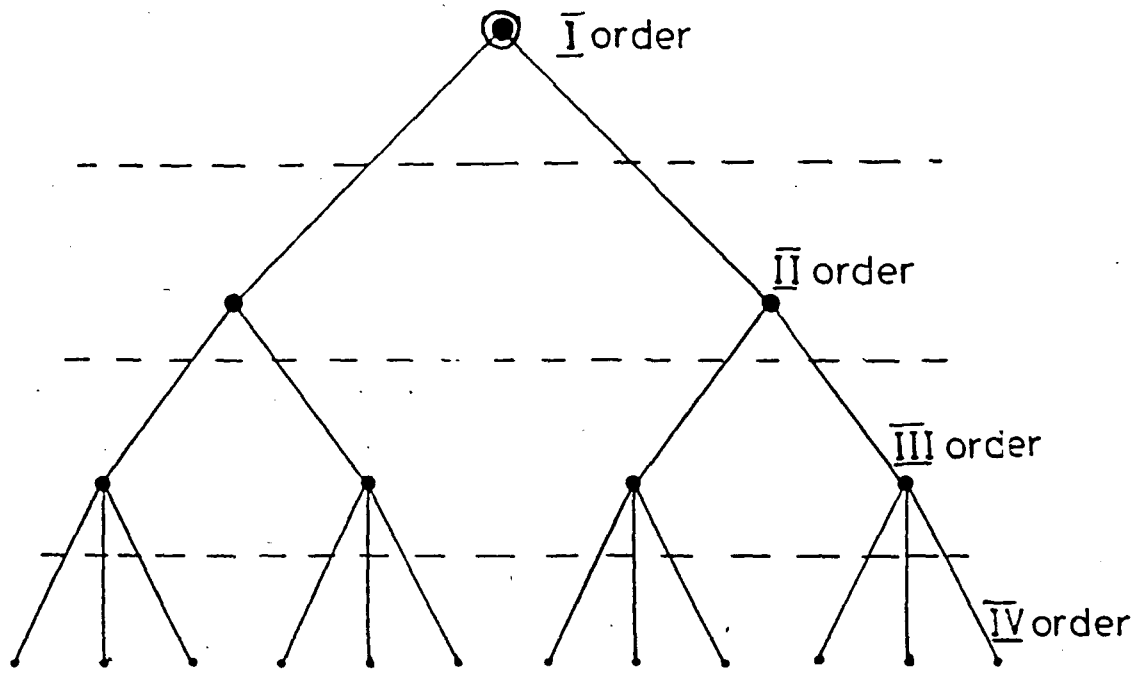

Fig.-2.4b: Functional Hierarchy Model

Therefore, it can be termed here as an average crop-yield per hectare. Thus, the village-wise average crop-yield index of three types of paddy crops, namely, ***Angangphou*** (i.e. , early paddy), ***Phourel,*** (late paddy), and ***Taothabi,*** (low-land paddy) of Imphal valley has been calculated in the following manner:

$$I_y = [A_1 Y_1 + A_2 Y_2 + A_3 Y_3)/(A_1 + A_2 + A_3)] \ldots\ldots\ldots\ldots\ldots\ldots \text{III}$$

Where I_y is the average crop yield index of all types of rice crops,

Y_1, Y_2 and Y_3 are yield (in q/ha) for each crop, and
A_1, A_2 and A_3 is total area under corresponding crops.

(iii) Labour productivity is also another main attribute of agricultural development which is defined as agricultural output per worker engaged in agricultural activities, i.e., (O/L). Thus, the village - wise labour productivity is assessed by dividing total output by total agricultural workforce as,

$$LP = O/L, \ldots\ldots\ldots\ldots\ldots\ldots \quad (IV)$$

Where LP = Labour productivity, O = output by three rice crops in quintals, and L = total labour force engaged in agricultural operation.

Since the farm-labour intensity (L/A), is an important factor of agricultural productivity, the village- wise labour intensity map has been prepared to compare labour intensity patterns with the patterns of agricultural productivity.

5.2: Methods for Identifying Growth Points/Centres

Growth points/growth centres are, therefore, identified in Imphal valley by adopting the permutation and combination method of four parameters of the characteristics of growth and development of villages as well as urban centres of the area. They are:

(a) Population size of the villages of the valley according to 1991 census,

(b) Annual growth rate of population more than 5.0 percent during 1981-91.

(c) Numbers of functional strength available more than 4 in numbers, and

(d) Administrative status of the villages/Urban centres like large village, Notified Town and Census Town and Municipality Corporation, etc.

More details regarding the operational parts of the methods used for identifying the growth points are given in the concerned Chapters.

5.3: Measurement of Centrality

The aggregated picture of functional diversities of selected growth points/centres is shown by using 'centrality score method' as given by Bhat, et.al (1976). Functional weightage (Wi) are assigned here to consider the the total number of growth points (N) divided by number of points/ locations having functions and facilities, (fi), i.e.,

$$Wi = N/fi \quad \text{..... (V)}$$

After calculating the composite centrality score for all the agricultural functions/ facilities by using 'weighted mean technique', the spatial ordering of functional hierarchy are prepared on the basis of nesting hierarchy.

5.4: Measurement of Food Requirements

The study related to the evolving patterns of production surplus/ deficiency is an important to test the validity of the facts, how growth points are working in the area of deficient/surplus production in its hierarchic way. Therefore, the village -wise surplus/ deficiency of production is also assessed by considering the availability and requirements of foodgrains in the valley. It is formulated as:

$$S/D = (A - R), \quad \text{..... (VI)}$$

Where, S/D = total amount of production surplus/deficient (in qu.), A = total agricultural production of the village (in qu.), and R = total annual requirement of the village (in qu.) which is calculated as:

$$R = \frac{[(0.9 \text{ kg/day} \times 365 \text{ days} \times \text{Total population})]}{100} \quad \text{.....(VII)}$$

5.5: DATA COLLECTION

In order to interpret the regional patterns of agricultural productivity (land as well as labour), and locational patterns of agricultural activities/enterprises, the village-wise statistics related to cropping patterns, crop-yield; agricultural labour force and agricultural infrastructure and administrative facilities are required. For the same, the statistics have been collected from the secondary as well as primary sources as given below:

(i) Agricultural as well as other related statistics have been collected from the offices of the district and sub-divisional headquarters located in Imphal Valley.

(ii) Crop-yield statistics collected from the Agricultural Offices, Government of Manipur, and National Sample Survey Organisation (NSSO), Department of Economics and Statistics, Government of India.

(iv) Cropping-patterns and agricultural landuse statistics have been collected from the various offices of Sub-Divisional Officers (SDO), Sub-Divisional Collectors (SDC), and Directorate of Settlements and Land Records, Government of Manipur, Imphal,

(iv) Data related to agricultural functions, facilities/enterprises have been collected Primary Economic Census Abstract from Directorate of Economics and Statistics, Government of Manipur, Imphal, Village Directory Abstract from the Census Operation, and National Informatic Centre (NIC), Imphal, and

(v) village-wise statistics related to demographic structure like, occupational structures, agricultural workforce etc. have been collected from the National Informatic Centre, Imphal, and Census Operation (Imphal), Govt.of India.

Testing the validity of spatio-functional organisation which is working in Imphal valley, the data related to the sources of farmers family income according to the various sizes of land holding are required because the functioning of spatio-functional organisation is directly related to income of the rural families. For the same, the data of 50 households belong to farming community who are living in Central part of the valley have been collected by preparing the questionnaires and compiling them at primary level.

more in the concerned Chapter. Now, the attributes of agricultural development that are agricultural productivity and growth should be studied in the next Chapter.

6.0: Concluding Remarks

The preceding parts of the present Chapter discuss the conceptual frame and review of literature related to agricultural development in general as well as for studies done in India. Since the theme of the present work is especially related to the growth centres approach for agricultural development, the main emphasised in the present Chapter is to be given only on the regional and spatio-functional organisation approaches which are relevant for justifying the effects of emerging nodes of market forces on the agricultural landscape of its initial phase of development.

Of course, road and power consumption are basic elements of infrastructure for the development of agricultural activities. These elements help for radiating the effect of modern technology in area. Therefore, these elements would be considered as the part of spatio-functional organisation. Road and power consumption are basic infrastructure through which the agricultural activities can be intensified to develop agro-industrial base in rural areas. Secondly, Market centres as economic nodes of the area can be recognised as 'radiators' of the effects of economic activities. Thus, growth points and their effects on agricultural landscape can be seen by adopting two approaches of the present study as:

(a) the regional approach of interpreting the agricultural production phenomena by which areas of weak agricultural development can be identified.
(b) The growth centre approach by which role of emerging nodal points in developing the agricultural landscape may be followed for studying the diffusion as well as concentration processes of agricultural development and growth. Therefore, our discussion should be proceeded to follow these approaches to discuss the methods for preparation of the strategy of agricultural activities occurring in the study area.

Chapter - III

AGRICULTURAL GROWTH, PRODUCTION AND PRODUCTIVITY

1.0:Introduction

Before interpreting the role of growth centres in agricultural landscape of Imphal valley, it is important to discuss here that the agricultural growth, the level of agricultural development and their patterns must be analysed to understand the process of the development structure and its main elements which are directly or indirectly related with the functions performed by the growth centres in the area. Therefore, this Chapter has a great significance in connection with finding out the causes of agricultural growth and level of agricultural development for establishing a relationship between the functional structure of centres and development patterns. Thus, the main emphasis in the Chapter has been given to search explanation of genesis of agricultural development.

In fact, agricultural development in Imphal valley is closely related to three main aspects of agricultural activities. The growth of agricultural production, the total output level and the productivity of land as well as labour and the factors of agriculture.

Furthermore,the significance of agricultural production and productivity can also be realised because total amount of agricultural production in the valley is not sufficient for fulfilling the food requirements of the area, despite of its favourable agro-ecological conditions. Keeping these aspects in mind, the agricultural production, growth, productivity and their areal patterns are described here.

2.0: General Trends of Agricultural Production

Agriculture of Imphal valley is characterised by its three main aspects:

(a) There is a dominance of cultivation in the features of agricultural landuse. Thus, farming practices are crop-dominated in which paddy is the first ranking crop. There-

fore, 'monoculture' is the main characteristics; more than 92 percent of the cultivated land is under paddy crop and, therefore, there is unified cropping pattern evolving in the valley,

(b) The agricultural land-use is not intensified by the means of modern technology. Therefore, agricultural production systems are labour-dominated; the major share of local workforce is employed in cultivation practices.

(c) The growth and level of agricultural production are directly influenced by the local demand for food. As a result, it appears to be a stagnant conditions of production processes, though there is a deficiency of food in the area. Thus, the patterns of agricultural development must be based on those characteristics of agricultural activities in the valley.

So far as general trends of agricultural production are concerned, it is obvious that the only two foodgrain crops; rice and maize, are important which change the agricultural production in the area. The trends of crop production which have already been described earlier in chapter-I (Figs.-1.7 & 1.8), can be highlighted in detail in the present context. The following salient features of these trends as:

(i) There is a gradual increase in production specially in foodgrains but the general tendency of increase is based on paddy production from 1953-54 to 1993-94.

(ii) During the period of time taking into consideration (1953-54 to 1993-94) for visualising the trend of agricultural production, it is clear that there is a fluctuating tendency of production increase especially for foodgrains. For example, during early and late 1980s, there is a record decline in the food production especially in 1982-83

and 1989-90 which fluctuate the tendency of increase (Table-3.1). It might be due to the irregularities observed in the climatic conditions of the area during the corresponding years.

Table: 3.1: Trends of Agricultural Attributes in Manipur State (1953-54 to 1993-94)

(Population , Area and Production in Percent)

Year	Rice		Total Foodgrains		Total population
	A	P	A	P	
1950-51	-	-	-	-	100.00
1953-54	100.00	100.00	100.0	100.00	------
1960-61	94.12	195.45	90.34	196.21	135.07
1961-62	83.33	160.60	90.40	160.60	------
1970-71	-	-	-	-	185.71
1972-73	83.33	230.55	85.56	268.21	------
1975-76	100.68	418.82	106.54	458.83	------
1980-81	107.16	413.64	113.79	442.27	245.99
1981-82	95.63	383.48	100.56	399.85	------
1982-83	90.06	332.58	94.41	348.64	------
1983-84	91.59	387.27	96.05	404.70	------
1985-86	93.52	503.79	96.21	525.91	------
1986-87	93.81	367.42	97.51	392.27	------
1987-88	94.20	473.94	95.54	489.55	------
1988-89	94.94	417.58	97.80	436.06	------
1989-90	92.27	371.36	94.46	393.94	------
1990-91	89.43	415.45	91.53	432.12	318.05
1992-93	126.14	463.64	150.28	550.76	------
1993-94	123.86	606.06	150.56	709.85	------

Abbreviations: A= Area and P= Production

Table-3.2: Area and Production of Principal Foodgrain Crops in Manipur state(1953-54 to 1993-94)

(Area in '000 ha, Production in '000 tons)

Year	Rice		Maize		Wheat		Pulses		Total Foodgrains		Total Population
	A	P	A	P	A	P	A	P	A	P	
1950-51*	-	-	-	-	-	-	-	-	-	-	5,77,635
1953-54*	176.0	66	-	-	-	-	-	-	177.00	66.0	-
1960-61**	159.0	129.0	0.04	0.20	0.50	0.50	-	-	159.90	129.5	7,80,037
1961-62*	160.0	106.0	-	-	-	-	-	-	160.00	106.0	-
1970-71	-	-	-	-	-	-	-	-	-	-	10,72,753
1972-73***	146.6	152.16	7.90	12.42	0.27	0.20	5.60	2.68	151.45	177.02	-
1975-76***	177.19	276.42	10.86	23.89	0.53	0.76	5.55	2.06	188.58	302.83	-
180-81	188.60	273.00	9.90	17.80	-	-	6.50	2.40	201.40	291.90	14,20.953
1981-82	168.30	253.10	5.60	9.20	-	-	2.90	1.10	178.00	263.90	-
1982-83	158.50	219.50	5.30	9.00	-	-	4.10	1.60	167.90	230.10	-
1983-84	161.20	255.60	4.70	10.40	-	-	4.10	1.60	170.00	267.10	-
1985-86	164.60	332.50	5.70	14.60	-	-	-	-	170.30	347.10	-
1986-87	165.10	242.50	7.50	16.40	-	-	-	-	172.60	258.90	-
1987-88	165.80	312.80	3.30	10.30	-	-	-	-	169.10	323.10	-
1988-89	167.10	275.60	6.00	12.20	-	-	-	-	173.10	287.80	-
1989-90	162.40	245.10	4.80	14.90	-	-	-	-	167.20	260.00	-
1990-91	157.40	274.20	4.60	11.40	-	-	-	-	162.00	285.20	18,37,149
1992-93+	218.50	306.00	16.50	23.00	-	-	26.00	24.50	266.00	363.50	-
1993-94+	222.00	400.00	16.50	34.00	5.0	10.0	23.00	24.50	266.50	468.50	-

Source: (i) * Statistical Abstract of the Indin Union, 1962, Department of Statistics, Govt.of India
(ii) ** Economic Progress in Figures, 1987, Directorate of Economic & Statistics, Govt. of Manipur.
(iii)*** Economic Review, 1978-79,Directorate of Statistic,Govt.of Manipur.
(iv) Directoratre of Economics & statistics, Govt.of Manipur
(v) Basic Statistics-1992 and 1995, N.E.C, Shillong.
(vi) + Annual Administrative Report, 1992-93 & 1993-94, Deptt.of Agriculture, Govt.of Manipur.
(vii) Census of India, 1951,1961,1971,1981 and 1991, Manipur.

(iii) Overall, there is a gradual increase in the food production from 66 thousand tonns (1953-54) to 363.5 thousand tonns (1992-93). Therefore, there is a gradual increase of food production as an annual rate of 16.3 percent during twenty two years of time of pre-green revolution (1953-54 to 1975-76). However, the annual rate of increase in the foodgrains was recorded lower during post- green revolution period of nineteen years(1975-76 to 1993-94). It was 2.9 percent annual rate from 302.8 thousand tonns in 1975-76 to 468.5 thousand tonns in 1993-94. It reflects that there is no impact of green revolution (seed-fertilizer technology) on the agricultural landscape of Manipur State (Singh 1997) (Table- 3.2).

(iv) It is interesting to note that there is a marginal increase in the total volume as well as percentage share of agricultural production during the last 40 years (from 1953-4 to 1993-4). however, there is a marginal decline in the area of foodgrain crops specially from 1953-4 to 1990-1 and, after that, it increase fast (Table-3.2). It means that there might be a record increase in crop-yield rather than crop-area of the foodgrain (Fig-1.8).

(v) Comparing tendencies of population increase as well as foodgrain increase, it has already been noted that the increase in population is still faster than the increase of total amount of foodgrain. Therefore, there is a still record deficiency of food which has been required to be transported from the outside of Manipur State. It is not the symbol of well-balanced development in agricultural activities. Thus, the area does not have much surplus of the agricultural products to be processed to develop the agro-base industries in the area. It is the symbol of low growth with very low productivity of the agricultural sector as well as the undeveloped conditions of agricultural activities. The causes of low growth and productivity may be interpreted in separate section of this Chapter, but there is a need of emphasising the growth pattern of agricultural production.

3.0: Patterns of Agricultural Production Growth

Methodological aspects of measuring agricultural growth have already been discussed in Chapter-II. According to the growth formula (Equation -I), it is obvious that growth between two points of time of any organism is a proportionate change in the

total volume of its quantity from the base-year. Thus, the growth of agricultural crops can be assessed by taking into account district-wise statistics of the total production of the principal crops from 1986-87 (base-year = Po) to 1993-94 (current year= Pi) which is a period of eight years.* The patterns of agricultural growth for the period of eight years of time have been shown by considering district-wise data of various crops and then, the explanation of areal variations of agricultural growth is also mentioned.

It can be revealed from the data that the growth of production of cereal crops as well as non-cereal crops is based on local demand. The population of the valley is increasing faster in its rate. The demand of food is to be made out by increasing the agricultural crop production. But its growth rate is lesser than population growth. The causes of low agricultural growth can be found out by going through the inherent characteristics of production increase and changes in its main components. Yield components of all principal crops have been increasing at slower rate than the increase of crop-area in Imphal valley. It means that there might be significant change in the land-use patterns from waste land of non- agricultural uses to agricultural landuse during 1986-87 to 1993-94. It reflects that the expansion processes are prevalent in agricultural landscape of Imphal valley rather than the intensification of production processes. It shows the weakness of 'yield-augmenting techniques'in the area. Thus, the seed-fertilizer technology of agricultural activities must be intensified in future. For more detail, one should be interpreted the productivity pattern to find out its regional variations and causes of low productivity and stagnant conditions of agricultural development in the Imphal valley.

There is a significant increase in the total volume of agricultural production (cereal and non-cereal crops) of about 85.3 thousand tonns in Imphal district, 92.6 thou-

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*On account of non-availability of the statistics of area, production and yield for various principal crops at district level for a continuously long period of time, the detail study of agricultural growth have been done by taking into acount only for eight years. There are many reasons for non-availability of agricultujral statistics. It might be due to re-organisation of district boundry during 1970, and the loss of the record of agricultural statistics at district headquarters as well as sub-divisional level during early and late periods of 1980s.

Table-3.3: District-wise Area, Yield and Production of principal Crops in Imphal Valley (1986-87 and 1993-94)

Area in `000 ha., Production in `000 tonns, and Yield in qu./ha.

		1986-87			1993-94		
		Imphal	Thoubal	Bishnupur	Imphal	Thoubal	Bishnupur
(A) Cereal Crops							
1. Rice	A	51.18	33.21	17.45	61.59	45.81	33.60
	Y	15.65	14.40	16.55	25.35	25.45	23.75
	P	80.10	47.81	28.88	156.10	116.60	79.80
2. Maize	A	0.76	0.01	-	0.90	1.50	0.70
	Y	16.71	10.00	-	22.22	20.00	22.86
	P	1.27	0.01	-	2.0	3.00	1.60
(B) Non-Cereal Crops (All Crops)**	A	8.26	4.22	0.96	8.15	7.45	7.65
	Y	23.38*	21.52*	24.86*	34.37	40.09	35.67
	P	19.31	9.08	2.39	28.01	29.87	27.29
Total	A	60.20	37.44	18.41	70.64	54.76	41.95
	Y	16.72	15.20	16.99	26.35	27.30	25.91
	P	100.68	56.90	31.27	186.11	149.47	108.69

N.B: * Average yield for non-cereal crops (1986-87) are provisional which have been calculated by lenear regression equation.

** Pulses, Pea, Rape ,Mustard, Chillies, Cabbage, vegetable, Potato, and Sugarcane.

Abbreviations: A= Area, Y= avorave yield, P= Production.

Source: (i) Manipur At a Glance- 1987

(ii) Annual Administrative Report 1993-94, Agricultural Deptt.,Govt.of Manipur.

Table-3.4: District-wise Growth in the Area, Yield and Production of Various Crops in Imphal valley (1986-87 to 1993-94)

(Area in '000 ha, and Yield in qu./ha, Production in '000 tonns)

		Absolute Change			Percentage Change		
		Imphal	Thoubal	Bishnupur	Imphal	Thoubal	Bishnupur
(A) Cereal Crops							
1. Rice	A	+ 10.41	+12.60	+16.15	+ 20.34	+ 37.94	+ 92.55
	Y	+ 9.70	+11.05	+ 7.20	+ 61.98	+ 76.74	+ 43.50
	P	+ 76.00	+68.79	+50.92	+ 94.88	+143.88	+176.32
2. Maize	A	+ 0.14	+ 1.49	+ 0.70	+ 18.42	+149.00	+100.00
	Y	+ 5.51	+10.00	+22.86	+ 32.97	+100.00	+100.00
	P	+ 0.73	+ 2.99	+ 1.60	+ 57.48	+299.00	+100.00
(B)Non-Cereal	A	(-) 0.11	+ 3.23	+ 6.69	(-) 1.33	+ 76.54	+696.86
	Y	+ 10.99	+18.57	+10.81	+ 47.00	+ 86.29	+ 43.48
	P	+ 8.70	+20.79	+24.90	+ 45.05	+257.30	+104.18
Total (Creal +Noncreal)	A	+ 10.44	+17.32	+23.54	+ 17.34	+ 46.26	+127.86
	Y	+ 9.63	+12.11	+ 8.92	+ 57.60	+ 39.67	+ 52.50
	P	+ 85.43	+92.57	+77.42	+ 84.85	+162.69	+247.59

Abbreviation: A=Area, Y=Yield, and P= Production.

sand tonns in Thoubal and 77.4 thousand tons in Bishnupur districts during the eight years period of time from 1986-87 to 1993-94 (Table-3.3). It reveals that there is a record proportionate increase in Bishnupur district (248 percent) during the same period of time while Thoubal district is also recorded faster growth of agricultural production (162.7 percent). The faster growth of agricultural production in Bishnupur might be because of record increase in the area under agricultural crops (127.8 percent) as specially in the non-cereal crops (696.88 percent) during the same period of time (Table-3.4).

In detail, it can be revealed from the Table-3.4 that there is a gradual increase in the percentage share of area and yield of rice and maize cereal-crops in the valley. Production of rice is also recorded increasing in all three districts of the valley at a significant rate of about 94.88 percent, 143.88 percent and 176.32 percent in Imphal, Thoubal and Bishnupur districts respectively. On the other hand, increase in the production of maize crop is recorded at highest rate in Thoubal district (only 299 percent) followed by Imphal district (57 Percent). Further, a significant increase in the production of non-cereal crops is also recorded marginally during the same period of time. But the area under non-cereal crops is decreasing marginally (1.33 percent) in Imphal district while Bishnupur district shows increasing trends of the area and yield of non-cereal crops. The pattern of agricultural growth may follow agricultural productivity pattern because growth influences productivity.

4.0: Patterns of Agricultural Productivity

Productivity is one of the most important determinants of agricultural development. (Jonston and Kilby 1975, Swant and Ganguli 1983, Abdul Munir 1991, Rahman and Singh 1992 and Singh 1997) Therefore, agricultural productivity and its regional variations are highlighted here by taking into consideration of its factors.

Agricultural productivity, is a relative term with reference to the factors of agri-

cultural operations (mainly two: natural factors of land which refers to the land productivity, and, secondly, the labour which is employed in the operation of production processes; it refers to labour productivity). While technology is also one of the factors or agricultural and agricultural productivity, but it is insignificant and negligible in its application in Imphal Valley. The emerging patterns of agricultural productivity can be studied by considering its two main aspects: (a) The land productivity as well as (b) labour productivity.

4.1: Land Productivity and Its Areal Pattern

As stated in the earlier Chapter -II, land productivity is weighted mean the crop-yield index of all principal crops per areal unit. While rice is only the dominating crop in Imphal valley, therefore, land productivity has been calculated to consider only three rice crops, namely: early paddy (the anganphou) late paddy (phourel) and low land paddy (taothabi). Further, it can be said that land productivity can be assessed in its physical terms (i.e. agricultural production in quintal per ha.) or in terms of its money value (i.e. agricultural out put in rupee per ha.). The conversion of physical product into money value is only the matter of considering the market prices of the agricultural products. Since the crop production is being used in local market for local consumption and it does not influence the regional as well as national market through its supply; the prices of crop-production do not influence much the pattern of agricultural productivity. As a result, the price factor of crop product is not taken into consideration for the calculation of land productivity in Imphal valley.

After calculating land productivity per ha. of agricultural land (i.e. average yield of rice crop per ha.) for each and every village of the valley by using weighted mean formula as mentioned in Chapter- II, the total number of areal units (villages) have been classified into seven categories of land productivity. The average land productivity of the entire valley is recorded 44.7 qu/ha which refers to a central tendency of the distributional pattern. The productivity value over and above this level are mentioned as High, Very High, Very Very High and Extremely High categories. The reverse in this case is for low productivity. Nearly one third of the entire valley area (i.e. 33.6 per-

Table-3.5: Areal Extent of Land Productivity (Average Yield of Rice in qu/ha) in Imphal Valley.

Sl No.	Categories	Average yield (qu./ha.)	No. of village	Total area (in sq.km.)	% of area to total
1.	Extremely high	(above - 60)	14	21.34	1.64
2.	Very Very high	(60 - 55)	21	60.48	4.65
3.	Very high	(55 - 50)	39	112.26	8.63
4.	High	(50 - 45)	152	436.85	33.61
5.	Medium	(45 - 40)	91	281.28	21.63
6.	Low	(40 - 35)	40	179.47	13.81
7.	Very Low	(below - 35)	32	208.18	14.03
Total area under study			389	1300.14	100.00

Source: (i) Various offices of Sub-divisional Agricultsural Officers and District Agricultural Officers, Government of Manipur.
(ii) Economic and Statistics Department, Government of Manipur.
(iii) Various Offices of Sud-divisional Collectors and Sub-divisional Officers, Government of Manipur.

Table - 3.6: Bivariate Frequency Distribution of Cultivated land Versus Waste land.

Waste Land / Cultivated Land	0-5	5-10	10-15	15-20	20-25	25- <	Total
30 - >	15	4	1	3	2	10	35
30- 40	8	2	2	5	2	7	26
40- 50	8	4	2	5	2	11	32
50- 60	14	12	10	8	4	11	50
60- 70	34	22	20	3	5	3	87
70- 80	33	19	4	8	-	-	64
80- 90	44	16	3	1	-	-	64
90- <	24	1	-	-	-	-	25
Total	180	80	42	31	15	42	392

NB: Categories of Cultivated and Waste lands have calculated in percent to the total area of each and every villages of the Imphal Valley.

cent) which includes a quite significant number of villages of about 152 out of a total 389 have been incorporated in the categories of High level of land productivity (45-50 qu/ha). Most of the areas of the narrow river valleys of Northern upland areas have been found in this category, while Extremely High productivity index is observed in and around Imphal town which includes an area of about 1.6 percent to total valley (Table-3.5 and Fig.-3.1). On the other hand, low productivity areas are observed in the Southern low land of the valley around the Loktak lake.

Since land productivity is closely and directly related to natural factors of land like soil, climatic conditions and topographical factors, it appears in the general patterns of land productivity in Imphal valley that land productivity is directly influenced by the agro-ecological conditions of land. For example, High and Very High productivity is recorded in the upland areas of the north, medium productivity in the Central fertile tract and low and very low productivity level in the Southern low land ecological conditions of the valley. The demand of foodgrains which is related to density of population patterns, is the second cause of variations in productivity patterns in valley. Thus, micro-areal variations in productivity can be seen in the areas of increasing demand of food for rapid growth of population and, therefore, a record change in the general land-use patterns have been realised by changing the waste land to cultivated land. As a result, there is a negative relationship between waste land and cultivated land. It shows that the villages having high percentage share of its land under cultivation have been recorded low percentage share of waste-land. The bi-variate frequency distribution of waste land versus cultivated land shows clearly those facts of negative relationship (Table-3.6 and Fig-3.2).

4.2: Labour Productivity and its Patterns

Labour productivity is also one of the important attributes for agricultural development. Labour productivity has been defined in different ways by many geographers, economists and agricultural scientist. The assessment of production of a farm or economic sector produced by a unit of labour employed in it (Bhalla and Alagh 1983, Singh and Sharma 1985 and Thakur 1987). The statistics of labour productivity for agricultural sector are not available at district or village level in India. However, the

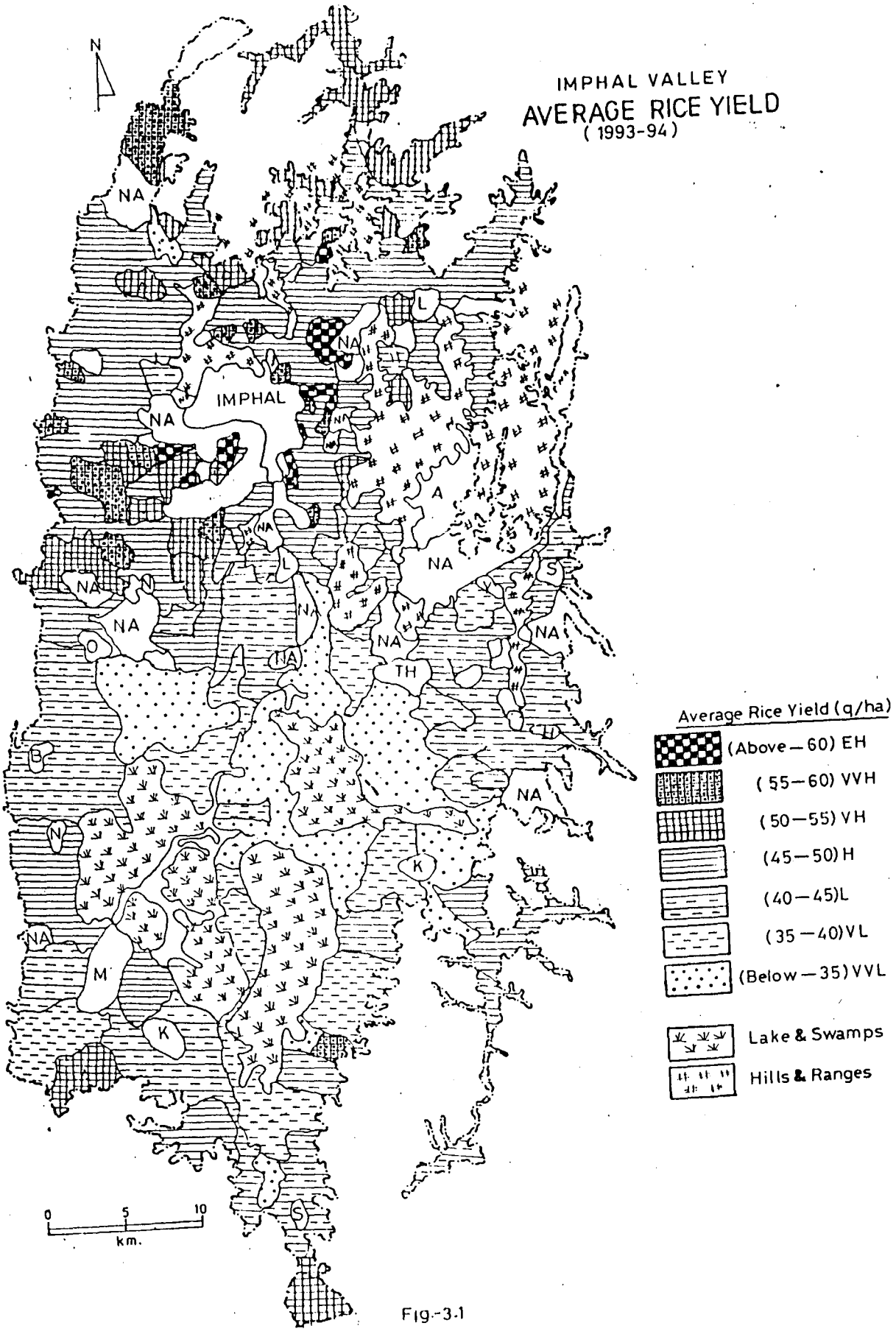

IMPHAL VALLEY
AVERAGE RICE YIELD
(1993-94)
N
IMPHAL
NA
L
A
S
TH
K
M
N
B
O
Average Rice Yield (q/ha)
(Above — 60) EH
(55 — 60) VVH
(50 — 55) VH
(45 — 50) H
(40 — 45) L
(35 — 40) VL
(Below — 35) VVL
Lake & Swamps
Hills & Ranges
0
5
10
km.

Fig.-3.1

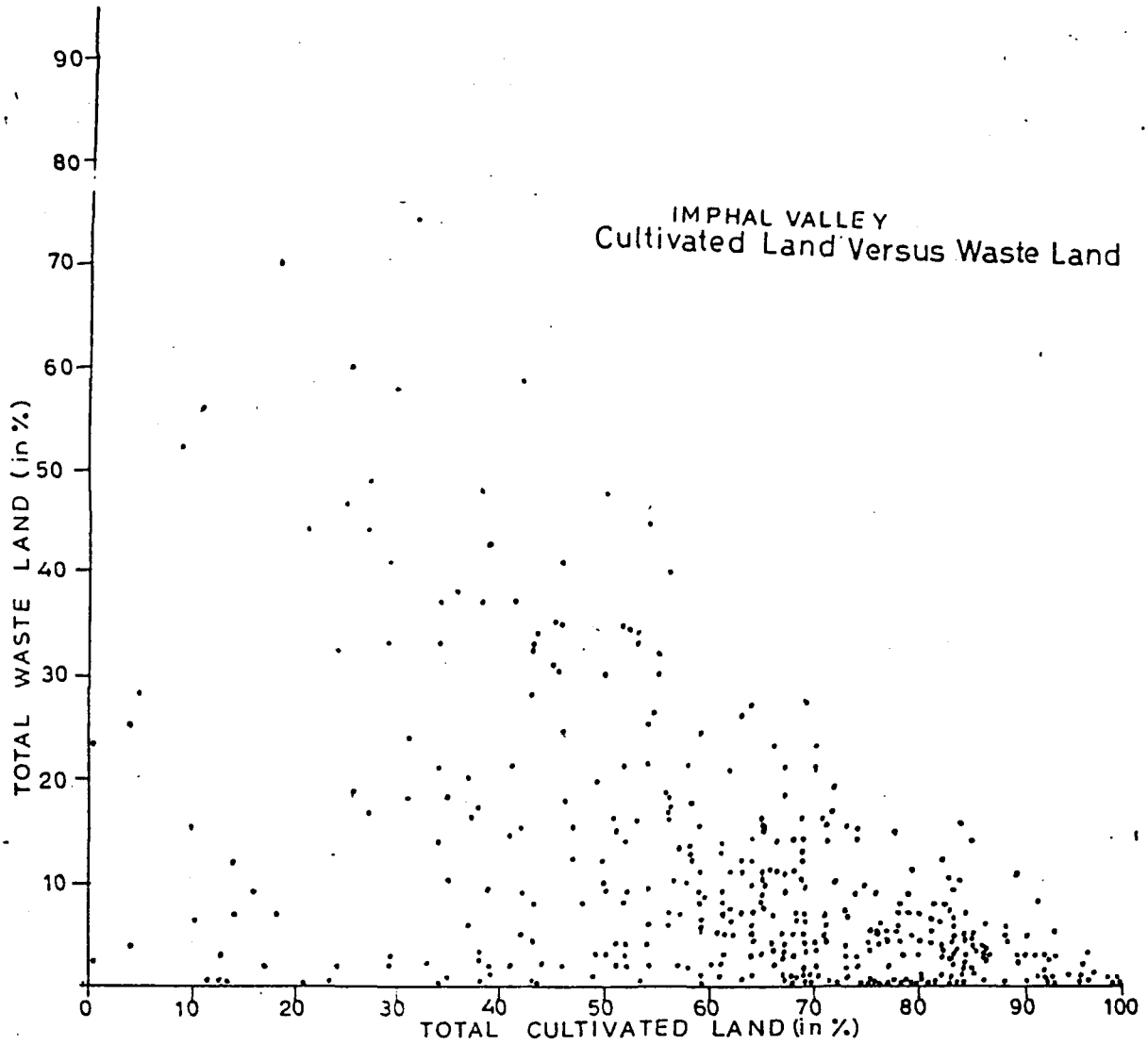

IMPHAL VALLEY
Cultivated Land Versus Waste Land
TOTAL WASTE LAND (in %)
TOTAL CULTIVATED LAND (in %)
0
10
20
30
40
50
60
70
80
90
100

Fig.-3.2

basic statistics on labour productivity for various economy have been collected from the National Sample Survey Organisation, Ministry of Statistics, New Delhi and Economics and Statistics Department, Government of Manipur, by conducting the sample Surveys. The village-wise agricultural labour productivity in the present study have been calculated by dividing the total agricultural output of an areal unit (i.e. village) by the intensity of workforce employed in the agricultural sector. The mathematical derivation of calculating the labour productivity have already been mentioned in Chapter - II (equation -IV) in which labour productivity is the multiplier factor of the main components of agricultural system: (a) the land productivity and (b) the land-labour ratio (Singh 1997, Singh 1994 and Rahman and Singh 1992). They can be considered here as main attributes of labour productivity. It is interesting to note that the second attribute of labour productivity, i.e., land-labour ratio (A/L), is inversely proportional to the farm labour-intensity (L/A). While, on the other hand, land productivity simply shows yield index (O/A) as described earlier in this Chapter. As stated earlier the land productivity is influenced by the physical factors of land and agro-ecological conditions of land. While, on the other hand , labour intensity would also be influenced by the availability and conditions of labour employed in agricultural sector (Singh and Devi 1996). Agricultural workforce and its areal patterns have already been discussed in Chapter-I under the head of Geographical Personality of the study area. However, there is a need of detail study in order to understand the emerging patterns of agricultural workforce intensity (which is defined here as farm labour intensity) with reference to labour productivity patterns of the Imphal Valley. Therefore, the attempts have been made here to focus attention on the labour productivity versus labour intensity patterns in agricultural sector of the valley. It would provide the clues of the importance and significance of labour in operating agricultural production systems in the area.

By adopting above mentioned criteria of labour productivity, the values of labour productivity for each areal unit (i.e., village) of the valley are calculated and then these units are distinguished into seven categories of the level of labour productivity (Table - 3.7). The regional patterns of these categories are analysed in the following manner in identifying the level of productivity classes as:

Table-3.7: Areal Extent of Various Categories of Agricultural Labour Productivity (qu./person) in Imphal valley

Categories of Productivity (qu./person)		No. of Villages	Total Area (in sq.km.)	% of Area to total
1.Extremely High	(Above-60)	46	154.49	13.27
2.Very High	(50 -60)	11	65.86	5.66
3. High	(40 -50)	23	69.17	5.94
4. Medium	(30 -40)	41	146.66	12.60
5. Low	(20 -30)	58	246.31	21.15
6. Very Low	(10 -20)	108	378.51	32.52
7.Exstremely Low	(Below-10)	52	103.18	8.86
Total area under study		339	1,164.00	100.00

(i) **Extremely High Labour Productivity** (more than 60qu/person):It incorporates the area of about 154 sq.Km.(13.27 percent) of the entire valley. There are the emergence of obliterated patterns of extremely high labour productivity specially in the upland areas of the central parts including a few patches in the surrounding of Imphal town(Fig.-3.3).

(ii) **Very High Labour Productivity** (50-60 qu/person): It includes only eleven villages which are dispersed in the surroundings of main towns of the valley and along with the National Highways (No.39) and the State Highways passing through the Moirang- Kumbi towns (Tiddim Road) and New Cachar Road.

(iii)**High Labour Productivity** (40-50qu/person): The level of high productivity can be observed in the upland areas of the North and North- Western parts of the valley with covering of an areas of about 69.17 sq. km.(about 5.94 percent).

(iv) **Low Labour Productivity** (20-30qu/person): It incorporates 58 villages of the valley (the areal extent of 246 sq. Km. with include 21.15 percent area of the total valley). These villages of low productivity are dispersed in a few pockets of foot hills along with the Western side of the valley. They do not form any pattern but reflect low level of productivity in the fertile land of the foot hill areas.

(v) **Extremely Low and Very Low Labour Productivity** (below-20 qu./person):

These categories are also equally important in the valley because they include more than 40 percent land which is dispersed specially in the entire Southern part of low lying marshy lands of the valley. Inspite of newly formed alluvial soils which are favourable for paddy cultivation, there are very low levels of labour Productivity. It may be because of very low level of crop-yield.

4.3: Labour Productivity Versus Labour Intensity in Agricultural Sector.

Visualising the patterns of labour productivity, it can be concluded that agricultural labour intensity might be one of the important causes of its regional variation. Agricultural labour intensity is closely related to agricultural workforce available in

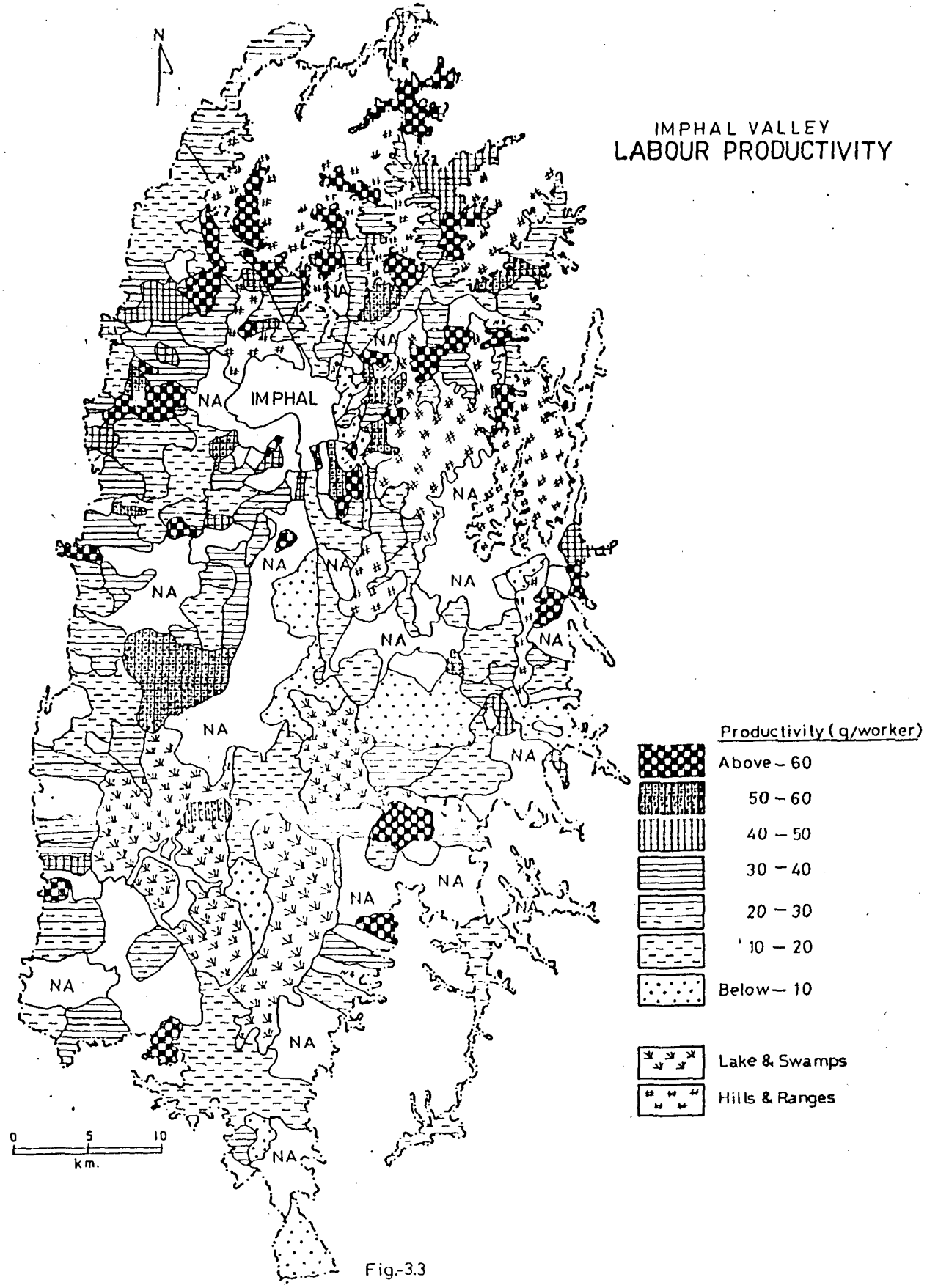

IMPHAL VALLEY
LABOUR PRODUCTIVITY
N
IMPHAL
NA
Productivity (q/worker)
Above – 60
50 – 60
40 – 50
30 – 40
20 – 30
10 – 20
Below – 10
Lake & Swamps
Hills & Ranges
0
5
10
km.

Fig.-3.3

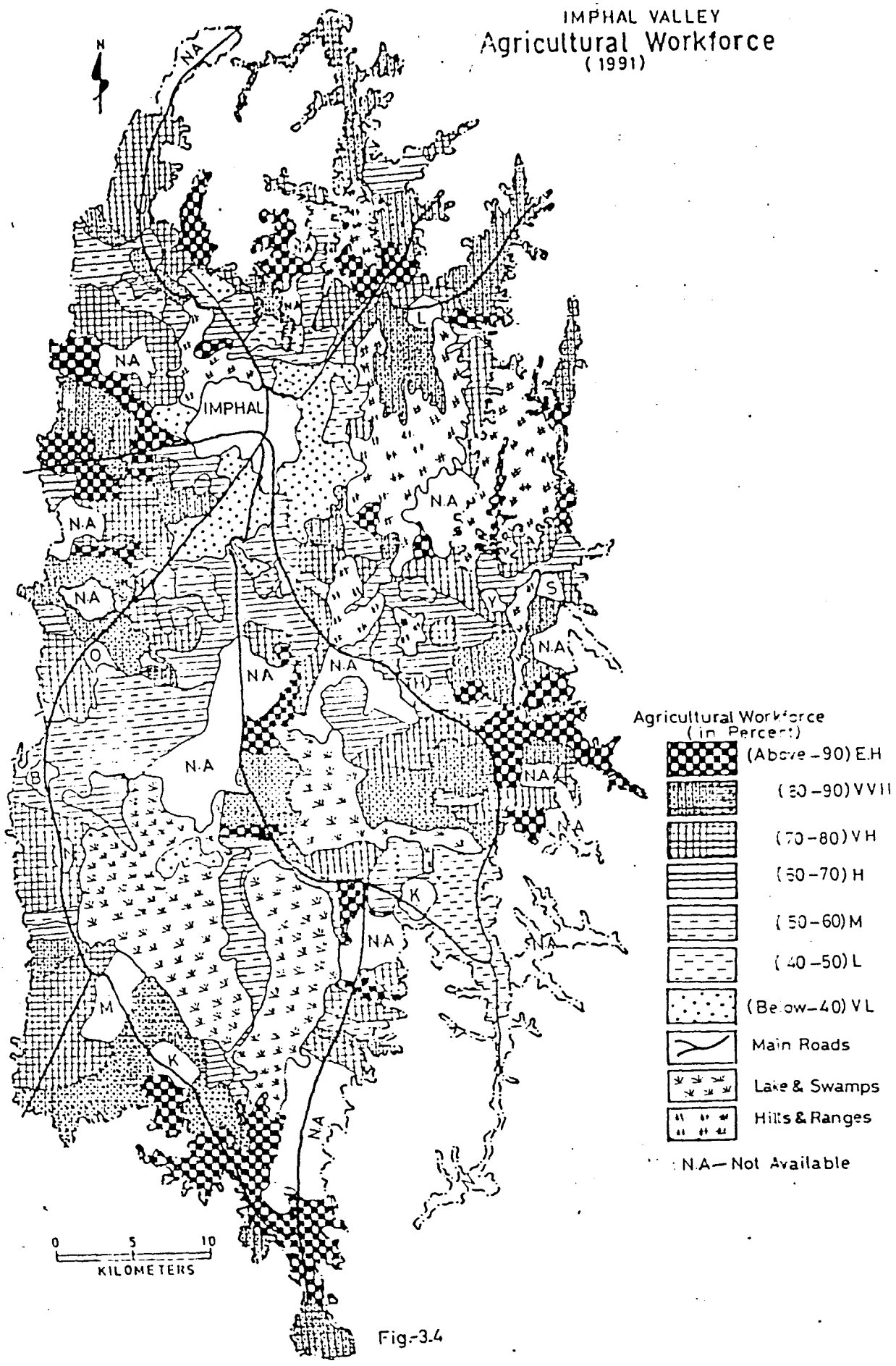

IMPHAL VALLEY
Agricultural Workforce
(1991)
N
IMPHAL
N.A
Agricultural Workforce
(in Percent)
(Above-90) E.H
(80-90) V.H
(70-80) V.H
(60-70) H
(50-60) M
(40-50) L
(Below-40) V.L
Main Roads
Lake & Swamps
Hills & Ranges
N.A—Not Available
0 5 10
KILOMETERS

Fig.-3.4

the area in terms of per areal unit of cultivated land. According to statistics given by Census of India, there is a total volume of available agricultural workforce of about 2.24 lakhs in 1991 which was increased to 77.3 percent during the last thirty years (from 1961 to 1991) (Singh and Devi 1996). So far as regional variations of percentage share of total agricultural workforce is concerned, its distributional pattern shows that the areas of foot hill specially in the upland topography including the extreme Southern parts of valley of Imphal river (the low land of the South) have the higher percentage share of agricultural workforce to total workers
(Fig.- 3.4) (Table - 3.8).

It is interesting to note that there is a significant change recorded in the percentage of agricultural workforce during 1980s. The distributional map of the change of agricultural workforce reveals that the very high increase has been recorded in the areas of central mid-land as well as upland agro-ecological conditions. Generally, 32 percent of the villages of the valley are found under the categories of High and Very High changes in agricultural workforce. The change in the percentage of agricultural workforce is noticed negatively in some areas of high percentage share of agricultural workers which are situated in the foothills of the upland as stated earlier. It means that the percentage of agricultural workforce to total workers is decreasing gradually (Fig.-3.5) (Table-3.9). Thus, there is a migration of agricultural workforce from these areas of its high percentage share. It may be because of saturation conditions of absorbing capability of agricultural workforce.

Labour intensity is noticed main attribute of labour productivity. Since the concentration of workforce has been increasing in agricultural activities, the intensity of labour is also increasing simultaneously. The Census statistics shows that the agricultural intensity has become double during the last thirty years of time. It was 47.24 persons/sq.km. of total geographical areas in 1961 which was raised upto 100.21 persons per sq.km. in 1991. If agricultural workforce intensity is calculated by considering cultivated land of the valley, then the average figures would rise upto 400 persons/sq. km. of cultivated land in 1991. More detail regarding the factors and its intensity pattern of Imphal Valley are given elsewhere (Singh and Devi 1996). However, it is inter-

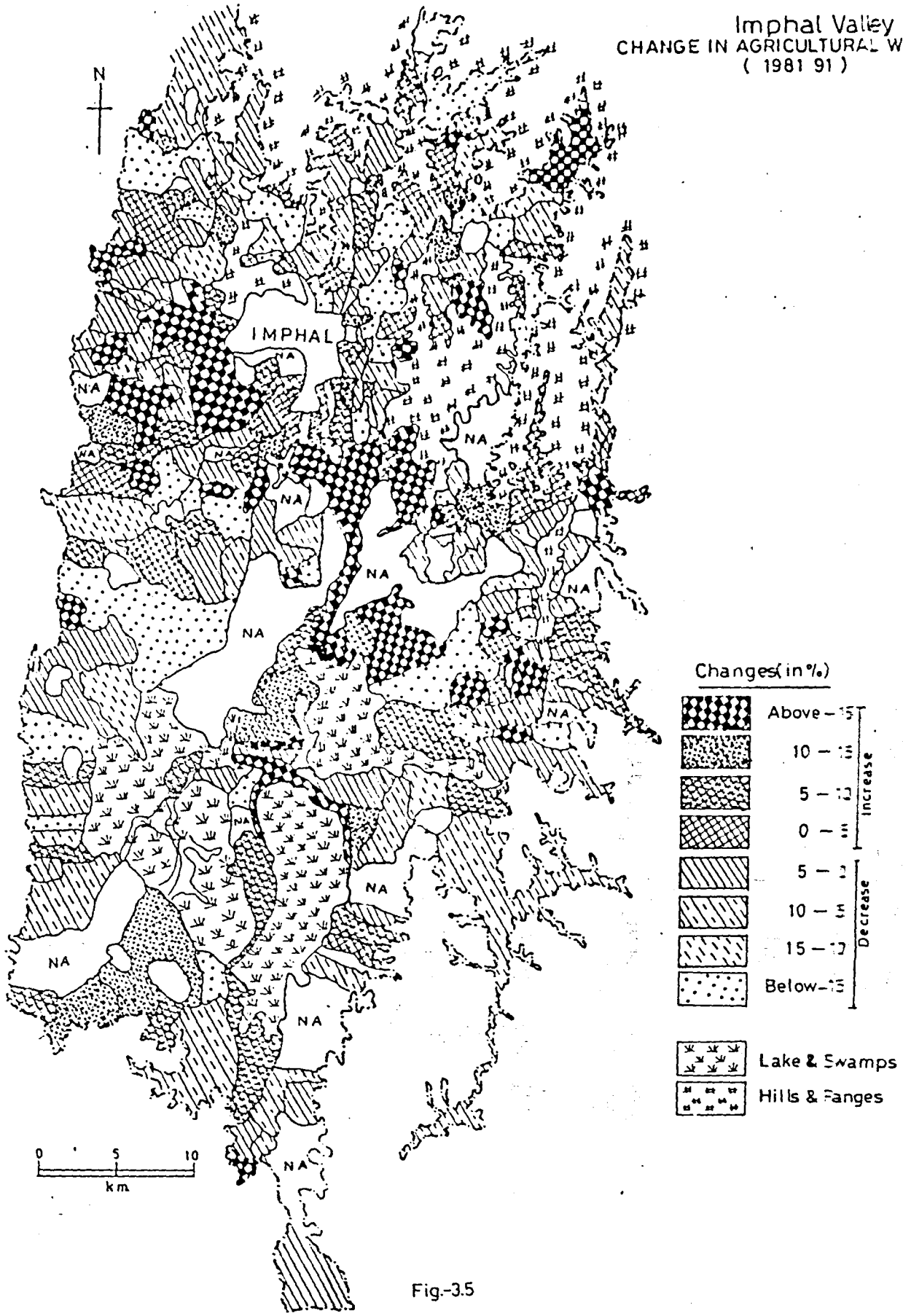

Imphal Valley
CHANGE IN AGRICULTURAL WORKERS
(1981 91)
N
IMPHAL
NA
Changes(in %)
Above – 15
10 – 15
5 – 10
0 – 5
5 – 0
10 – 5
15 – 10
Below – 15
Increase
Decrease
Lake & Swamps
Hills & Ranges
0 5 10
km

Fig.-3.5

esting to note that the regional patterns of agricultural workforce intensity is interpreted here in connection with analysing the pattern of labour productivity.

Table- 3.8: Areal Extent of Various Categories of Percentage Share of Agricultural Workforce in Imphal Valley (1991).

Categories		No. of village	Total Area (in sq. km.)	% share of areas to total
Extremely High (above-90)		58	172.63	15.34
Very Very High (80 - 90)		103	331.22	29.43
Very High	(70 - 80)	60	283.30	25.17
High	(60 - 70)	42	205.43	9.97
Medium	(50 - 60)	27	113.40	10.08
Low	(40 - 50)	22	51.70	4.60
Very Low	(Below- 40)	65	67.81	10.62
Total Study Area -		377	1125.5	100.00
Total Imphal Valley area-		512	1843.0	-

Source: (i) No. of villages based on Census of India,1991, Manipur.
(ii)Area of the villages Collected from S.D.C.,S.D.O. Offices of the Imphal valley.

After classifying the total areal unit of the valley into same number of categories, and preparing map of distributional patterns of agricultural workforce intensity (persons/sq.km) for Imphal valley for the year of 1990-91, it is realised that the agricultural workforce is very high and high in the areas of central as well as southern parts of the valley where the labour productivity is recorded low. Very low and extremely low level of workforce intensity(less than 200 persons/sq.km) have been recorded in the areas of northern upland where the labour productivity is high (Table -3.10 and Fig.-3.6). Therefore, negative relationship between labour productivity and labour intensity have been recorded in the valley. The fact of these relationship has been confirmed by preparing a Scatter Diagram of the agricultural labour productivity versus labour intensity. (Fig.-3.7).

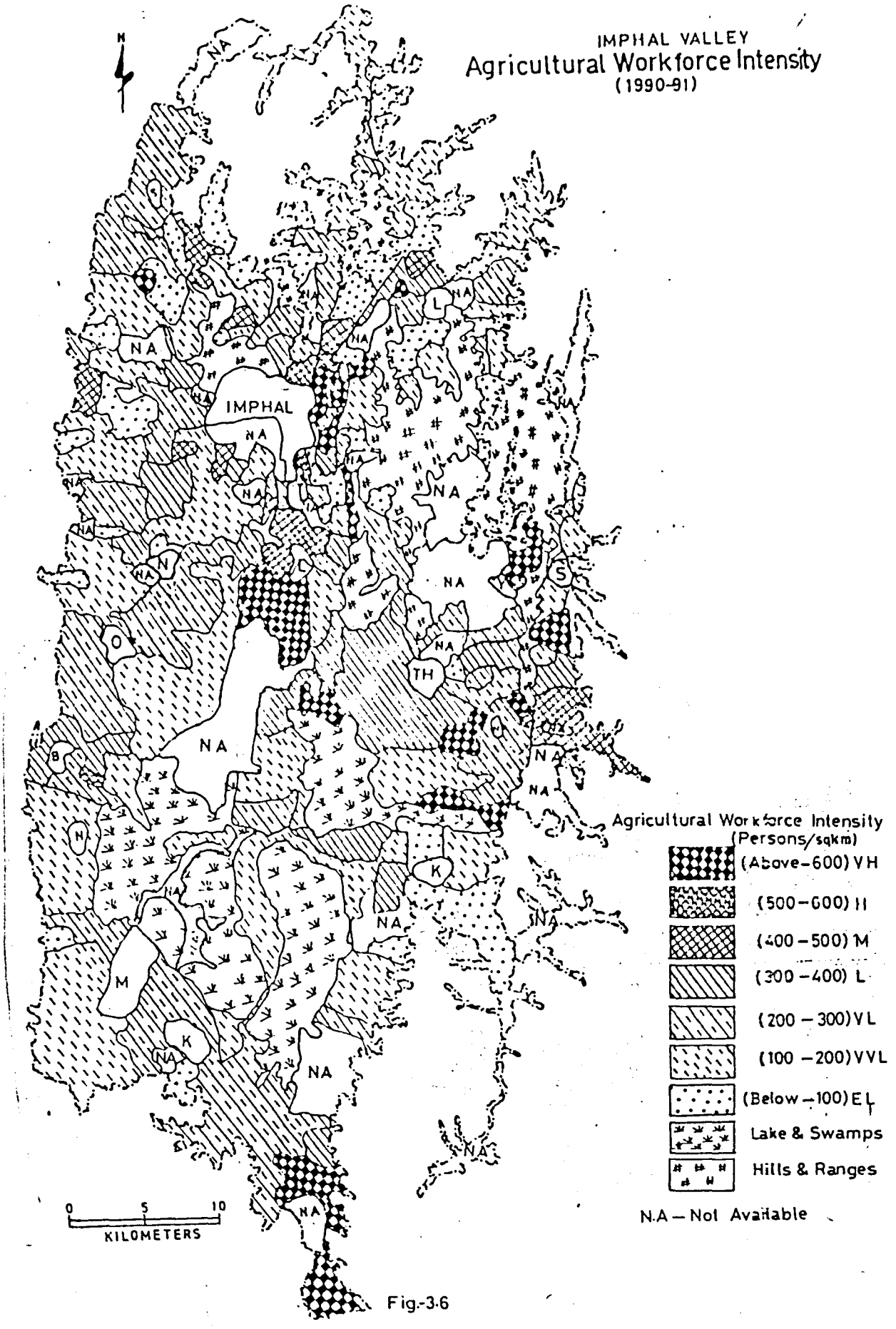

IMPHAL VALLEY
Agricultural Workforce Intensity
(1990-91)
N
IMPHAL
NA
Agricultural Workforce Intensity
(Persons/sqkm)
(Above-600) VH
(500-600) H
(400-500) M
(300-400) L
(200-300) VL
(100-200) VVL
(Below-100) EL
Lake & Swamps
Hills & Ranges
N.A - Not Available
0 5 10
KILOMETERS

Fig.-3.6

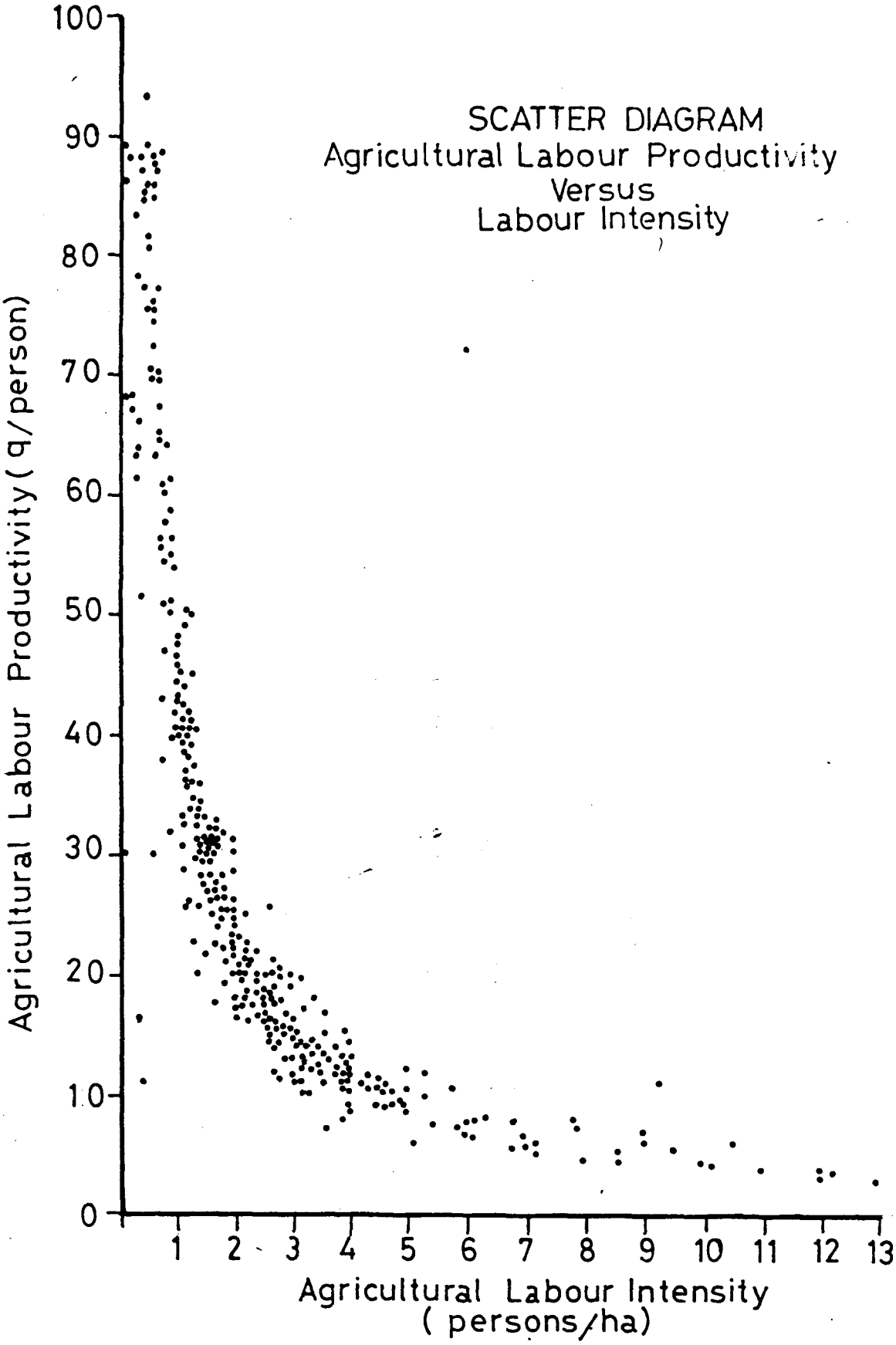

SCATTER DIAGRAM
Agricultural Labour Productivity
Versus
Labour Intensity
Agricultural Labour Productivity (q/person)
100
90
80
70
60
50
40
30
20
10
0
1
2
3
4
5
6
7
8
9
10
11
12
13
Agricultural Labour Intensity
(persons/ha)

Fig-3.7

Table- 3.9: Percentage Change in Agricultural Workforce in Imphal Valley(1981-1991).

Categories (in %)	No.of Village	Percentage
(A) Areas of Increase		
Very High (Above - 15)	66	17.41
High (10 - 15)	20	5.28
Medium (5 - 10)	38	10.03
Low (0 - 5)	46	12.14
(B) Areas of Decrease		
Low (-5 - 0)	55	14.51
Very Low (-10 - 5)	52	13.72
Very Very Low (-10 -15)	33	8.71
Extremely Low (Below-15)	69	18.21
Total study Area	379	100.00

Sources: Census of India,1981 and 1991, Manipur.

It is interesting to note here in connection with scatter diagram in which a inverse relationship of labour productivity with the labour intensity is shown that there is a diminishing curvi-linear trend of labour productivity with respect to labour input (Fig.-3.7) . There are many studies on the agricultural production function in which labour productivity is considered as average productivity which diminish constantly while the production follows the law of diminishing returns (Doublas and Cobb 1928, Lewis 1954, Hanumanth Rao 1967, Singh 1994). But in the present case, the curvi-linear relationship has same reasons which are stated below with the salient features of the established relationship.

(a) There is a significant variation in the distribution of labour productivity which starts in its range from the maximum 93qu/person to the minimum level of 3qu/person in the valley, while the areal variation in labour intensity is recorded from 1 person to 13 persons per ha. in the trend of its distribution.

Table- 3.10: Areal Extent of Various Categories of Agricultural Workforce Intensity (Persons/sq.km.) in Imphal valley (1990-91)

Categories (Persons/sq.km)		No.of Villages	Total Area (in Sq.Km)	% Share of area to total area
Very High	(Above - 600)	31	43.50	3.74
High	(500 - 600)	8	15.74	1.35
Medium	(400 - 500)	20	47.95	4.12
Low	(300 - 400)	39	159.98	13.74
Very Low	(200 - 300)	67	263.59	22.65
Very Very Low	(100 - 200)	105	423.05	36.34
Extremely Low	(Below - 100)	62	210.34	18.07
Total Study Area	--	332	1164.0	--
Total Imphal Valley Area		512	1843.0	--
Area not inclulded		180	679.0	--

Source: (i) Census of India.
(ii) SDC and SDO Offices, Govt.of Manipur.

(b) Concave nature of in the distribution distinguishes three important steps of relationship of the labour productivity with respect to labour intensity. First, the areas where the labour intensity is employed in agricultural activities upto 120 persons/sq. km have carried very high level of labour productivity (more than 50 qu./persons). Secondly, the areas of 200-500 persons/sq.km. labour input have a productivity levels ranging between 10-40 qu./persons and, lastly, the areas of very high employment of labour (more than 600 persons /sq.km.) have a very low level of labour productivity.

(c) The marginal rate of labour productivity with respect to change in labour intensity is recorded very high in the initial stage of employment of labour in agricultural sector in the valley. There is a record decrease in labour productivity ranging from 40 to 22 qu/ person(the difference between them i.e.,18qu./person) while 100 persons are increased per sq.km. in the valley. Contrary to it, there are conditions of labour stagnancy in agricultural production processes in few areas of high labour input. It shows that in the third stage of relationship, the increase of marginal product of one quintal per person (from 4 to 5 qu/person) at the low level of labour productivity is recorded with the change of 100 persons/sq.km. of input from the level of 1000 to 1100 persons/sq.km. employment of labour in agricultural sector in Imphal Valley (Fig.-3.7).

(d) It seems that there are three main causes of regional variations of changing established relationship of labour productivity with agricultural workforce increase. They are:

(i) Urbanisation which attracts the rural masses of the available workforce of the rural areas to the nearby towns. As a result, labour intensity is recorded very low in the surrounding areas of the fast growing towns with the high level of labour productivity,

(ii) The transport route - which are also helpful to migrate the rural labour to the urban centres which create imbalances in the distributional pattern of labour productivity, and

(iii) The physical factors of agricultural landscape are important to influence sequential patterns of labour as well as land productivity. It is realised that there is a need of detail interpretation of the established relationship of land productivity with labour intensity because labour is also a factor of land productivity at micro-areal level.

5.0: Established Relationship of Agricultural Productivity with Labour Input

It is obvious that the land productivity (i.e. average paddy yield) is the function of not only the physical conditions of land but labour input also. This functional relationship of agro- ecological as well as labour input conditions can be studied by identifying the level of Maximum Expected Yield of paddy crop because it may helpful in preparing strategy for optimising the patterns of agricultural production and productivity in the valley. The limit of Maximum Expected Yield especially for rice crop is also influenced by the agro-ecological conditions of the area.

Going through the Table-3.11, the parameters related to agricultural productivity and relationship among them for different agro-ecological conditions of Imphal valley, the following main observations can be drawn:

(i) In the agro-ecological conditions of the Upland areas which cover more than 45 percent land of the valley where land productivity is recorded higher with very high level of maximum expected paddy yield and low level of labour input (i.e., 5.9 persons/ sq.km.), the relationship between land productivity and labour input is strongly positive (r=.773) but the distribution of land productivity w.r. to labour appears to be more diversified.

(ii) The mid-land and low-land of ecological conditions of the Central as well as Western parts of the valley are varying at significant level with the variations of maximum expected yield from 68.96 qu/ha.in Mid-land areas to 52.53 qu/ha. in the Low land areas. A significantly higher variation from 8.93 persons/ha. to 12.92 persons/ha. of labour employment in agricultural activities is also recorded in the area. Though, there are significantly high correlationship between average yield and labour intensity (r=.891 in mid-land and r=.912 in low-land areas). It evolves a unified pattern of yield with low-level of yield-gap. For example, the areas of Upland agro- ecological conditions have an average yield -gap of paddy crop of about 23.22 qu/ha. which are comparatively higher than the low land areas (14.35 qu/ha.). However, it is recorded a fairly very high land productivity in Mid-land areas with a high areal variations (Fig.-3.8)

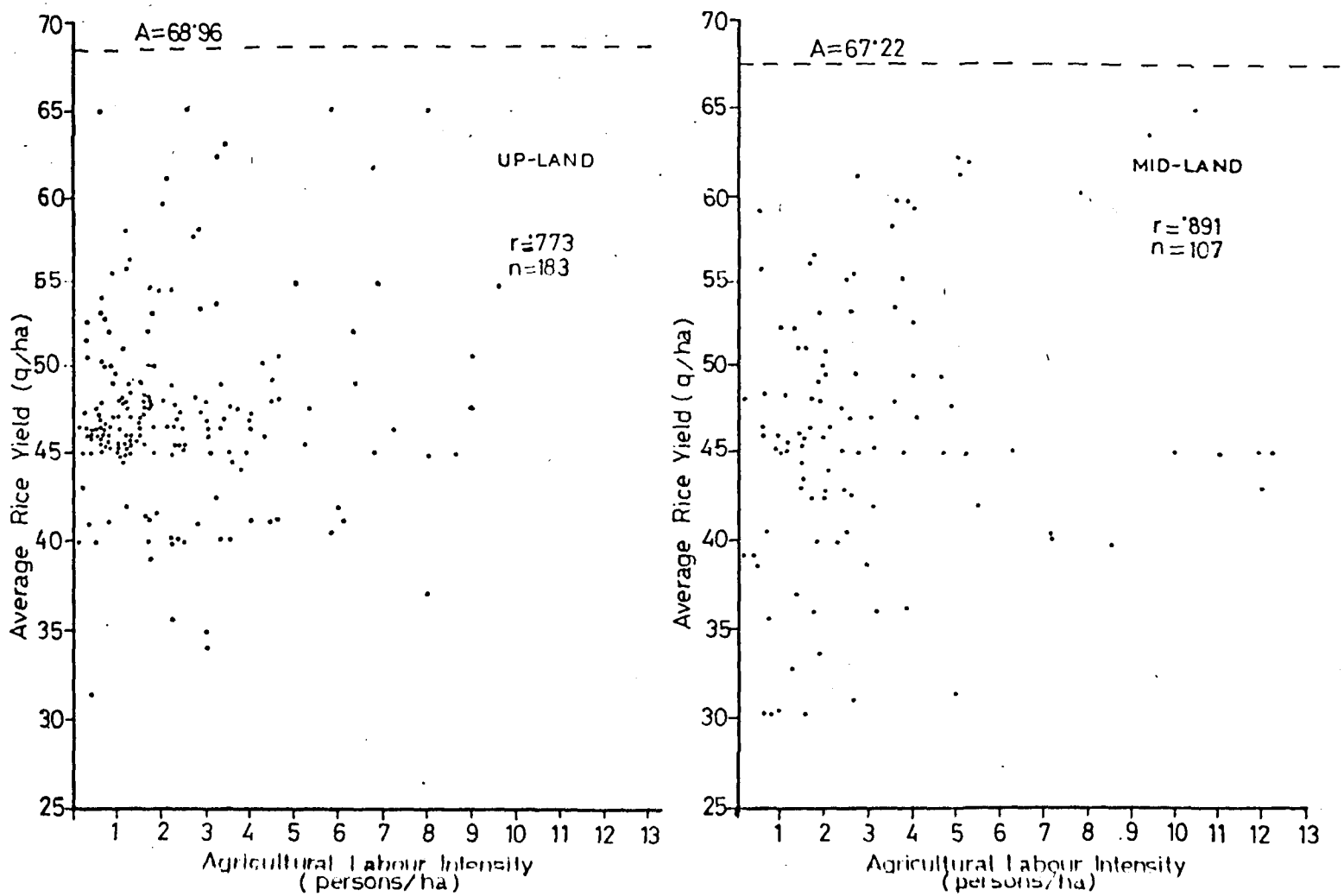

A=68·96
UP-LAND
r=·773
n=183
Average Rice Yield (q/ha)
Agricultural Labour Intensity
(persons/ha)
A=67·22
MID-LAND
r=·891
n=107
Average Rice Yield (q/ha)
Agricultural Labour Intensity
(persons/ha)

Fig-3.8

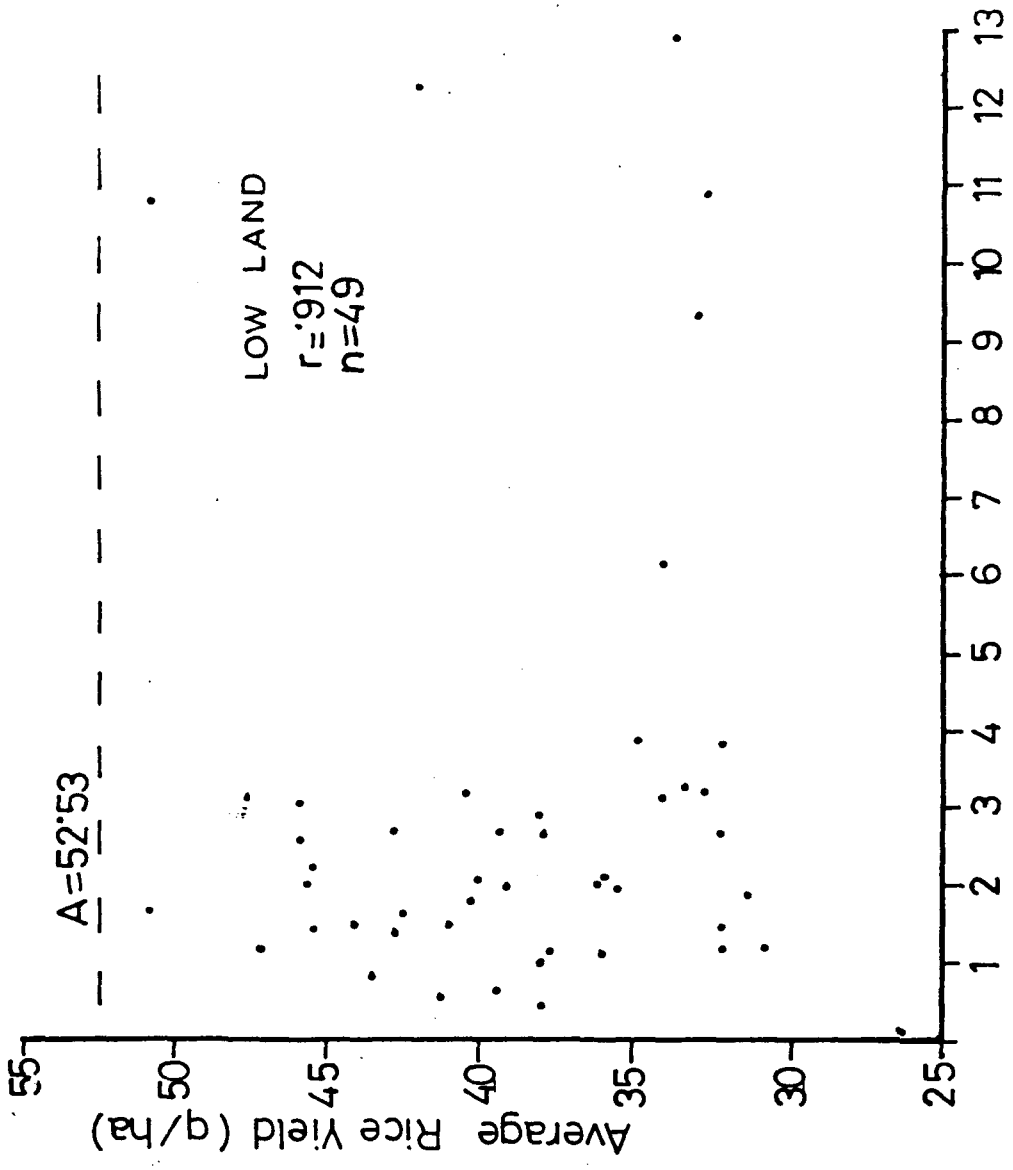

A=52'53
LOW LAND
r='912
n=49
Average Rice Yield (q/ha)
55
50
45
40
35
30
25
1 2 3 4 5 6 7 8 9 10 11 12 13
Agricultural Labour Intensity
(persons/ha)

Fig-3.8

Table-3.11: Areal Variations of Paddy Yield and Labour Intensity in Different Agro-Ecological Conditions in Imphal Valley.

	Upland	Mid-land	Low-land	Total/ Average
1. No. of villages (n)	183	107	49	339
2. Total area in sq.km.	470.93	366.80	326.27	1164
3. Ranges of Labour intensity (persons/ha.)				
a. Maximum	8.93	11.15	12.91	11.00
b. Minimum	0.02	0.36	0.44	0.27
4. Average Range of land paddy yield Variations.				
a. Maximum	65.00	67.87	50.74	61.20
b. Minimum	31.44	27.26	26.16	28.29
5. Maximum Expected paddy yield (A)	68.96	67.22	52.53	62.90
6. Existing Average paddy yield (Y)	45.74	46.01	38.18	43.31
7. Yield-gap (A-Y)	23.22	21.21	14.35	19.59
8. Correlation Coefficient of yield (r) w.r.t. labour intensity	.773	.891	.912	.859

(iii) It shows that up-land agro-ecological conditions have more land-potential which may be utilised in future with diversifying the agricultural patterns through intensifying the seed-fertilizer modern technology for which growth centres of the area may play a significant role.

6.0:Concluding Remarks

There are three main highlighting features of the growth and productivity pattern of agricultural development emerging in Imphal valley. First, the agricultural production systems are heavily dominated by the rice crop cultivation in the area with very low intensity of its production processes. Secondly, the system is working under unlimited supply of labour with low level of its productivity and growth. Consequently, there are stagnant conditions in the agricultural activities. However, there is an emerging trend in the regional variations of associated phenomena of agricultural production. It is noticed that the intensification of agricultural production processes is weak because of weak and low level of infrastructure for agricultural development. It can also be concluded that urbanisation and emerging new centres are playing the vital role in various ways in acceleration the developmental processes in the area. In fact, the study area is passing through its initial stage of agricultural development where these emerging growth points are playing an important role for fastening the growth rate and diversifying the developmental patterns of agricultural activities. These aspects should be dealt separately.

Chapter - IV

IDENTIFICATION AND NATURE OF GROWTH CENTRES

1.0: Introduction

In the process of development of any area, the locational view of growth impulses is equally important because there are many processes which are accelerated through growth points. In the historical perspective, the socio-economic development is a continuous process through which changes in the economic landscape can be observed overtime. In the present context, when we are going to discuss the role of growth centres in agricultural development with reference to Imphal valley, it can be said that the valley is economically passing through its initial stage of development where growth points are also emerging with their diverse functional nature. The stagnant conditions of workforce shift and insignificant changes in the economic conditions are the evidence of primary stage of the development in the valley. However, there are evidences of rapid growth of some villages and towns which accelerate the spatial processes of development. No doubt, the emerging locational patterns of these specific growth points would be playing a significant role for accelerating the developmental processes on its economic landscape and faster growth of the area.

It is conceived that agricultural growth persists through these nodal points of functional agglomeration and the growth impulses are based on its locational characteristics. These nodes are being influenced by the spatial features of agro-economic activities emerging on geographic landscape. The arrangement of agricultural activities can be seen by studying their functional hierarchy, ordering of the space and functional locations and their evolving patterns, a proper network of their inter-connecting features and spatial-gaping or over-laping in their influencing zones.

In the proceeding discussion, general conceptual frame of locational processes and features of socio-economic development would be reviewed. In fact, growth points or the agglomeration of functional nodality are emerging in different ways in the different areas because of their differentiation of the resource personality, economic param-

eters, social customs, and demands of agricultural production systems. Therefore, we must emphasize the processes operated by these location and distributional patterns of the growth points emerging on economic landscape of the Imphal valley.

There are some prerequisites of the study of locational systems of agricultural activities in connection with viewing the processes of agricultural development in Imphal valley which we are going to put forward in this Chapter. They are that:

(i) Imphal valley is passing through the primary stage of development with the initial stage of emergence of the growth points in the area.

(ii) The economy of the valley is based on the primary activities with stagnant economic conditions where agriculture is dominating sector of the economy and overall development of the area is agriculture-based.

(iii) The functional strength and nature of functional agglomeration are based solely upon primary activities like activities associated with the farming, fishing, quarrying and mining.

(iv) Only a few growth points and important settlements of the area which are growing only on the basis of agglomeration of tertiary activities like marketing, educational services, postal etc. which might be the nodal points of infrastructure for the development, and

(v) The spatial arrangement of these growth points might not be following the horizontal patterns as proposed by Christaller (1933), though Imphal valley is a homogeneous physical unit of the gentle slope area.

Keeping these aspects in mind, the present Chapter is devoted to analyse and interprete the distributional patterns of activities, locations related to agricultural development and their distribution in the area. Centrality and the interactional patterns and even hierarchy of growth centres are infact based on functional status, magnitude and functional distances which would also be interpreted in this Chapter. It is fact that the distribution of settlements in respect of their functional strength is unubiquitous in

nature. It means that there is not a homogeneous distribution of agricultural activities. Only the few settlements perform more functional strength with their diverse nature and, consequently, they are growing faster than the others. While the small villages of the lowest level are considered as dependent points which would link with the growth points and would feed the force of development in the form of their spatial arrangement. Therefore, these aspects must be kept into mind at the time of identifying the growth points. The first task here is to identify the nodal points which are organising the agricultural activities in the valley.

2.0: Identification of Growth Points

Identification of growth points/centres is a difficult task because these identified points should be the true representative of spatio-functional organisation and should also be the real nodal points of functional agglomerations of the area(Sen and others 1976). Therefore, a practicable criterion is to be adopted for identifying the growth points of the Imphal valley. The following attributes of development activities are considered as main parameters of identifying the growth points of the area.

(i) It is assumed that the intensity, magnitude and complexity of agricultural activities which are agglomerated on points are directly related to its population size. It means that bigger the population size, greater is the strength of agricultural activities. Therefore, population size of the settlements (1991) has been considered as one of the important attributes of growth points identification. In general, the minimum population size for points identification is considered 2,000 persons as point strength. However, some villages below this size are also included in the identification procedure because they may be considered important functional nodes of the area on the basis of other criteria of identification. Two ways classification was also made for interpreting the nature of those identified growth points. It is defined in the present context that the villages and towns of the population size of above 5,000 persons are called 'large growth points' and below 5,000 persons as 'small growth points'. The rest of settlements are considered as 'dependent villages' in their spatial organisation.

(ii) Population growth rate has been considered as second attribute of growth points identification. It is predicted that population growth of the settlement reflects the growth of other activities and functions and strong nodal characters of the point pattern. Thus,

the points of their higher strength start interaction with the other growth points of their own level or the points of the different levels in the area. Therefore, population growth is also an important attribute for identification of growth points. The average decadal growth rate of population in the entire valley is accounted as 35 per cent during 1980-91. In the present context of identification procedure of growth points, the villages having more than 50 percent decadal growth rate are incorporated in the universe of growth points. They are defined in classifying them into two categories as: (a) the points of the high population growth more than 75 per cent decadal growth rate during 1980s and (b) the low population growth points (50 to 75 percent decadal growth rate).

(iii) The functional structure and activity distribution in any area are 'point-based' rather than 'area-based'. Therefore, the intensity and magnitude of those activities available on those points would also be the important attributes for the identification of growth points. Therefore, the settlements which are performing at least one activity of non-agricultural nature, but is associated with the agricultural development, have been incorporated in the selection of universe of growth points. The points are categorised into two, namely, (a) Diversified growth points -where the number of functions perform more than 5 in number, and (b) Unified Growth Points - where only a few functions are available i.e., less than 5 in number.

(iv) The administrative status of the points is also considered is one of the criteria of points selection because administrative setup helps to provide functions/ facilities in the area.

Following the above criteria, 114 number of settlements belonging to urban as well as rural growth nodes have been identified for interpreting and analysing the nature and locational patterns of activities specially related to agricultural development. The general nature of these identified growth points can be studied by categorising them into 26 categories adopting a permutation and combination method of those attributes (Table-4.1).

Table 4.1: **Categorisation of Growth Centres/Points by Permutation and Combination of Three Attributes; Population Size, Growth Rate of Population and Number of Functions Available in Imphal Valley.**

SL No.	Categories	No. of growth points/Centres
1	HP,HG,HF	-
2.	LP,HG,LF	-
3.	HP,HG,LF	2
4.	HP,LG,LF	1
5.	LP,HG,HF	-
6.	LP,LG,HF	1
7.	LP,LG,LF	1
8.	HP, LG,HF	-
9.	LP,LF	11
10.	HP,LF	7
11.	LP,LG	4
12.	LG,LF	-
13.	LG,HF	-
14.	HG,LP	-
15.	HP,HF	1
16.	LP,HF	3
17.	LP,HG	3
18.	HP,LG	-
19.	LP,LG	-
20.	HP,HG	1
21.	HG,LF	2
22.	HP	4
23.	HG	25
24.	LG	23
25.	HF	4
26.	LF	22
	TOTAL 26 Categories	114 number points/Centres.

Abbreviations:

HP= High Population size (Above 5000 persons)

LP=Low Population size (Below 5000 persons)

HG = High Population Growth (above - 75% in1981-91)

LG= Low Population Growth (50-75% in 1981-91)

HF =High Number of Functions(above - 5)

LF = Less Number of functions (4-5).

The above Table- 4.1 reveals the following characteristics of the identified growth points of Imphal valley.

(i) Arranging total number of growth points (i.e. 114 in number) in their descending order according to the population size(1991) and growth rate, number of functions and administrative status, a graph of vertical distribution of these points have been prepared (Fig.-4.1).It shows that a concave tendency of population distribution instead of constant decrease of population size. The selected bigger growth points have proportionally larger population size and ***vice versa***. It means that the range of the distribution of the size of growth points is obviously larger from 198,535 persons (Imphal city as State capital) to 143 persons (Langthrei Loukon village).

(ii) The distributive nature of these identified growth points (if they are classified on trivariate basis considering population size, decadal growth and functional strength) is based on uni-attribute criterion in the classification. The most of the growth points follow only single criteria. Say for example, 25 growth points out of a total of 114, have an identical characteristics of high growth rate, 23 are having low growth rate, 22 number of growth points are of less numbers functions. On the other hand, only a few points are selected on the basis of two-attribute criteria namely, low population size with low functional status, (only 1 point), low population size with many functions (3 in number) and high population size with less number of functions (7 in number) (Table- 4.1).

(iii) Out of the 26 categories of the distribution which are based on main permutation and combination of the identification of growth points, the nine categories are prominently following the combination of maximum three attributes. These categories include only 5 growth points of the area which falls under the categories of large population, high growth rate and less functions (Table - 4.1) It means the general nature of identified growth points is based only on 'Uni-Attribute' Criteria.

On account of dominance of uni-attribute basis of the most of identified growth points, it is essentially an indication of the initial stage of development in Imphal valley. These facts can only be highlighted by giving the detail interpretation of distributive nature of growth points under separate heading:

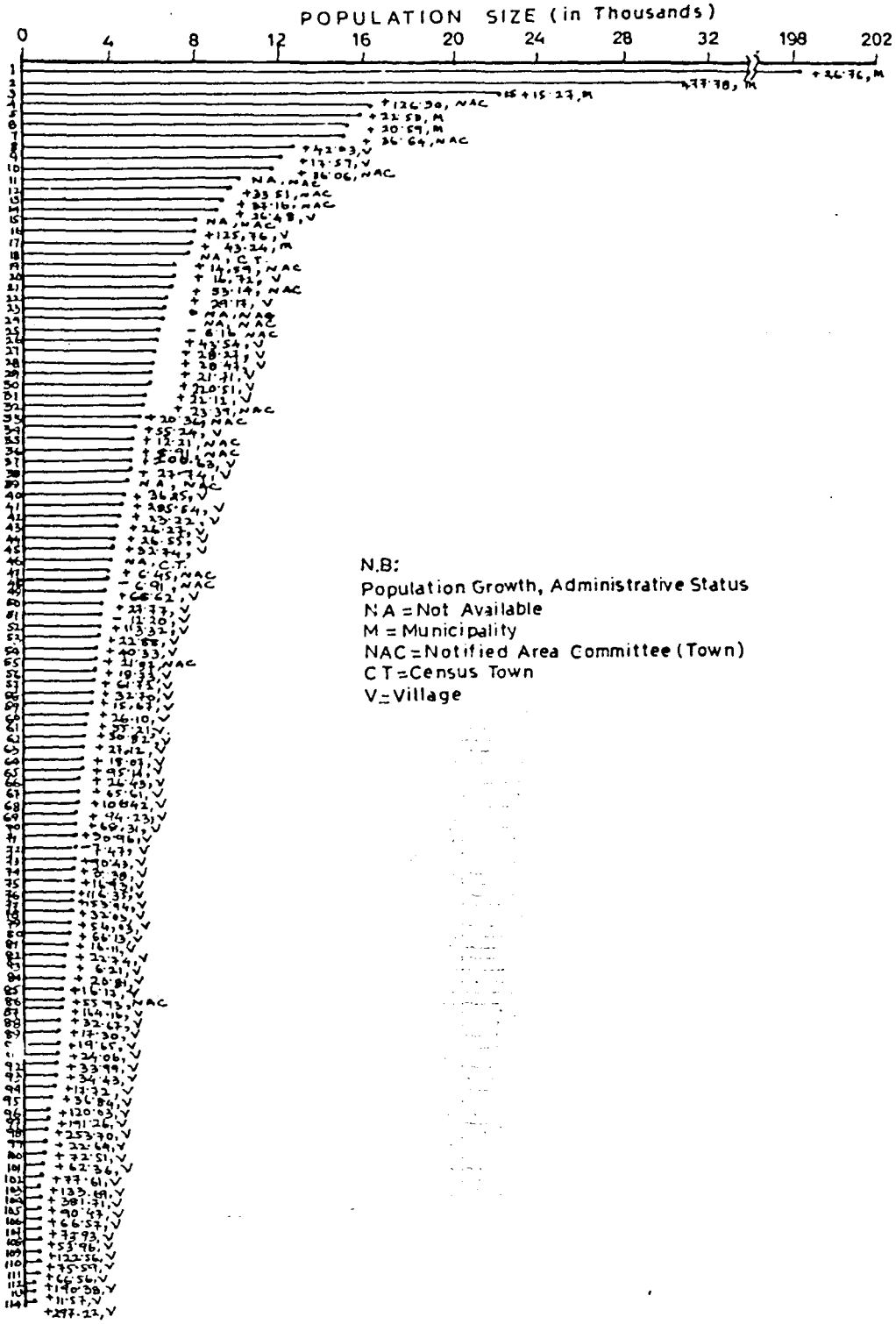

POPULATION SIZE (in Thousands)
0
4
8
12
16
20
24
28
32
198
202
LOCATION CODES OF GROWTH POINTS
N.B:
Population Growth, Administrative Status
NA = Not Available
M = Municipality
NAC = Notified Area Committee (Town)
CT = Census Town
V = Village

Fig.-4.1

3.0: Functional Nature of Growth Points

There are various aspects of studying the nature and growth of the growth points which can be analyzed to study the importance of these points because they are now true representatives of the agglomeration of functions and activities and through them various developmental processes are accelerated in the area. Reviewing the concerned literature on these aspects, it can be concluded that these growth points are performing multi-facility agricultural innovations in the areas (Misra 1968, Herman 1972, Moseley 1974, Mohammad 1978, and Clark 1986) and therefore they are considered as "Diffusion Centers" in the area (Hagerstrand 1967, Misra 1968, Morrill 1970, Clark 1986 and Misra 1995). They are also "Collecting Centres" for surplus production (Sen1975), as well as treated as " Processing Centres" of the primary products available in the area. In the perspective of integrated area development approach, these growth points are considered as "Points of Interaction" of the local people who move from rural to urban areas. On the whole, it can be said that these points are the nodal centres of spatial functional forces from where many processes of socio-economic development in the area are operated. In detail, it can be viewed in the way that these centres are playing significant role in three ways by:

(i) Supplying the materials and commodities which fulfil the demands of the local people,
(ii) Spreading the effects of developmental activities to their surrounding areas, and
(iii) Processing the available local resource-base surplus production.

Therefore, these growth points are linkaged with the higher order centres in their nesting hierarchy through strengthening the "Forward and Backward Linkages" (Myrdal 1967) which form the development of space- economy. The developmental activities which they perform must be interpreted separately in the following paragraphs:

3.1: Developmental Activities and their Threshold Level

The distributive nature of developmental activities related to agriculture in Imphal Valley has been analysed by considering these activities as available infrastructural services/facilities which create the force for altering the developmental

structure. These activities can be studied by distinguished them into their three broad groups, namely:

(i) The infrastructural facilities for development in which educational, medical, market, postal and telegraph services and facilities are incorporated.
(ii) The facilities associated with economic base of the area for strengthening the agricultural development like the enterprises related to electric and gas, wholesale and *retail trades, transport, storage, banking and financial estate and insurance etc. and*
(iii) The administrative facilities which are also important to incorporate for accelerating the developmental processes of agricultural activities in the area (Table- 4.2).

These facilities and services which are considered in the present study for analysing the locational characteristics of agricultural development, account for nearly 96 percent strength of the total functional force of the valley which is available on identified growth points (i.e.,114 in number). Therefore, these growth points are true representatives of the spatio-functional organization working in the valley. The locational characteristics of the distribution of these facilities are highlighted here in the following paragraphs.

(i) The status and importance of facilities can be assessed by observing its appearance in the spatial system and how it is helping in operating the spatio-functional organisation in an area. If a facility appears at the lower order growth points, it indicates very low level in its appearance, but it represents the lower level of organisation. Therefore, the threshold population of the service/facility may indicate the appearance of that facility status in its emerging pattern. For instance, primary school and middle school are having lower status in educational facilities and, hence, they have their appearance at low levels in the spatio-functional organisation. The threshold population level of primary school is, thus, true representation of facility entry or appearance in the spatial system. In Imphal valley, the threshold population level of primary school is at very low level of its appearance that is the growth point of its very small size (only 241 persons) while college facility is available at the level of 2,399 persons of threshold population at Luwangsangbam growth point and above,

(ii) Medical, market, and postal facilities are available with very small size of population threshold i.e., 815 persons at Sagolmang growth point. However, these facilities are available only at the higher order growth points except their availability on a few lower order growth points.

(iii) The facilities related to economic-base are also having different levels of population threshold when they are entering into the system of agricultural development. For example, transport facilities and enterprises are available at lower order growth points (i.e., 699 persons at Itham village). While storage and warehousing enterprises are available only on the centre higher order centres, that are Imphal city, Thoubal and Bishnupur Municipalities. The retail shops are entering into the spatial system at the level of lowest order population size of 114 persons at Langthrei Loukon growth point because retail shops are essential for purchaging household commodities for consumption (Table-4.2),

(iv) The threshold level of administrative services fluctuates in their distributive patterns because they are entering into the locational pattern at various levels without following any norms. For instance, they are entering at circle headquarters of various sizes. the district level administrative services are available at larger only (district headquarters) and, therefore, they have spatial importance at higher orders growth points.

3.2: Distributional Pattern of Development Activities

The entry of developmental activities/ facilities available in Imphal valley has been interpreted in the preceding section of the present discussion. Now question arises how these facilities and services are distributed over space in relation to population size of the growth points. There are number of studies which conclude that there is highly positive relationship between population size and functional strength of the growth points in any area (Bhat 1975,1976 and Mishra 1983). These facts can be interpreted here by considering the Imphal valley as testing ground for it. If there is a deviation from the normal tendencies of the distribution of these facilities/ services, then their causes may be interpreted in present context. It would help in understanding the spatial strategic points of spatio-functional organisation of the area.

Table-4.2: Weightages and Threshold Population of The Identified Growth Points.

Name of Functions/ Facilities	Relative/Arbitarary Weightages	Threshld Population Size		
		Population	Name	Status
(A) Infrastructural Facilities				
(a) Educational-				
(1) Primary Schools (PS)	1.03	241	Ningel	(V)
(2) Middle Schools (M)	1.24	874	Thangtek	(V)
(3) High/Higher Secondary Schools (H)	1.52	815	Sagolmang	(V)
(4) Colleges (C)	6.00	2,399	Luwangsangbam	(V)
(b) Medical				
(5) Health Services (PHS)	2.24	819	Chandrakhong	(V)
(6) Health Centres (PHC)	4.22	815	Sagolmang	(V)
(7) Hospital (H)	11.40	815	sagolmang	(V)
(c8) Daily Markets	2.24	815	Sagolmang	(V)
(d) Post & Communications				
(9) Post Office (PO)	2.53	815	Sagolmang	(V)
(10) Telegraph (T)	19.00	8,040	Bishnupur	(M)
(11) Bus stops (BS)	2.11	815	Sagolmang	(V)
(B) Economic Enterprises/ Facilities*				
(12) Electricity,Gas,& Water	3.00	3,230	Pallel	(V)
(13) Wholesale Trade	5.00	1,140	Hangul	(V)
(14) Transports	4.00	699	Itham	(V)
(15) Storage & Warehousing	7.00	198,535	Imphal	(M)
(16) Finance,Insurance,Real-Eastate & Business	6.00	1,671	Khongjom	(V)
(17) Retail Shops	2.00	143	Langthrei	(V)
(C) Administrative Services				
(18) State Headquater	114.00	198,535	Imphal	(M)
(19) District Headquaters	28.50	8,040	Bishnupur	(M)
(20) Sub-divisional Hq.	16.29	4,288	Sekmai	(NAC)
(21) Circle Headquaters	7.13	815	Sagolmang	(V)
(22) Block Headquaters	22.80	4,306	Porompat	(V)

N.B. * Arbitraray Weights are assigned because of their cocentration patterns.V= Villages, M=Municipality, NAC= Notified Area Committee (Towns).

Table-4.3: Number of Growth Points having Infrastructural Facilities/Enterprises for Agricultural Development by Population Size in Imphal Valley.

Population Size	No.of Points	No. of Facilities available											
		11	10	9	8	7	6	5	4	3	2	1	0
Biggest (Above-100,000)	1	1	-	-	-	-	-	-	-	-	-	-	-
E.Big (50,000-100,000)	-	-	-	-	-	-	-	-	-	-	-	-	-
V. Big (20,000- 50,000)	2	2	-	-	-	-	-	-	-	-	-	-	-
Large (10,000- 20,000)	7	1	-	3	1	1	-	1	-	-	-	-	-
L.Medium(5,000- 10,000)	29	-	-	-	1	5	13	5	5	-	-	-	-
Medium (2,000- 5,000)	45	-	-	-	2	2	8	15	4	6	5	3	-
Small-M.(500- 2,000)	27	-	-	-	-	-	-	6	2	5	5	7	2
Small (200- 500)	2	-	-	-	-	-	-	-	-	-	-	2	-
V.Small (Below- 200)	1	-	-	-	-	-	-	-	-	-	-	-	1
Total	114	4	-	3	4	8	21	27	11	11	10	12	3

It is an axiom of spatio-functional organisation of any region that the strength (i.e., determined by the number and intensity of functions/ facilities of growth points) are positively related with their population size. Thus, the distributional patterns of functions and facilities can be analysed by classifying the growth points on the basis of their strength in relation to the population size in the valley. The bi-variate frequency tables of the developmental activities like infrastructural, economic and administrative facilities /enterprises with respect to population size of the growth points have been prepared separately for showing the internal assemblages of spatio-functional organisation and its resulted patternse. The main salient features of the distribution of these activities are given below:

(i) The distribution of infrastructural facilities available on the growth points have been chosen as eleven in their numbers. Following Census criterion of settlement classification for their population size and enumerating number of functions facilities related to the infrastructure for agricultural development, a bi-variate frequency distribution of functional strength against population size of growth points have been prepared. It shows a positive relationship between them (Table- 4.3). The table further reveals that the small-medium and large-medium growth points (that have population strength below-10,000 persons) have a scatter-tendency of distribution of infrastructural facilities which vary from one to eight in their number. It shows that some points of less population size are having very less number of these facilities. For example, the small and very small growth points have only one or two facilities related to infrastructure for agricultural development, while medium size growth points (that are ranging in their population strength from 2,000 to 5,000 persons and are classified 45 in number in our study universe) exhibit the maximum degree of scatterness in these facilities. These growth points are having different functional strength ranging from one to eight in number, while 15 growth points out of the 45 of medium size are having an average strength of 5 facilities. On the other hand, large and very large points are less in number but enjoying with all types of these facilities (Table-4.3).

(ii) The distributive nature of economic enterprises which are shown by preparing the bi-variate frequency table, shows that the strength of these facilities is also having positive relationship with the population size of the growth points. It shows that the small-medium size growth points are more dispersed in the distribution which ac-

Table-4.4: Number of Growth Points having Economic Facilities/ Enterprises According to Various Population Size in Imphal Valley.

Population Size	No.of POints	No.of Economic Facilities/Enterprises 6	5	4	3	2	1	0
(Above - 100,000)	1	1	-	-	-	-	-	-
(100,000- 50,000)	-	-	-	-	-	-	-	-
(50,000- 20,000)	2	-	-	-	1	1	-	-
(20,000- 10,000)	7	-	-	2	1	3	1	-
(10,000- 5.000)	29	-	1	2	11	9	6	-
(5,000- 2,000)	45	-	-	1	9	22	13	-
(2,000- 500)	27	-	-	-	-	12	15	-
(500- 200)	2	-	-	-	-	-	2	-
(Below - 200)	1	-	-	-	-	-	1	-
Total	114	1	1	5	22	47	38	-

Table-4.5: Number of Growth Points having Administrative Facilities in Imphal Valley.

Population Size	No. of Points	No. of Administrative Facilities 5	4	3	2	1	0
(Above - 100,000)	1	-	1	-	-	-	-
(100,000 - 50,000)	-	-	-	-	-	-	-
(50,000 - 20,000)	2	-	1	1	-	-	-
(20,000 - 10,000)	7	-	-	1	-	2	4
(10,000 - 5,000)	29	-	1	-	1	5	22
(5,000 - 2,000)	45	-	-	1	-	1	43
(2,000 - 500)	27	-	-	-	-	1	26
(500 - 200)	2	-	-	-	-	-	2
(Below - 2000	1	-	-	-	-	-	1
Total	114	-	3	3	1	9	98

count for more number of growth points. Out of a total of 114 growth points, 85 points are performing only a few number of economic facilities. Therefore, the main concentration of these facilities can be seen only at the bottom of the distribution. A maximum number of points (i.e., 22 in number) are weak in their functional performance; they perform only economic facilities at the size of medium population (i.e.,2,000 to5,000 persons). However, a typical feature of distribution can be seen that the very large size growth points (i.e.,20 to 50 thousand persons) are exhibited only two in number with proportionately less number of economic facilities in the Imphal valley. Only Imphal town of the highest population size performs maximum (more than 6 number) economic enterprises with their high intensity (Table-4.4).

(iii) The administrative services obliterates in its concentration pattern in the valley. Only 16 number of growth points of the valley perform administrative service of their varieties ranging from district headquarters to circle headquarters. They are concentrated only on the medium to large size growth points (2 to 20 thousand persons) (Table-4.5).

4.0: Functional Performance of Growth Points

The distributive nature and strength of developmental activities which have been discussed in the preceding parts of the Chapter, show a positive relationship between population size and functional strength in the distributional patterns of the facilities and activities. Now, our discussion should be proceeded to the synthesis of evolving functional strength and its spatial patterns to study the functional processes related to the spatial dimensions of the development of these activities. For the same, the status and magnitude of the agglomeration of these developmental activities are important to study. In this connection, a review on methodology and methods applied for the agglomeration of the activities should be discussed.

4.1: Methods Used

There are various methods which have been adopted for the agglomeration of functional strength and hierarchy of growth points by following the criteria of: (i) the number of functions and services performed by the Centres (Bracey 1953,1956, Misra,

Sundaram and Rao 1974, Misra and Sundaram 1980 and Alam and Khan 1972) (ii) the patterns of functional interaction (Godland 1951, and Sen and others 1971), and (iii) the factor and principal component analysis which is based on correlation matrix on functional attributes (Wanmali 1983). These criteria of functional aggregation in its spatial context are important for which the following methodology have been adopted by the geographers. They are:

(i) The 'Scalogram Method': It is based on a scale of a social functions developed by Guttman and Stouffen,(Stouffen 1967). It was previously used by Galpin and Christaller for studying the spatial pattern of social activities (e.f.,Mayer and Kohn 1967). Later on, it was followed by many Indian geographers (Singh 1988, and Singh and Singh 1997).

(ii) The Derivative Method; It deals with the functional complexes of tertiary activities and has been used to identify the aggregating functional hierarchy of growth points (Mayer and Kohn 1967, Singh 1966, and Singh 1969),and

(iii) The Multi-functional Matrix Method: It is associated with the weightages of functions and services for calculating centrality scores of growth points (Berry 1962, Abiodun 1967,and Bhat and others 1975, 1976,). The functional strength of a particular growth point is assessed by using functional weightages through preparing functional matrix. The assignment of functional weights for aggregating their strength or preparing composite index for functional hierarchy is also one of criteria but it is a debatable question among the geographers who are working in this field of economic landscape planning. Therefore, there are two criteria of assigning the weights for aggregating the functions and facilities:

(a) The Arbitrary Weightages are based for aggregating the activities to achieve the composite index and to calculate the centrality score for multi-facilities,(Bracey 1955, 1956 and Wanmali 1971). But this criteria does not fit in highlighting the real picture of functional availability and their importance.

(b) The Relative Weightage criteria, which was developed by many geographers for studying the spatial aspects in Indian context (Bhat and others 1976, Bansal 1975 and Singh and Chauhan 1981). However, both the criteria were used for the assignment of calculating composite centrality scores of functional hierarchy of growth points.

According to Bhat and others (1975 and 1976), the weights of different functions are assigned according to their distribution among all the settlements on the basis of the principle of their spatial importance. Greater the scarcity, greater is the importance in terms of centrality with higher the weights and ***vice-versa***. Therefore, the weighted score of functions which are based on their relative importance is one of the important criteria for preparing the composite centrality score which would show functional strength of the growth points. The relative weightages criterion is expressed as:

$$Wi = N / fi,$$

where, Wi is the relative weightages of ith function /facility , 'N'equals to number of settlements/ growth points, and 'fi'refers to number of functions and facilities available at the growth points.

$$Cj = \sum Wi \; Xj$$

where, C= Composite centrality score of ith facilities for jth locations,W= Weightages, X= Intensity of facilities, i= 1,2,3,.....n for facilities and j= 1,2,3,.....m for locations.

4.2: Magnitude and Intensity of Various Developmental Activities

The magnitude and status of different activities, which are considered for the study of spatial pattern of developmental activities, have been interpreted and analysed by preparing the map of distributional pattern of functions and facilities. Their common features are highlighted by superimposing them. The salient features of the distributional patterns of these functions and facilities are highlighted below:

(i) It is universal fact that the centres which are having high population size are considered as the main nodes of the developmental activities and vice-versa. It is true in case of Imphal valley where Imphal city is accommodating all types of facilities for radiating their effects into its surrounding rural areas,

(ii) The growth points which are larger in size of population, perform high intensity and complex nature of functions and, consequently, the most of the developmental activi-

ties are available on them. On the other hand, the points of very low and low population size have only a few functions with their less intensity. For instance, the growth points of the lowest level, namely: Ningel (241 persons) and Langthrei Loukon (114 persons) which are located in the vicinity of foothill areas of the Eastern ranges and lowland areas of Waithou pat and Waithou hills respectively, are having only two or three numbers of functions related to economic as well as infrastructural attributes. On account of inaccessibility of these points of small sizes, very low magnitude and less importance of developmental activities are marked on those points (Fig.-4.2).

(iii) Most of the developmental activities are distributed in the surrounding areas of the Imphal city (the state capital) and along with the main transport route of the valley. Therefore, road network which is sparking all sides of the valley, is the important factor of development and is considered as the main element of infrastructure for agricultural development of Imphal valley.

(iv) A wide functional-gap has been observed in the distributional patterns of various developmental activities in the agricultural landscape of the valley. It also shows that the biggest growth points are having high degree of magnitudes of these activities and vice-versa. In the adjoining areas of the Northern and North-Eastern foothills, and surrounding areas of the Loktak Lake and other marshy lands of the valley are marked as the areas of very weak infrastructural facilities for agricultural development.

The present discussion interprets the distributive nature and locational characteristics of developmental activities in Imphal valley. However, there is need of a composite picture and ordering of these functions/ facilities with respect to their population size.

5.0: Functional Hierarchy and Spatial Ordering of Growth Points

The ordering of the growth points can be arranged and grouped by putting them into classes on the basis of their functional strength of various developmental activities. By converting the functional strength of each group of developmental activities applying two methods of functional aggregation (relative as well as arbitrary; relative for the group of infrastructure, and administrative and arbitrary weightages for economic enterprises) as mentioned earlier, the composite centrality score for each group

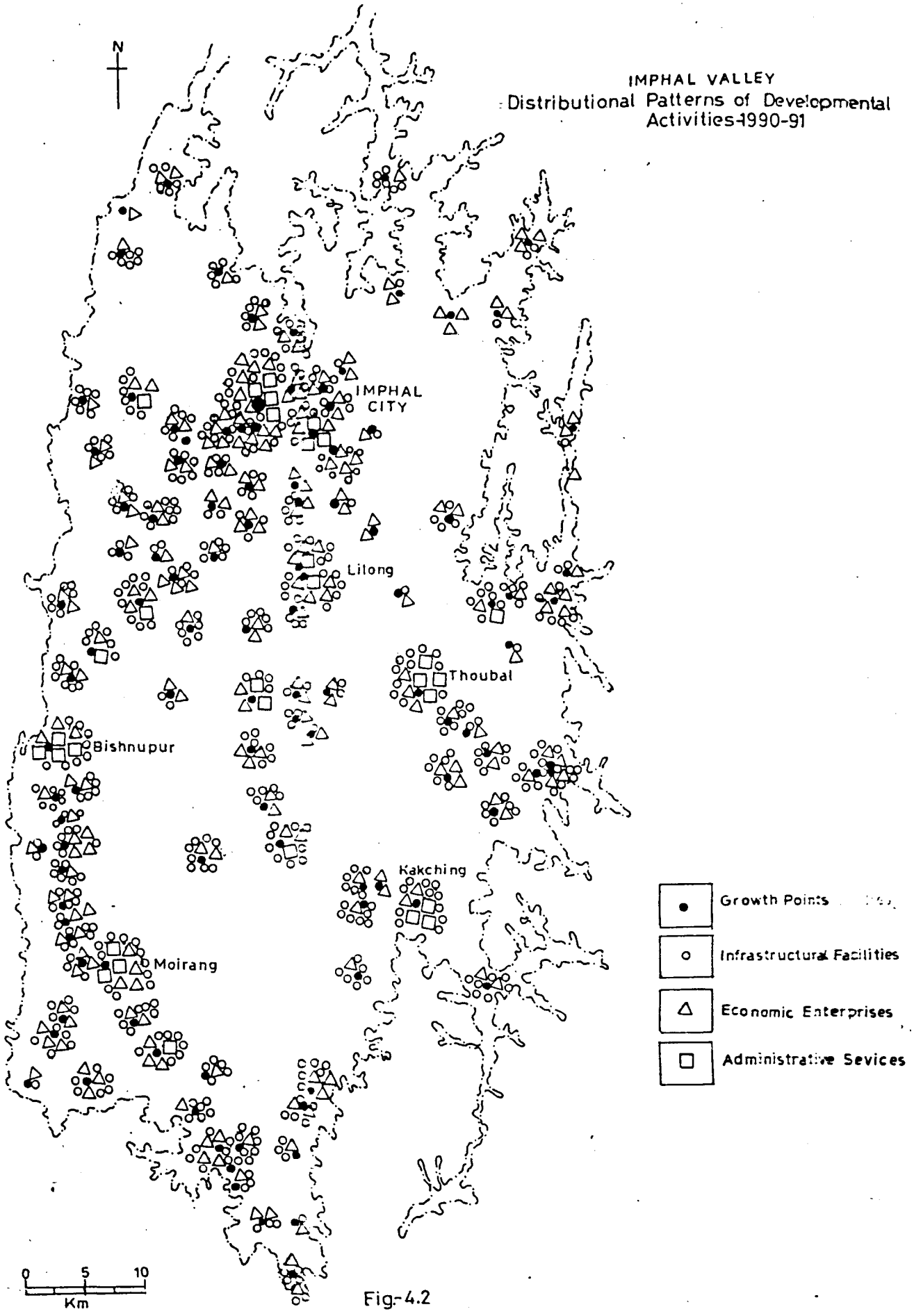

N
IMPHAL VALLEY
Distributional Patterns of Developmental Activities-1990-91
IMPHAL CITY
Lilong
Thoubal
Bishnupur
Kakching
Moirang
Growth Points
Infrastructural Facilities
Economic Enterprises
Administrative Sevices
0 5 10
Km

Fig.-4.2

of developmental activities have been calculated separately for detail analysis of centrality strength and then combined them together to interprete the composite picture of the functional attributes (Appendix-I). These scores are plotted on the graphs against the population size of growth points for highlighting its salient features. The functional hierarchy of these growth points are emerged as:

(i) As indicated earlier in Table-4.2, the level of threshold population of the educational and lower level medical facilities is recorded very low (815 persons). It means that these facilities are available at the lower level growth points. Hence, the scatter-diagrams for educational and medical facilities show that a continuity in their distributional patterns with respect to the population size of the growth points (Fig.-4.3). As a result, there is a significant positive relationship of the functional strength of educational and medical facilities with population size. But, it is not true in case of postal and communication facilities, because they do not have strong relationship between them.

(ii) The scatter-diagram of economic facilities against population size of the growth points shows a continuity with very high functional distance prevailing among the highest order points because the highest order growth point, i.e., the Imphal city, is availing a high concentration of economic facilities. Therefore, it has more functional distance with the second order point, namely, Bishnupur town. Likewise, the second and third order growth points are also having significant functional distances among them. A positive relationship is observed among them with their weak functional strength of economic enterprises (Fig.-4.4).

(iii) The locational attributes of administrative services in the valley do not have strong relationship with the population size because of fluctuating nature of scatterness of the points. It shows diverse pattern of distribution of these facilities with its five emerging groups (Fig.-4.5).

(iv) Overall, the aggregated strength of all facilities/services (i.e., the composite centrality score) is not following the regular pattern in their distribution. It can be observed in the scatter-diagram that, in same cases, growth points which are performing

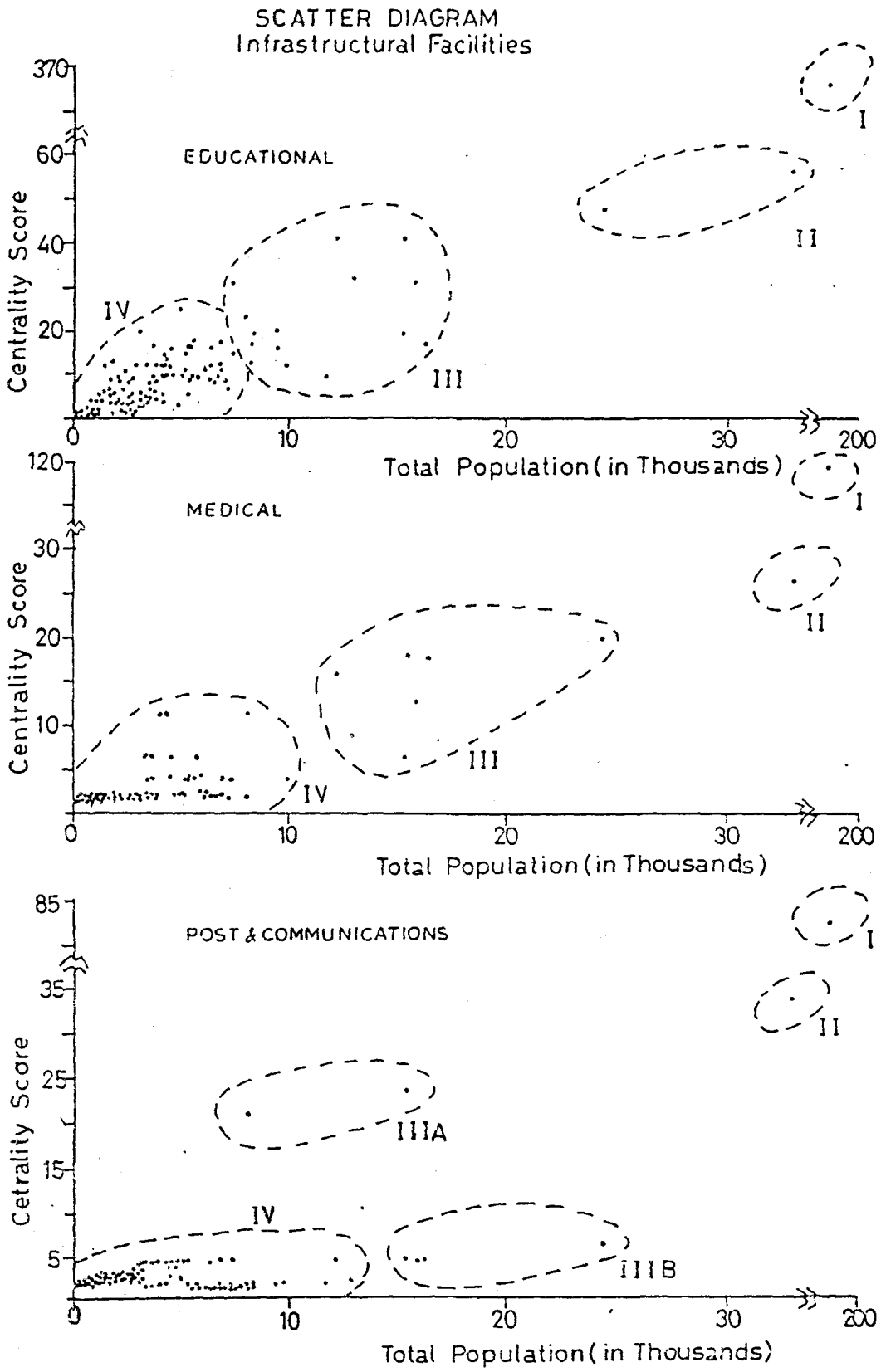

SCATTER DIAGRAM
Infrastructural Facilities
EDUCATIONAL
Centrality Score
370
60
40
20
0
10
20
30
200
Total Population (in Thousands)
I
II
III
IV
MEDICAL
Centrality Score
120
30
20
10
0
10
20
30
200
Total Population (in Thousands)
I
II
III
IV
POST & COMMUNICATIONS
Cetrality Score
85
35
25
15
5
0
10
20
30
200
Total Population (in Thousands)
I
II
IIIA
IIIB
IV

Fig.-4.3

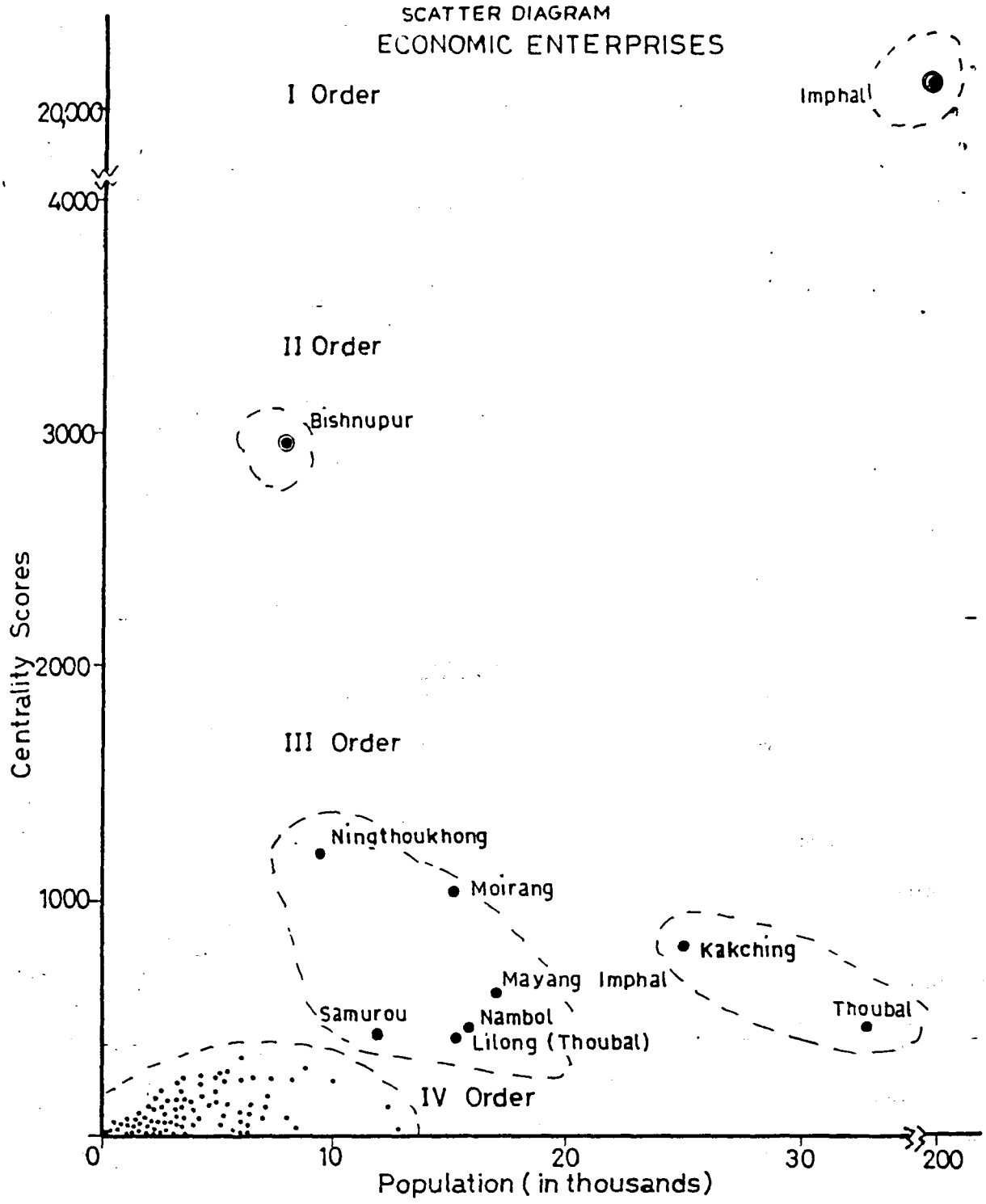

SCATTER DIAGRAM
ECONOMIC ENTERPRISES
I Order
Imphal
II Order
Bishnupur
III Order
Ningthoukhong
Moirang
Kakching
Mayang Imphal
Samurou
Nambol
Lilong (Thoubal)
Thoubal
IV Order
Centrality Scores
20,000
4000
3000
2000
1000
0
10
20
30
200
Population (in thousands)

Fig.-4.4

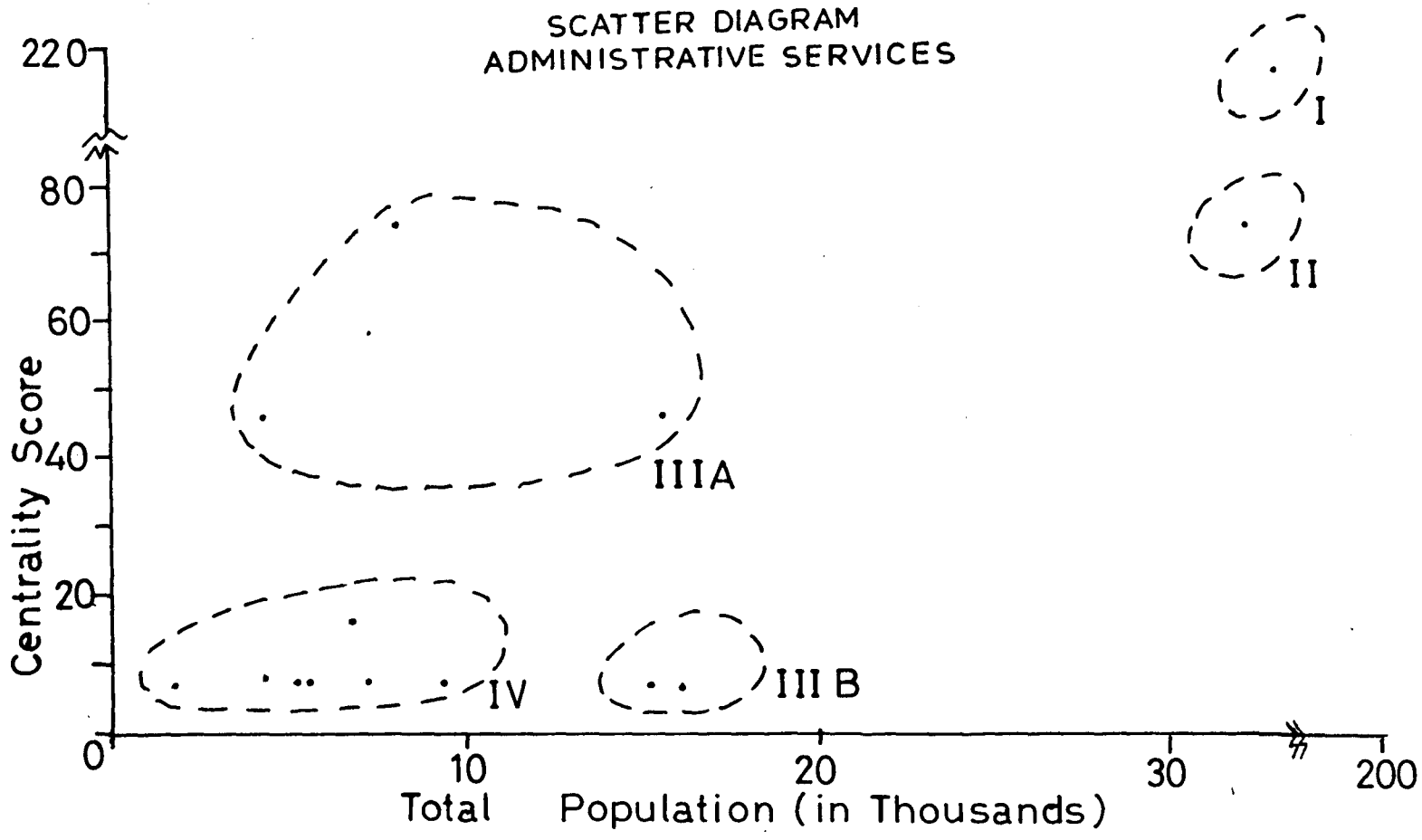

SCATTER DIAGRAM
ADMINISTRATIVE SERVICES
220
80
60
40
20
0
Centrality Score
I
II
IIIA
IV
III B
10
20
30
200
Total Population (in Thousands)

Fig.-4.5

very high magnitude and intensity of developmental activities are inversely proportional to their population size. On the other hand, some of the growth points are following low centrality score with very high population size. The functional magnitudes and population size of these points have weak relationship. It means that there are emergence of functional gaps in the economic landscape with its weak spatio-functional organisation in Imphal valley (Fig.-4.6).

(v) The hierarchy of functional ordering of all identified 114 growth points which are distributed over space and closely related to the growth impulses in the valley, can be classified into four orders on the basis of their functional distances and nearness. The main features of the functional hierarchy of these growth points are visualised as follows:

(a) The total number of growth points of Imphal valley have been distinguished into four orders, namely, the Growth Pole (i.e., Higher order points in hierarchy), the Growth Node (High order), the Growth Centres (Middle order points) and the Growth Villages (Lower order growth points) (Table- 4.6). The growth pole is observed only one in the valley i.e., Imphal Urban Agglomeration which has the highest population concentration with availability of almost all types of developmental activities. Therefore, the Imphal city is working as a pole for accelerating the processes of developmental activities. The growth node is also identified only one i.e., the Bishnupur town with a population of 8,041 persons, It performs all the facilities but it includes comparatively small size of its population. As a result, it has been categorised into second order growth point. Likewise, third order growth points that are given the name as growth centres, are identified eight in number with an average size of population of 15 to 20 thousands with 5 to 10 number of functions and services. The lower order educational, medical, transport, and markets facilities can be observed on these growth points. The growth villages which form a group of the lowest order growth points are more in number (104 in number) which are exhibited in the lowest order hierarchic system of the functional distribution in Imphal valley. They have very small average size of population ranging from 1 to 5 thousand with very less number of facilities (from one to five functions). They are considered as the fast emerging points in the hierarchy of growth points because of their fast population growth. They are directly involved in the agricultural development in the valley and may be considered as main 'contact points' for lacal resource mobilisation in future to grow the economy of the area.

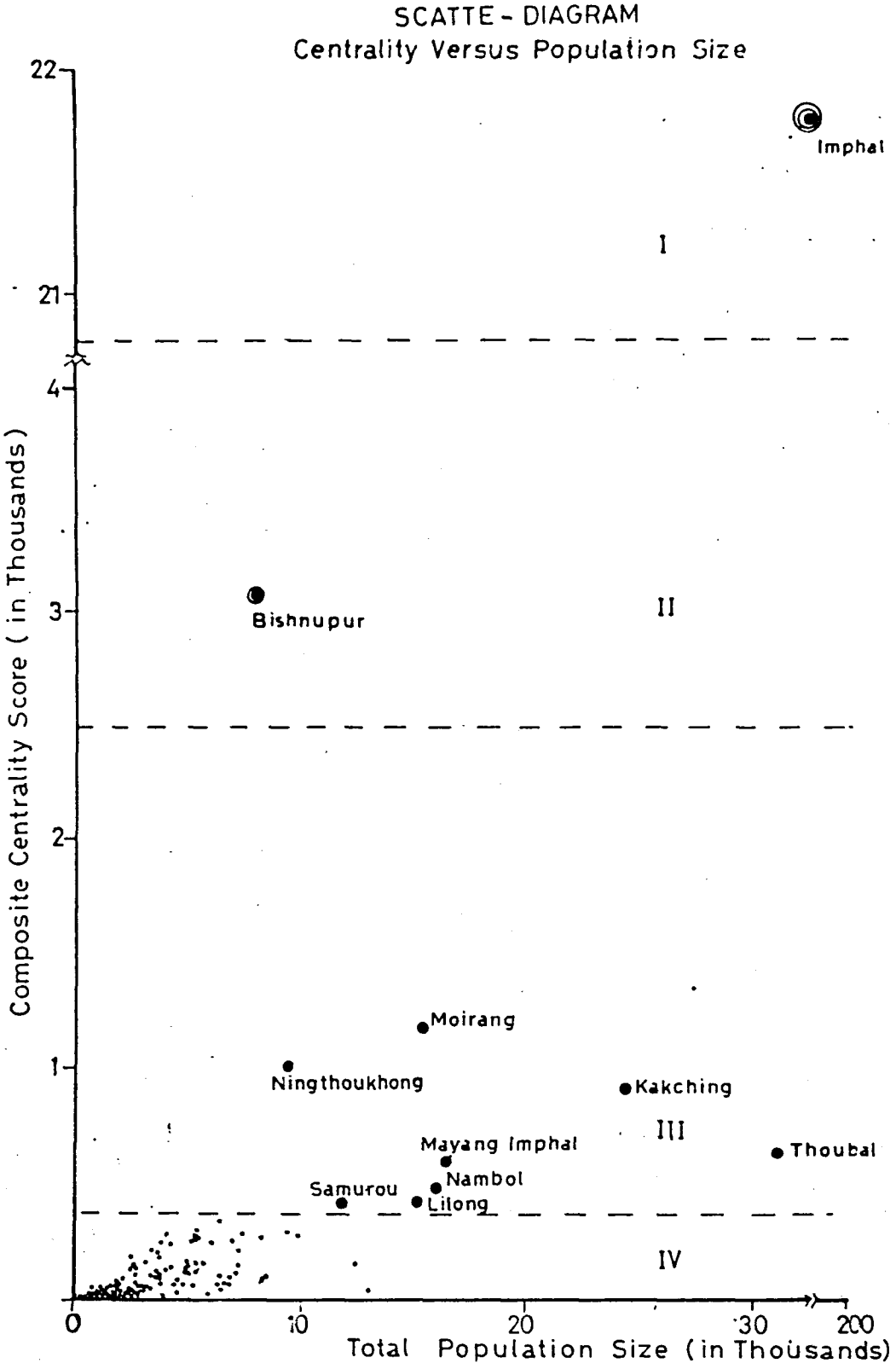

SCATTE - DIAGRAM
Centrality Versus Population Size
Composite Centrality Score (in Thousands)
Total Population Size (in Thousands)
Imphal
Bishnupur
Moirang
Ningthoukhong
Kakching
Mayang Imphal
Thoubal
Nambol
Samurou
Lilong
I
II
III
IV
22
21
4
3
2
1
0
10
20
30
200

Fig.-4.6

Table-4.6: Population Size, No.of Functions/facilities and Their Nature in Different Hiererchical Order of Growth Points in Imphal Valley.

Orders	Growth Points Name	No.	Population Size	No.of Functions	Nature of Available Developmental Activities
I Higher	Growth Pole	1	200,000	21	All type of facilities available with their intensive and complex nature.
II High	Growth Node	1	5,000-100,000	15	Educational,Hospital and Health Service, Postal,Transport,Market, Administrative Services.
III Middle	Growth Centres	8	15,000-20,000	5-10	Lower level educational, Transpot, Market, Municipality,Primary Health Service and Centre Facilities.
IV Lower	Growth Villages	104	1,000- 5,000	1-5	Primary School, Middle School, Primary Health Centre, and Retail Shop Facilities.

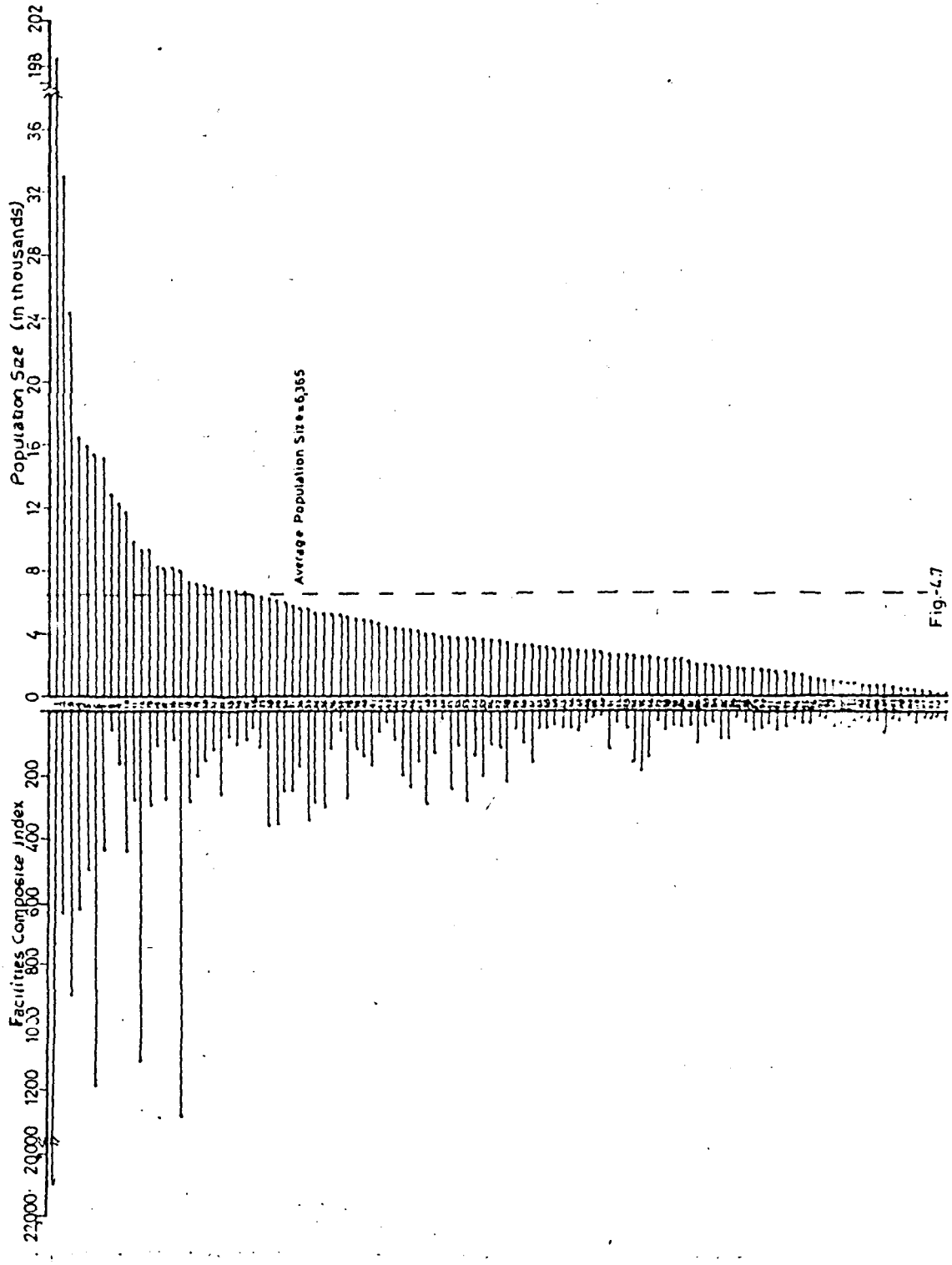

Population Size (in thousands)
0
4
8
12
16
20
24
28
32
36
198
202
Average Population Size = 6,365
Facilities Composite Index
200
400
600
800
1000
1200
20000
22000

Fig.-4.7

Concluding Remarks:

In the ends of the Chapter, it can be concluded that the functional-gaps are observed in the vertical crossed section of the functional hierarchy of the growth points, which can be rectified by strengthening the proper arrangement of spatio-functional organisation of these activities in the valley. For instance, if the hierarchy of these developmental activities follows the market principle (k=3) of Chritaller's system of the central places, the ordering of growth points should be three times to its lower level points. But, in the present case, the ordering of the growth points in Imphal valley is not following the market principle of theirspatial arrangements. By comparing the emerging hierarchic patterns of the growth points in the valley with the Christaller's central place theory, it can be said that the growth points of Imphal valley are following the transport principle (i.e.,k=4) with weak performance of functional strength at high and medium order central points. If the transport principle is followed to study the functional hierarchy and spatial ordering of growth points of the valley, the second order growth nodes must be four in number, but it is identified only one in number in the existing arrangement in the valley (i.e., Bishnupur). Likewise, the growth centres of medium order must also be 16 in number, that are accounted for only 8 growth centres in the developmental space of the valley. As a result, the main pressure of growth and developmental forces are concentrated only at the highest order growth points (Imphal city) that is 'Growth Pole' of the valley. Consequently,the lower order centres are failed to function optimally in the existing organisation. It appears to be an imbalance in the arrangement of the functional strength. It can also be seen by arranging growth points according to their population size and functional strength.

In fact, both the attributes of locational characteristics ; population size and functional strength must be related positively, but the composite index of function/ facilities shows fluctuating tendency rather than the distribution of population size (Fig.-4.7). It is the indication of imbalance and weak systems prevailing in the valley.

The locational processes and the spatial arrangement of hierarchic systems of developmental activities have been interpreted in the preceding paragraphs, it is found that there is a weak performance of diffusing the developmental activities to their surrounding areas. Thus, the contribution of growth points and their emerging spatio-functional organisation can be interpreted separately in the next Chapter.

Chapter- V

CONTRIBUTION OF GROWTH CENTRES IN AGRICULTURAL DEVELOPMENT

1.0: Introduction

The increasing disparities in the emerging patterns of agricultural development and the growth points in Imphal valley which have been discussed in the earlier Chapters,presently demand to develop an appropriate strategy for the balanced growth in Imphal valley. The associated problems of preparing strategy are many - folds. In order to highlight these problems, there is a need of interpreting the role of growth centres for the development of agriculture in study area for visualising the interactions of developmental phenomena in its core-periphery angles. There should be direct emphasizes how the processes of development of agricultural landscape are accelerated through the growth centres in an area. This view of development is related to the concept of 'Spatio-Functional Organisation' through which the proper integration of agricultural activities with the existing land resources can be linked by proposing a normative functional structure for optimal development of agricultural activities. For the study of its structural features, the contribution of growth points for agricultural development in the valley may be highlighted.

There are many aspects related to the contribution of growth centres for the development of agriculture in Imphal valley. In the present context, there are four aspects to be discussed here. They may be helpful in understanding the relationship between functional nodes and their influence in their surroundings.

Broadly, the functioning of existing spatio-functional organisation follows some norms and rules which are generally based on the availability of resources and demand of local people. Therefore, there are some prerequisites for understanding the functioning of spatio-functional organisation existing in the valley where following conditions of the organisation are noticeable.

(i) If the surplus resources are available in the area, there is a need of processing them at the lower order growth points to strengthen them for feeding surplus and processed

material to their higher orders. The existing spatio-functional organisation of the area would be working to follow the pattern of surplus resource available in the area . As a result, the functional structure of the growth points is closely related to the local available resources. While their spatial arrangement should follow the normative nesting patterns in the area.

(ii) If the surplus resources are not available to process but there is a need of a variety of demands of the goods and materials to consume them for the local people in the area, then the spatio- functional organisation of the area would work accordingly and the functional nodes would be considered as 'central places' which would perform functions for supplying the goods and material in the area. For example, if there is a food deficiency in the area, there is a question of supplying food grains from outside the state through existing spatio-functional organisation which would change its functional structure as well as locational behaviour accordingly.

(iii) In the areas of transition where surplus/ deficiency of food and consumer goods and articles do not influence the working of spatio-functional organisation, then it is sure that spatio- functional organisation has a complicated structure and complex nature of the functions in such areas. In such conditions, it may play its role in various ways for the development of agricultural landscape. For example, the working of spatio-functional organisation in such areas is based on the agro-processing as well as consumer-goods activities.

These conditions of the working of spatio-functional organisation can only be interpreted by identifying the areas of: (a) surplus resources available for their proper processing and (b) need and demands of food items and other material for stabilising the consumption of the local people. This ground of resource personalities and emerging functional nodes thereon can only be integrated properly by putting forward the contribution of growth centres for agricultural development of Imphal valley in four ways as :

(i) The growth centres are considered as "Production Processing Centres" of the area by which the surplus production is processed and send it to the outside market. Therefore, they may also be considered as the generation of earning nodes of the area.

(ii) The growth centres may be considered as "Diffusion Centres of Modern Agro-Technology" which play a significant role for diffusing the effects of agro-technological inputs to the surrounding peripheral areas. These centres, therefore, are contributing for agricultural development through intensifying the market activities in the area.

(iii) The growth centres as "Surplus Labour Absorption Points as well as Centres for Infrastructural Development" for agricultural activities by attracting the large number of rural masses and providing employment assets to the surplus labour of the rural areas.

Keeping these aspects of the main contribution of the growth centres in mind, there is a need of detail interpretation for testing the validity of these facts in connection with emerging growth points in Imphal valley. It is put forward in the following paragraphs.

2.0: Growth Points as "Collection and Processing Centres of Surplus Production"

For testing the validity of the above facts of the present research that the market activities of the growth points must be growing faster in the areas of available agricultural production surpluses. Increasing production surplus in the rural areas increases the growth of the growth points faster simultaneously by increasing the number of agro-based activities on them. The matured system of wholesale and retail market activities, storage facilities, and agro-based manufacturing enterprises must be developed accordingly in the areas of surplus agricultural production. Therefore, these facts can only be highlighted here by identifying the areas of agricultural production surplus / deficiency and comparing them in their established spatio-functional organisation of agricultural activities.

2.1: Areas of Agricultural Production Surplus/ Deficiency

The amount of agricultural production surplus/ deficiency has been calculated for each and every village of Imphal Valley by finding out the difference between the total annual foodgrains production available in the village and its total annual foodgrains requirement. Food production availability (in quintal) is calculated by summing up production of the three types of paddy crops and food requirement (in quintal) is assessed by multiplying the total population of the village with a constant of 3.285 quintal annual

food consumption per person (i.e.,the conversion factor ofpopulation for requirement) (for detail, see equation-VII in Chapter-I).

The areal patterns of agricultural production surplus as well as deficiency have been shown by classifying the total number of villages into two main broad categories as the villages of surplus production and deficiency. They are further divided into three sub classes as large, medium and less surplus/ deficient areas of agricultural production (Table-5.1).

Table- 5.1: Number of Villages Classified on the Basis of Total Amount of Agricultural Production Surplus/Deficiency in Imphal Valley.

Categories of the amount of production Surplus/ Deficient (in '000qu.)	No. of villages	%	Percent of Growth Points Total No.	%
(A) Surplus Areas:				
1. Large (Above - 10)	24	8.31	75	65.8
2. Medium (5 - 10)	48	14.77	-	-
3. Low (Below-5)	137	42.15	-	-
(B) Deficient Areas:				
1. Low (Below - 10)	86	26.46	39	34.2
2. Medium (10 - 20)	19	5.85	-	-
3. Large (Above-20)	8	2.46	-	-
Total Valley*	325	100.00	114	100

NB : Villages which do not have production data are not incorporated here

According to the distributional patterns of agricultural production surplus/ deficiency, it is clear that 65.2 percent of villages in the valley belong to the areas of surplus production which are dispersed along with the foothill areas of the North-West and Northern parts including the flatland areas of the open valley and the South-Western and low lying areas of the South of the valley. On the other hand, the villages having deficiency of agricultural production are found in the surrounding areas of main towns and along with the main transport route passing through Thoubal, Kakching and Moirang Municipalities. In these areas of foodgrain deficiency there is a record concentration of

population with a huge amount of food demand which is being fulfilled by the outside supply. However, the area has a well-established functional organisation in the valley (Fig.-5.1 and Table-5.1).

If the distributional pattern of land and labour productivity of Imphal valley are compared with the map of food deficiency, it is found that the areas of central part are more fertile with high agricultural productivity. However, these areas are considered as food deficient areas. It may not be because of productivity factor for food deficiency, but may be more concentration of population which creates more demand in such areas. While the peripheral areas of the valley of fertile land and foothill topography, though there is less productivity, are having surplus food production. On account of imbalances in the distributional patterns of these areas of food surplus/deficiency, the functioning of the spatio-functional organisation may certainly be different.

It is surprising to note here that the areas of surplus production which share 65 percent area to the total area of the valley have consequently more or less similar proportionate share of growth points (that is 65.8 percent to the total growth points emerging in the valley). It means that there is no concentration of growth points in the areas of surplus food production. However, newly emerging growth points have been enumerated more in these areas. It shows that surplus production may influence the functional structure in the locational processes of spatio-functional organisation at lower level growth points. As a result, the growth of the lower order growth points is faster in the areas of surplus production where the new growth points are also emerging faster. These growth points may start processing the surplus agricultural production available in the area. However, the spatial organisation of agro-processing activity would be unified and weak in such conditions of surplus areas. Contrary to it, the areas of deficient foodgrain production would allow to grow a specific type of spatio-functional organisation in which the agricultural activities may not be dominating the organisation but the locational characteristics of functional organisation in these areas may be dominated by market and storage functions and administrative facilities to diffuse the food products into the rural areas. The pattern of economic activities may give more detail regarding working of spatio-functional organisation.

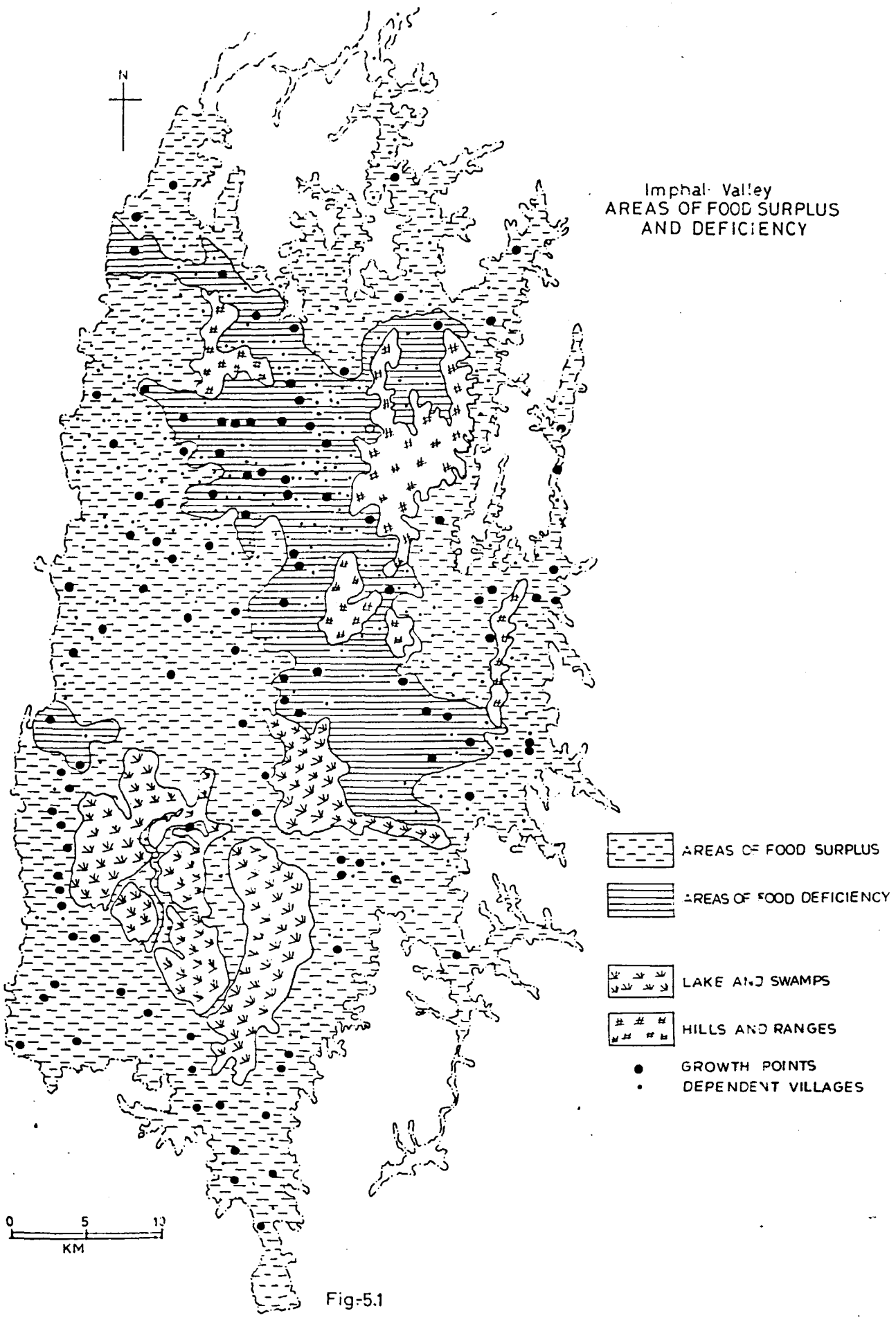

N
Imphal Valley
AREAS OF FOOD SURPLUS
AND DEFICIENCY
AREAS OF FOOD SURPLUS
AREAS OF FOOD DEFICIENCY
LAKE AND SWAMPS
HILLS AND RANGES
GROWTH POINTS
DEPENDENT VILLAGES
0
5
10
KM

Fig-5.1

2.2: Locational Characteristics of Economic Enterprises

Mapping the locational characteristics of market facilities, agro-based manufacturing as well as storage facilities available in Imphal valley (Fig.-5.2) and comparing them with the distributional patterns of production surplus and deficient areas, the following conclusions can be drawn.

(i) The areas of surplus agricultural production evolve a diversified pattern of economic activities specially small size agro-based manufacturing and processing units like rice mills, paddy husking, mustered oil mills and spellers etc., which are located on the growth points of the valley. On the other hand, the large size agro-manufacturings are available on very big growth points of the area ,i.e., Imphal, Thoubal and Bishnupur towns.

(ii) The retail market enterprises are more diversified in their patterns in which they are available at the lower order growth points of the South and South- Western parts of the valley specially in the areas of deficient production. While the wholesale and big retail shops are concentrated on a few growth points.

(iii) The storage facilities are negligible in the valley; it is noticed that there are only eleven locations in the different areas of valley having storage facilities. It indicates that the storages facilities are used to store for non-agricultural commodities which are imported from outside the state.

(iv) It is also clear that the growth points which are emerging in the areas of surplus production are growing in its initial stage and, therefore, they might not be able to process the entire surplus agricultural production of the valley. Therefore, there is a leakage of agricultural resources at this stage of development which can be stream-lined by implementing the proper planning of spatio-functional organisation in the valley.

3.0: Growth Points as " Centres of Infrastructural Facilities for Agricultural Development"

Indeed, the growth points of any area have locational characteristics of the agglomeration of activities related to agricultural development. What is infrastructure for

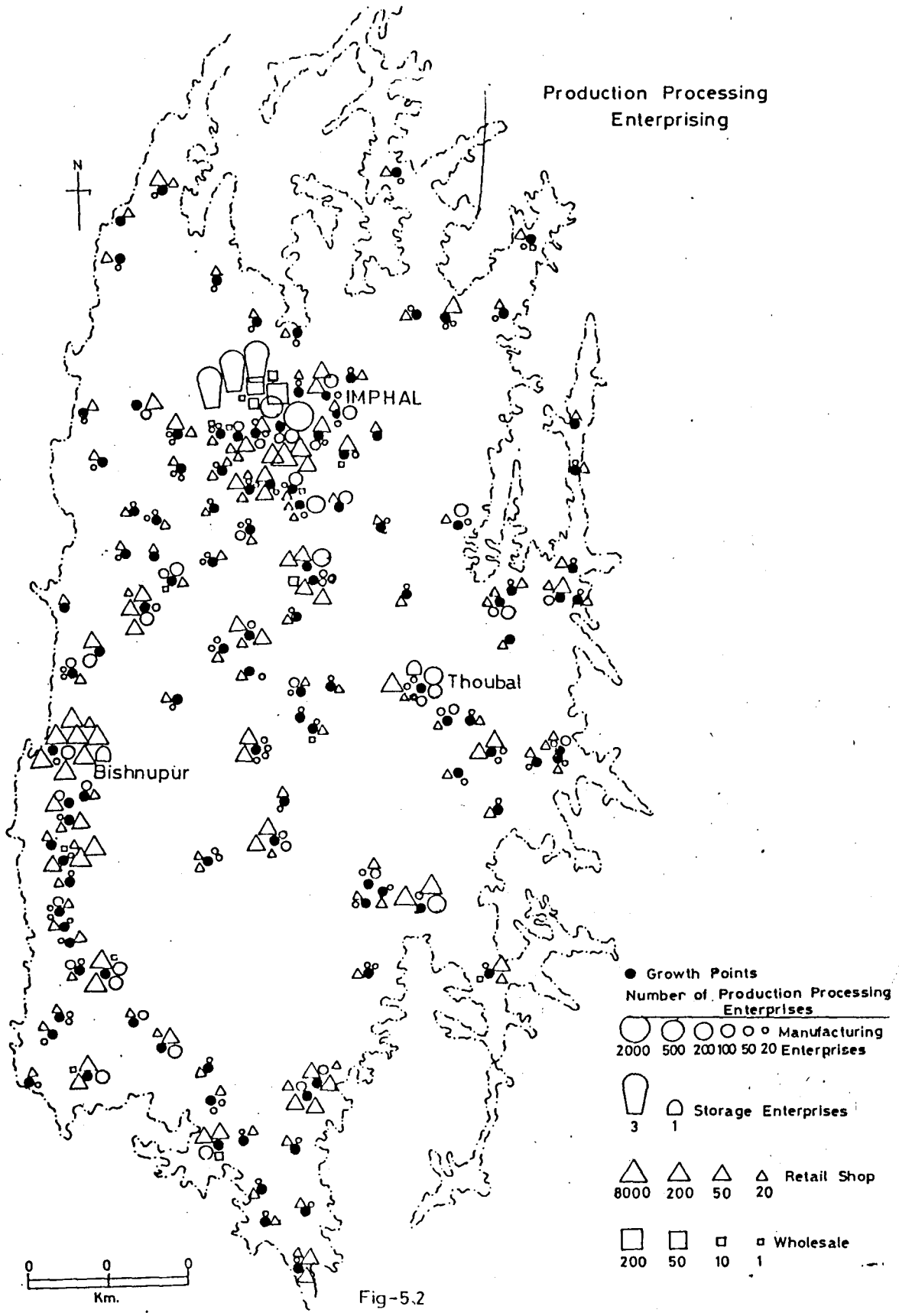

Production Processing
Enterprising
N
IMPHAL
Thoubal
Bishnupur
0 0
Km.
Growth Points
Number of Production Processing Enterprises
Manufacturing
2000 500 200 100 50 20 Enterprises
Storage Enterprises
3 1
Retail Shop
8000 200 50 20
Wholesale
200 50 10 1

Fig-5.2

agricultural development? Some attributes of socio-economic development may also be considered as infrastructure for agricultural development (World Development Report 1994), And some attributes are related to the same. For example,educational, medical, sanitation and drinking water facilities are directly related to socio-economic development but they are indirectly associated with the agricultural development through providing the skill labour.On the other hand, the attributes of infrastructure namely, Electricity, road and banking including financial institutions,insurance and real estates and business services facilities are directly related to agricultural development. Therefore, there is a need of interpreting the locational characteristics of infrastructural facilities/enterprises which are directly related to agricultural development in Imphal valley.

3.1: Road as an overall Infrastructure for Agricultural Development

Road accessibility is an important attribute not only for agricultural development but also for overall development of an area. The locational characteristics and impact of road on agricultural development can be visualised in two ways: first, by studying the road accessibility patterns and secondly the locational patterns of available transport enterprises in the area. The other infrastructural facilities related to gas, electricity, financial and insurance institutions can also be studied together. Doing so, the contribution of road in the process of development can be visualised by considering the locational patterns of facilities/ enterprises related to transport, gas and electricity,and financial estate and insurance comparing them with the pattern of road accessibility.

(a) Road Accessibility Pattern:

Road accessibility map is prepared by considering the network of National Highways and main roads of the valley and distinguishing the areas of the valley into various road accessibility classes as the areas of: Highly Accessibly (0-2.5 Km), Moderately Accessible (2.5 - 5.0 Km), and Less Accessible areas (5.0 - 7.5 Km) (Table -5.2). It reveals that more than a half share of total area is under highly accessibility class which reflects the high density of road with significantly higher connectivity in these areas . Imphal city is a biggest nodal centre connected by the National Highway numbers 39 and 53 and main

roads of the state as stated earlier. These main roads are connected with main towns and growth points emerging in the valley (Fig. - 5.3).

On the other hand, the areas of South Central part of the valley including the surrounding areas of Loktak Lake and other marshy Lands where the degree of accessibility is recorded low, are not well connected with the main roads. It is also observed that the settlements which are generally situated along the roads are highly accessible specially in the Western as well as Southern parts of the valley.

Table - 5.2: Areas Under Various Road Accessibility Classes.

Categories	Scale (In km)	Area (in sq.km)	Percent
1. Highly Accessible	(0-2.5)	986.37	53.52
2. Moderately Accessible	(2.5-5.0)	644.68	34.98
3. Less Accessible	(5.0-7.5)	219.95	11.50
Total	—	1843.00	100.00

(b) Locational Characteristics of Infrastructural Facilities:

In fact, road is playing an important role of emerging pattern of infrastructural facilities for agricultural development. Therefore, the locational characteristics of these facilities are studied here in connection with the road accessibility pattern. It has been described here by considering the available number of enterprises related to transport, gas and electricity and financial insurance and business services. These enterprises are generally located on the main towns with their most varieties. Most of these enterprises are concentrated only on Imphal city and its adjoining areas (Fig.-5.4). Therefore, Imphal city is considered as the biggest nodal point of varieties of infrastructural facilities. The transport enterprises of small order are also located along with the district and state roads

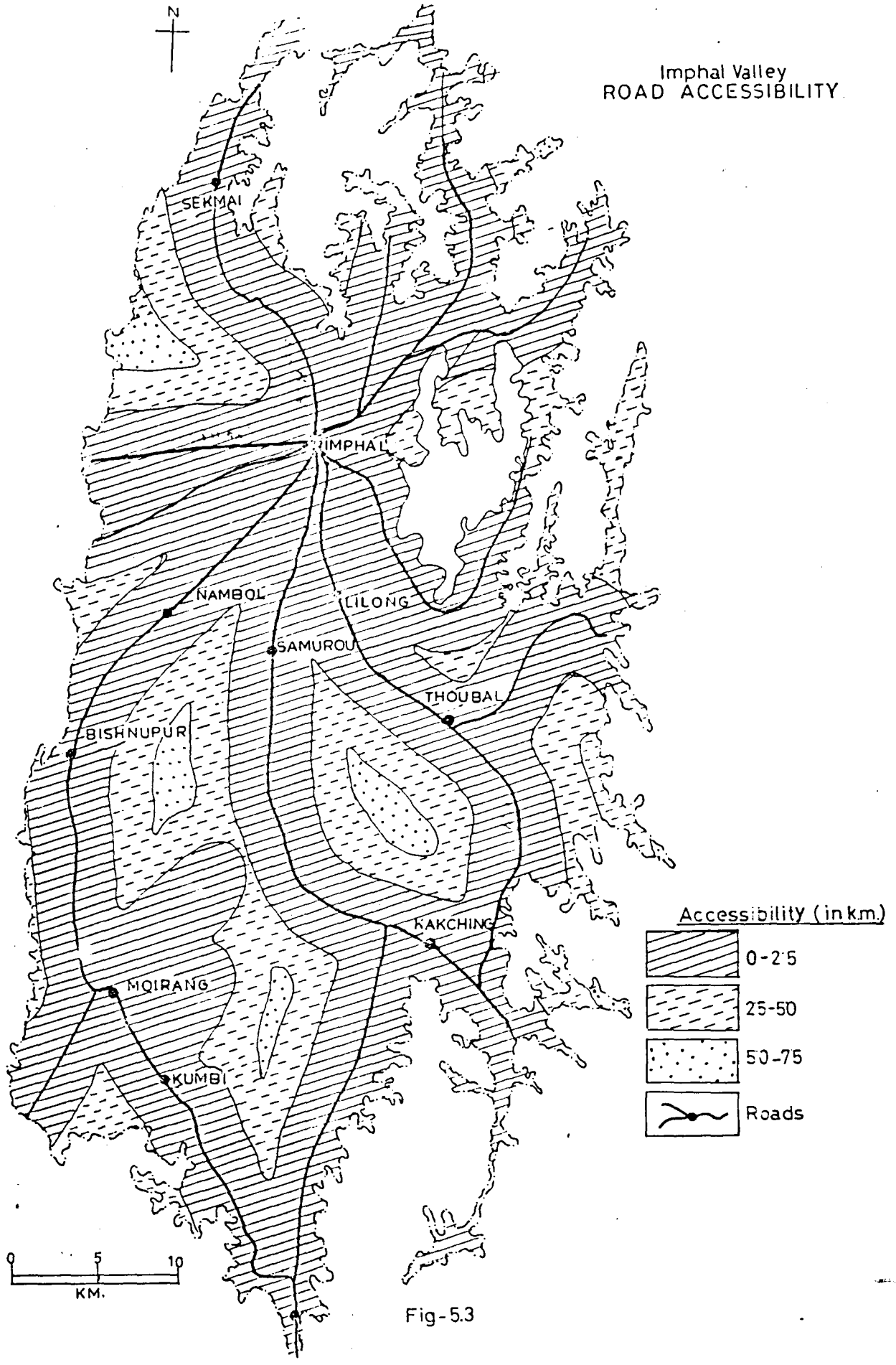

N
Imphal Valley
ROAD ACCESSIBILITY
SEKMAI
IMPHAL
NAMBOL
LILONG
SAMUROU
THOUBAL
BISHNUPUR
KAKCHING
MOIRANG
KUMBI
Accessibility (in km.)
0-2·5
2·5-5·0
5·0-7·5
Roads
0
5
10
KM.

Fig-5.3

connecting Bishnupur, Moirang and Kumbi towns with Imphal city. Nambol and Bishnupur towns are also considered the important points which are situated in the Western foothill side having only a few enterprises related to transport activities, while Utlou village of 2,583 population is having comparatively more infrastructural facilities situated on the same route.

(c) Comparison Between Road Accessibility and Available Infrastructure:

Preparing the map of locational patterns of infrastructural facilities/ enterprises and road accessibility, the following conclusions can be drawn:

(i) The intensity and concentration of transport enterprises are the highest at Imphal city while Moirang ,Lilong,and Nambol centres are lesser concentration of these facilities. There are 1,379 total number of enterprises related to transport activities are available at the growth points of the valley. It shows that 554 number of such enterprises (about 40.2.% to the total) are available only in the Imphal Municipality, 20-100 in number transport enterprises are in Mayang Imphal, Moirang, Thoubal, Lilong, and Nambol. At the small growth points ,the enterprises are available below 20 in number (Fig.-5.4). These growth points of transport enterprises are located on the central part of the valley along with the National and State highways.

(ii) The gas and electricity facilities/ enterprises are equally important because electricity influences directly the agricultural development. According to the statistics given by the State Government regarding rural elecrification, more than 90 percent village in Imphal valley are electrified. However, the electric supply is not regular in the area. The enterprises related to gas and electricity are few in their strength and located only on a few growth points. More than 50 percent enterprises related to gas and electricity are located only at Imphal city and a few number of enterprises are located on Ningthoukhong town.

(iii) The financial insurance, real estate, banking and business service enterprises are also important attributes of infrastructure for agricultural development because these enterprises provide the financial assistance to the farmers to increase agricultural production. These enterprises are 149 in number of which nearly 64 percent is located on the Imphal city. The growth points situated along the Imphal-Moirang road (Tiddim

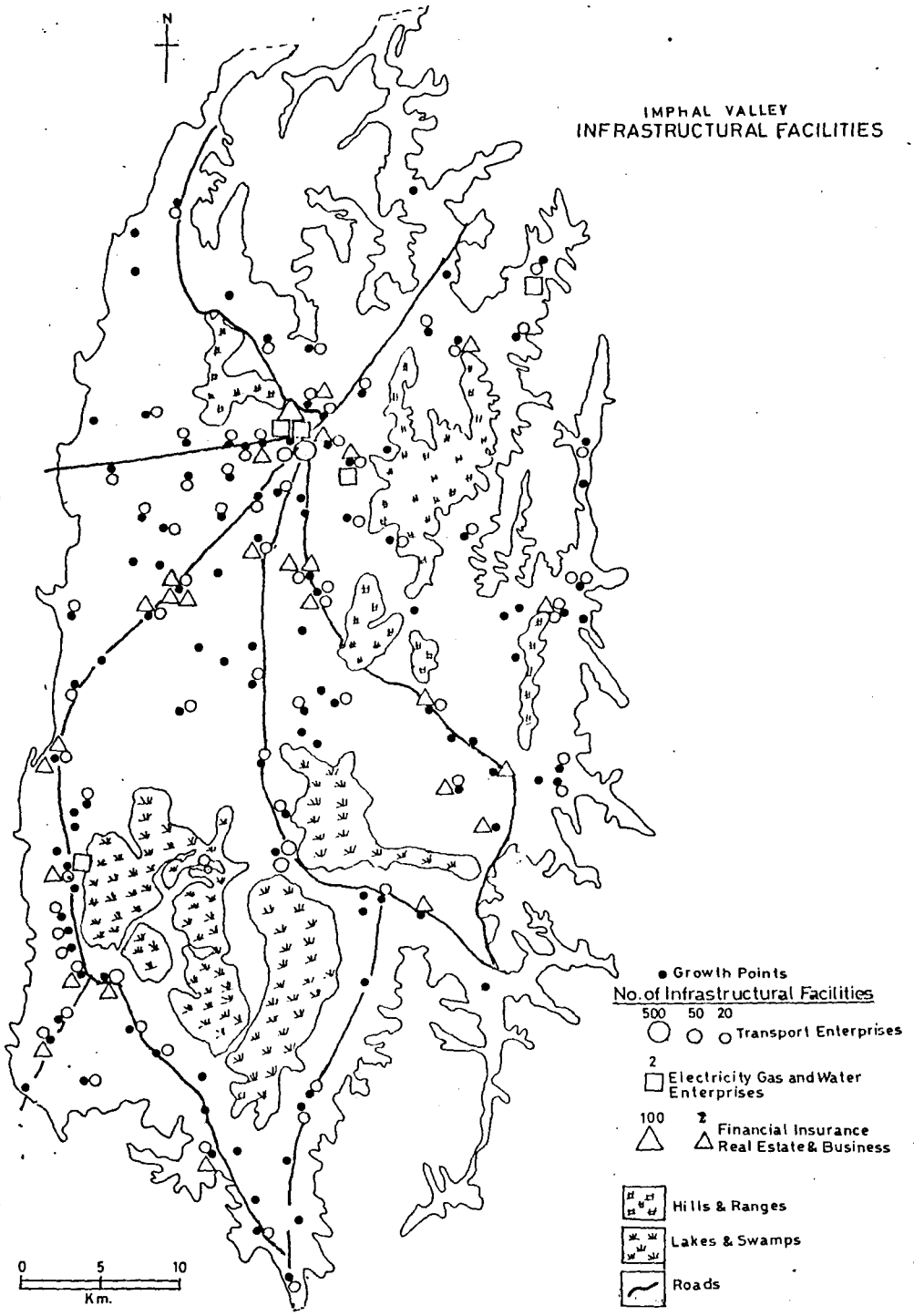

N
IMPHAL VALLEY
INFRASTRUCTURAL FACILITIES
● Growth Points
No. of Infrastructural Facilities
500 50 20
Transport Enterprises
2
Electricity Gas and Water Enterprises
100
Financial Insurance
Real Estate & Business
Hills & Ranges
Lakes & Swamps
Roads
0 5 10
Km.

Fig-5.4

road) are also having these enterprises but they are less in number. However, some growth points which are emerging in the central part of the valley, namely , Utlou, Samurou and Wangoi include large number financial and banking enterprises though they are small in their population size (Fig.-5.4).

It can be said that the areas of higher degree of road accessibility carry high concentration of these facilities/enterprises and *vice-versa*. It means road pattern influences positively the pattern of infrastructural facilities of the area.

4.0: Growth Points as "Diffusion Centres of Agricultural Innovations"

In the foregoing analysis of the contribution of growth points in agricultural development in Imphal valley, the main salient features of the locational characteristics of emerging growth points are highlighted. It shows that Imphal city is the main nodal centre of the area from where two types of developmental processes are being accelerated in its surrounding areas in the rural landscape of the valley. Transport and other infrastructural enterprises evolve diversified patterns concentrating their intensities on a few centres of higher order. The available facilities intensify the process of 'attraction' by which the people spacially farmers of the area move to their nearby centres to avail facilities. On the other hand, there are some processes related to thrust which have been radiating the effects of those available functions, facilities on those growth points. Therefore, if it is assumed that the roads of the area are rking as channels in the locational system and these centres radiate the effects of these facilities, then the processes of diffusion of innovations can be studied in relation to agricultural activities. For the purpose, the growth of these activities are interpreted in their spatial perspective.

Hagerstrand (1968) is the pioneer worker on diffusion theories who explains the processes of diffusion in two ways: continuous spread and hierarchical patterning. The continuous spread of a particular innovation is the result of many facts (Misra 1995). For example, the availability of functions/facilities on the growth points increase the waves of diffusion of any kind of innovation, while high intensity of road network helps in radiating the effects of these innovations in the area. These are the physical available attributes of spatial organisation. On the other hand, innovation of adoption is based on the adopter (in the present case farmers) who adopt the innovation and use them for agricultural

development. Fertilizer, irrigation, and HYVs are the main attributes of intensifying the agricultural activities in any area. These innovations are diffused by existing the spatio-function organisation and adopted at lower level. Therefore, the farming community is also important factor of receiving the effects of innovation. Economic as well as educational levels of the farmers also control the rate of adoption of those innovations. For the same, the data related to agricultural innovations, their adoption rate and related factors have been collected by preparing questionnaire and compiled them in a proper way to test the validity of the facts related to the diffusion of agricultural technology from the growth centres and its impact on the surrounding areas.

In order to analyse the spread effect of agricultural innovations in Imphal valley, the data of 50 farmers who have various size-land holdings with various income groups have been collected by conducting household survey in the study area. The farmers, samples and their villages are selected by distance from the Imphal city in its surrounding areas. The following conclusions have been drawn by compiling the questionnaires data.

(a) The farmers of high income group (20-30 thousand rupees annually) who are having a large size of partial of land holding with two hectares land under paddy cultivation, are adopting modern means of HYVs and chemical fertilizers in the agricultural practices. While the farmers of low income groups are practising agriculture in traditional ways. Therefore, the agricultural productivity is recorded very low in the low income families.

(b) The rate of adoption of modern innovations in agricultural practices is recorded low in the farmers family those who are having low level of education (below-middle school class). The educated farmers family are having high degree of adoptability of innovations in the agricultural practices in the valley.

(c) The adoption rate of innovation is also influenced by the demand of food for the family. Nearly 15 percent farmers of the sample families shows high rate of adoption of chemical fertilizers and HYVs in agriculture because of their high demand of food in their families for local consumption especially rice crop.

(d) On the other hand, the functional structure of growth points and road connectivity of Imphal city with other growth points prevailing in the valley are also wrothnoting factors for the adoption rate of innovations in the agricultural practices. There is a smooth distance-

decay pattern of the interaction and diffusion of those innovation which are related to agricultural development in the valley. For example, the rate of adoption of innovation decreases with increasing the distance of the location of adopters of these innovations from the Imphal city. It is recorded that the adoption rate of fertilizer use is recorded 63.23 percent upto 10 km of distance from its vicinity of Imphal city and decreases upto 21.50 percent between 40-50 km. Therefore, the core-periphery relation of Imphal city and other growth points are important in the developmental processes in the valley.

(e) The gradient of distance-decay of the innovations is not so steep in the valley. For example, the surroundings of 10 km from the Imphal city, decreasing rate of the adoption is observed 3.7 percent per km. of distance, which is slower (1.2 percent) between 10 and 30 km. distance recorded only 0.9 percent in the outer zone of the 30-50 km. of distance from Imphal city.

5.0: Growth Points within Their Spatial Arrangement

The locational characteristics of the functional structure prevailing in Imphal Valley have already analysed to put them separately under various homogeneous functional groups. There is, further, need to synthesise the functional strength and their distributive nature. Therefore, in this section of the present Chapter, the synthetic view of functional strength with their hierarchic orders and spatial arrangement of agricultural activities is interpreted here.

The functional nature and their aggregated strength and heirarchic orders which are working over economic space by integrating the growth points in Imphal valley, have already discussed in detailed. The spatial organisation of functional structure is also equally important aspect. It would give some clues of the weakness of the locational system prevailing in the valley. Therefore, the spatial organisation of those activities related to economic, infrastructural as weell as administrative attributes is interpreted here by aggregating them and classifying them into four homogeneous groups. It would provide the spatial organisation of those activities at different levels. As already been mentioned in Chapter-IV that the total growth points identified in the valley are classified into four orders, namely, Growth Pole, Growth Node, Growth Centres and Growth Villages; from higher order to lower order growth points , it is important to study how these growth

points are interlinked and interrelated with their lower order growth points in the spatial organisation of economic landscape.

5.1: Spatial Arrangement at Various Levels of Growth Points

Starting the assimilation processes of arranging the lower order and dependent grow th points with their higher order growth points and putting them on different maps, the boundaries of influencing zones at various levels of growth points are delineated and the total population served by them are calculated. The following salient features in this spatial organisation of growth points emerging in Imphal valley are markable to highlight.

(i) Imphal city which is emerged as the growth pole of the area,is serving the total population of the valley through the next high order growth point i.e. Bishnupur town.

(ii) There are two high order growth nodes (Imphal city and Bishnpur town). Imphal is interacting with 6 next lower order growth centres, namely; Lilong, Thoubal, Samurou, Mayang Imphal, Kakching and Nambol towns, while Bishnupur town is serving only two next lower order growth centres (i.e. Ningthoukhong and Moirang towns) in the valley. But the population size of Bishnupur town is recorded very low rather than its proportion functional strength. Therefore, it may provide an important place in near future in the spatial organisation in the valley (Fig.-5.5).

(iii) The middle order growth centres are classified ten in number including Imphal and Bishnupur growth nodes. Because these two are performing functions/facilities at the middle order growth centres and therefore they are also considered as growth centres of the middle order in the spatial organisation. Imphal city serves with maximum number of facilities to its next order growth points (i.e., 24 in number) with serving the maximum areal size in the central part of the valley. The second important growth centre at the middle order of the spatial organisation is Moirang town which is situated at the South-Western lowland area of the Loktak Lake in the valley is serving to 10 growth points of its lower order points including a few growth points located at Loktak Lake (i.e. Thanga). Kakching and Thoubal are also important growth centres of the middle order because each of them serves average six numbers of growth points of their next lower order growth villages (Table- 5.3).

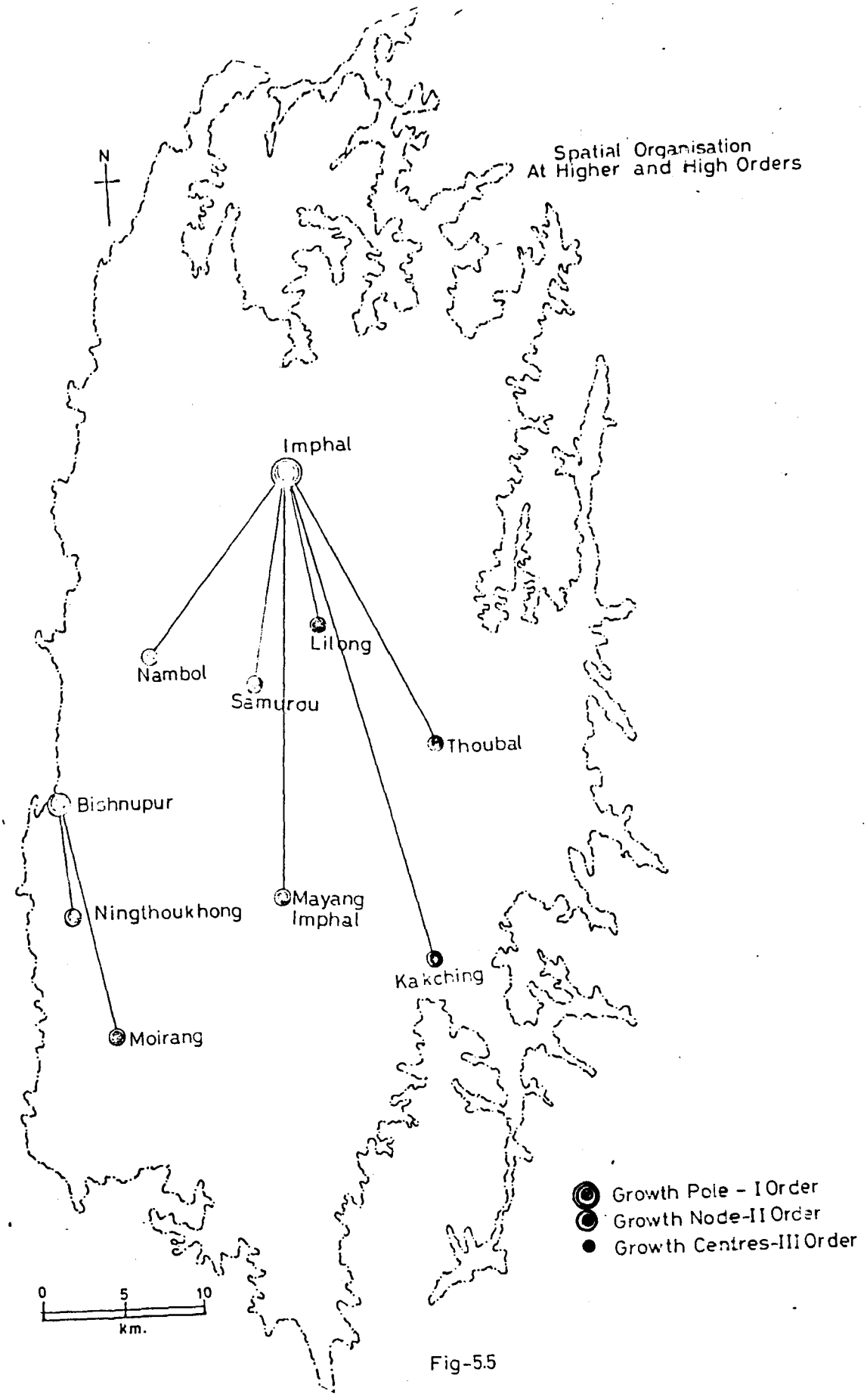

Spatial Organisation
At Higher and High Orders
N
Imphal
Nambol
Samurou
Lilong
Thoubal
Bishnupur
Ningthoukhong
Mayang
Imphal
Kakching
Moirang
Growth Pole - I Order
Growth Node-II Order
Growth Centres-III Order
0
5
10
km.

Fig-5.5

Table-5.3: Number of Dependent growth Points and Population Served at various orders of Spatial Organisation

Name of Oredrs	Population Size(1991)	Total Population Served (1991)*	No. of Next Lower Order growth Points Served and their Name
A. Higher Order:			
1. Imphal	198,535	11,51,946	1 Bishnupur
B. High Order:			
1. Imphal	198,535	5,87,096	6 Thoubal,Kakching, Mayang Imphal, Nambol, Lilong, Samurou.
2.Bishnupur	8,040	1,57,390	2 Moirang, Ningthoukhong
C. Medium Oredr:			
1.Imphal	198,535	2,13,425	24
2.Bishnupur	8,040	35,178	2
3.Thoubal	33,011	97,229	6
4.Kakching	24,437	55,709	5
5.Mayang Imphal	16,570	26,124	1
6.Nambol	16,021	66,872	9
7.Lilong	15,211	70,244	5
8.Samurou	11,858	57,493	5
9.Moirang	15,443	1,03,300	10
10.Ningthoukhaong	9,458	18,912	4
D. Lower Order:			
All Identified Growth Points**	6,500	10,000	3

N.B: * Figures include the population of the growth points of various orders

** Figures at this order are average only.

At this level, it is also clear that some small points which are emerging as growth villages of the Extremely Southern side as well as of the foothill areas of the North Eastern side are growing in the isolation. They do not serve and interact with their higher order centers. Therefore, there is a case of functional-gap at this middle level of the spatial organisation. (Fig.- 5.6).

(iv) The sptial organisation at lowest orders where the growth villages are emerging faster and working as 'contact points' in the spatial organisation of the valley, contributes significantly. The contribution of lower order growth points can be interpreted as follows:

(a) The growth villages of Northern and North-Eastern foothill areas where higher order centres are emerging in isolation, these growth villages have more interaction with the dependent villages. The average number of seven dependent villages are being served by each growth village in the valley.

(b) The growth villages emerging in the Central part of the valley serve an average number of 2 to 5 dependent villages in their surrounding areas with an average size of population of about 10 to 15 thousand persons.

(c) In the longitudinal belt of the Southern part where Kakching-Sugnu towns are situated, the number of dependent villages which are served by the lower order growth points are very less. It is because of these areas situated in the transional belt of agro-ecological conditions between marshy lands and foothill slope areas (Table-5.3).

(d) Most of newly emerging growth villages which are having an average size of population of about 6 - 10 thousand persons are growing themselves without interacting with their dependent villages specially in the South-Western parts of the valley (Fig.-5.7)

6.0: Concluding Remarks

Functional hierarchy and spatial organisation provides clues for suggesting weakness of the spatio-functional organisation working in the area. It was found that, in spite of diverse nature of the distribution of economic as well as infrastructural enterprises in

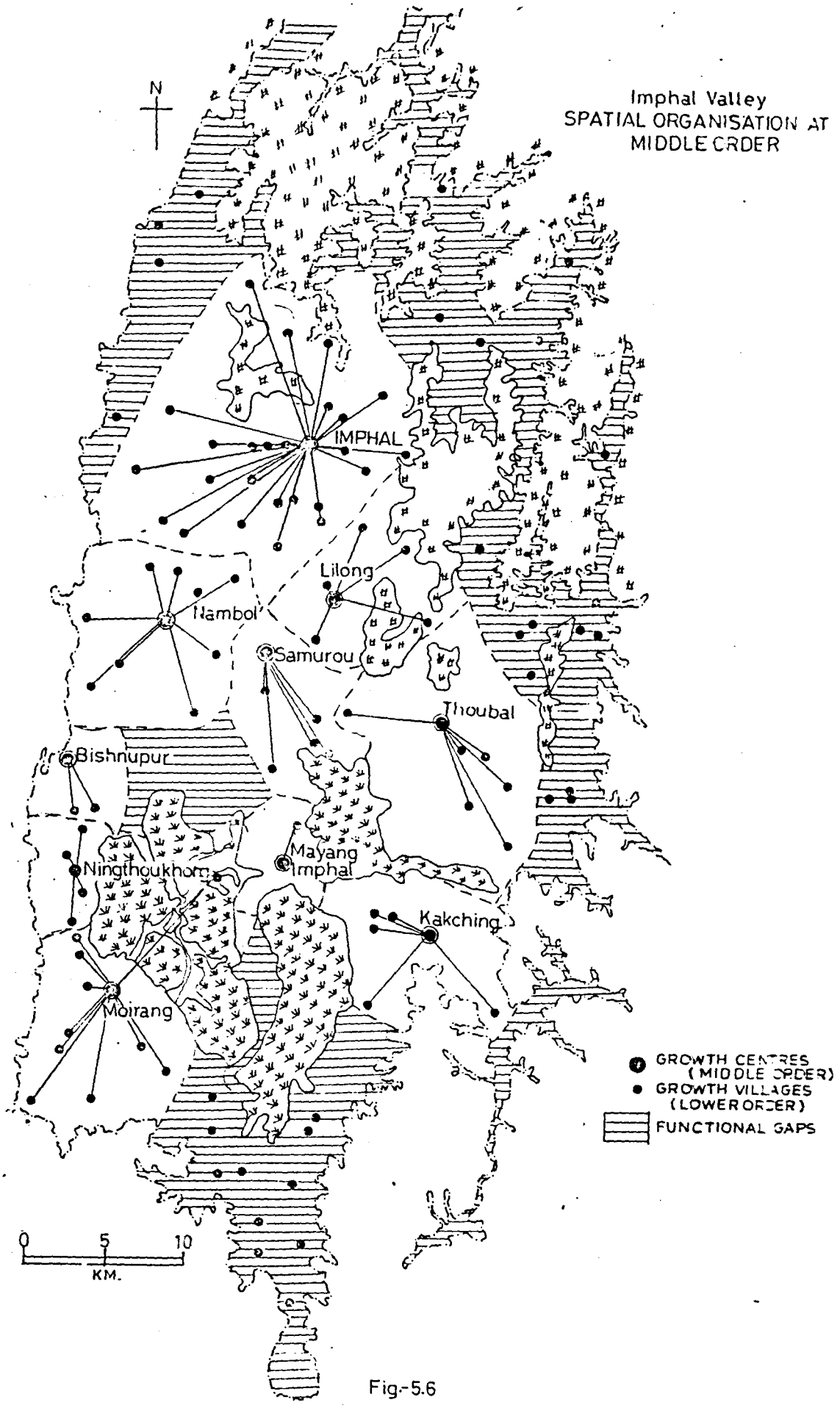

Imphal Valley
SPATIAL ORGANISATION AT
MIDDLE ORDER
N
IMPHAL
Lilong
Nambol
Samurou
Thoubal
Bishnupur
Mayang
Imphal
Ningthoukhong
Kakching
Moirang
0
5
10
KM.
GROWTH CENTRES
(MIDDLE ORDER)
GROWTH VILLAGES
(LOWER ORDER)
FUNCTIONAL GAPS

Fig.-5.6

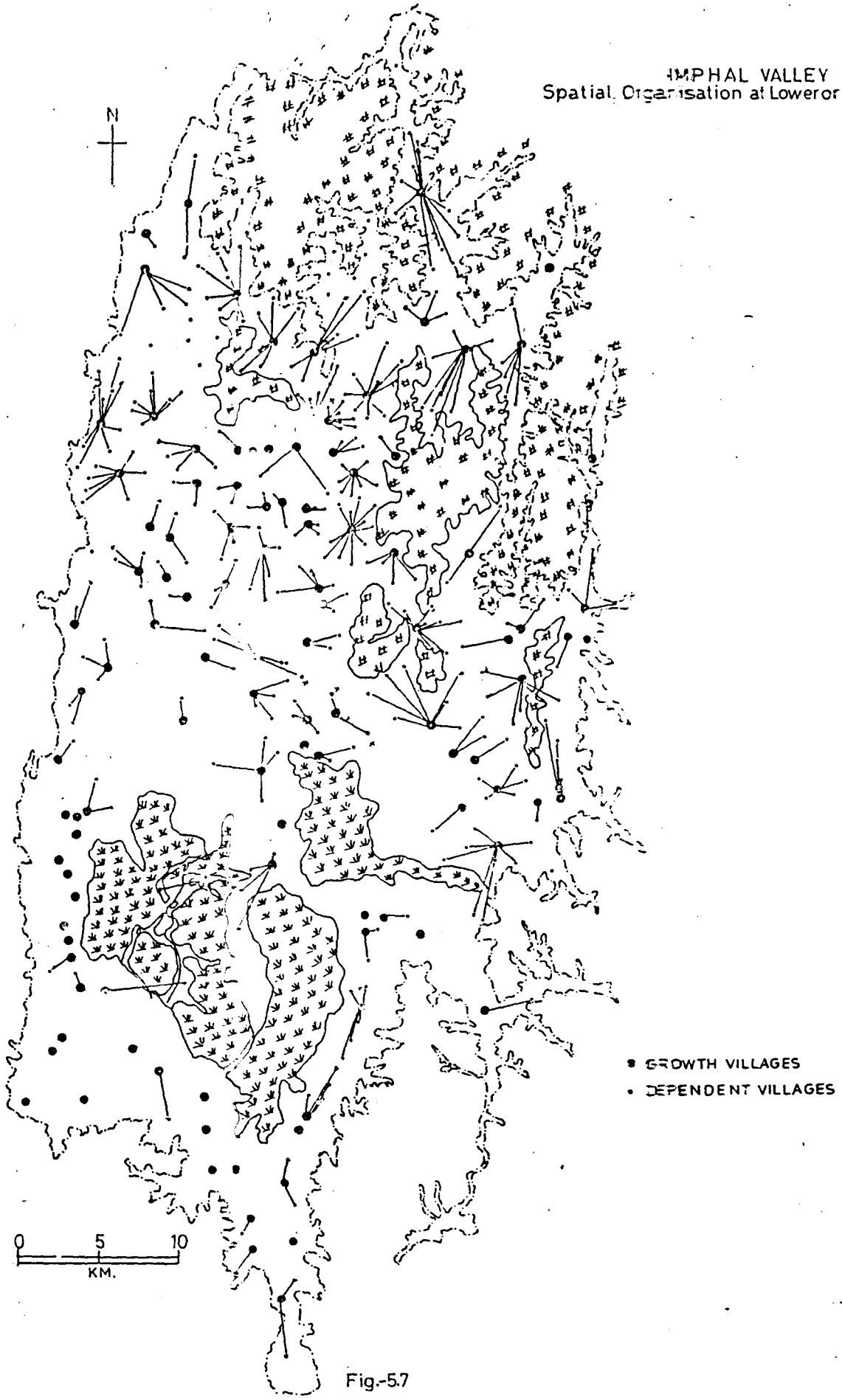

IMPHAL VALLEY
Spatial Organisation at Lowerorder
N
GROWTH VILLAGES
DEPENDENT VILLAGES
0 5 10
KM.

Fig.-5.7

Imphal valley, there is an emergence of weak spatial organisaiton of these facilities. The highest order growth point, i.e. Imphal city, is working as a functional pole with high concentration of functional agglomeration. Therefore, it seems that the functional force is concentrated towards Imphal town which creats diversified pattern and primacy in the functioning of spatial organisation. However, the centres of lower order, that are called 'growth villages' are emerging faster and would be acting as 'Contact Points' between higher order growth points of the functional hierarchy and the resource structure available for utilisation in the valley.

The weaknesses of the spatial organisation and its remedies can be suggested with the initial findings of the research which are to be discussed separately in the next Chapter.

Chapter - VI

CONCLUSION AND SUGGESTIONS

6.1: Introduction

Agriculture is the main sector of economy in Imphal valley and most of the farmers produce foodgrains at their subsistence level which characterises its low level of production resulting in poverty and underdevelopment in many parts of the valley. The rapidly increasing population pressure worsens the situation of food requirement and provides unlimited supply of labourforce which is to be absorbed in economic activities in the area. As a result, labour productivity in agricultural as well as non-agricultural sectors is recorded low with low level of operation of production processes and productive- work. Agriculture in the valley suffers from stagnant conditions of slow rate of agricultural growth with its low level of production and productivity, in spite of its favourable agro-ecological conditions, especially fertile soils with well-drained topography and good climatic conditions. In fact, functional nodes of the growth in the area are helping to diffuse the agricultural innovations to their surroundings with accelerating the processes of developmental growth in agricultural landscape. In this connection, an attempt has been made here to examine the validity of the facts whether these growth points of the area influence the agricultural landscape in their optimal way or there is a need of strengthening them further.

Physiographically, Imphal valley is divided into three physiographic zones to study the areal variations of agricultural phenomena. The upland zone of the Northern foothill areas of the valley has gentle slope with fertile soils and extremely drained conditions. The mid-lands areas of the Central part of the valley where Imphal city is located, is flatland with fertile loamy sand soils. The low-land areas of the South and adjoining areas of Loktak lake and marshy land topography are poorly drained with silty and clayey soils with its less fertility. Therefore, these micro-areal variations of physiographic factors of land influence directly the agricultural productivity of the area.

The entire valley is a systematic geo-hydrological unit of Imphal river system and its tributaries, namely; Iril, Kongba, Thoubal, Sekmai, etc., which are passing through the main heart of the valley. Imphal valley enjoys with the sub-tropical monsoon type of climatic conditions which are favourable for cultivation of crop especially paddy during the summer seasons. It receives the highest average annual rainfall of about 150 cm with a moderate temperature ranging from 25°C to 30°C. The winter season is cool and dry in the valley.

Infrastructure for agricultural development is not sufficient in the valley. For instance, road intensity is recorded only 1.28 km/sq. km. In spite of 80-90 percent villages electrified, consumption of electricity in agricultural sector is recorded very low that is only 2.0 percent to the total consumption. The educational, postal, medical and market facilities are also concentrated only on a few growth points of the area which are not sufficient for human development of the entire population of the valley. The locational characteristics of distribution of those services/facilities which are directly or indirectly influencing the agricultural activities are weak and, consequently, their spatial arrangement is also not working properly. Therefore, there is need of intensifying infrastructure for agricultural development through developing its spatio-functional organisation in the valley in which growth points are playing a significant role.

Keeping these aspects of agricultural development in mind, the contribution of growth points through which many developmental processes are being operated in Imphal valley has been studied by adopting cartographic as well as statistical techniques in the present research. In this connection, the following main findings are important to note.

6.2 Initial Findings

The present study highlights some of the interesting features of the relationships established here at various levels of the study related to attributes of agricultural development and their influencing factors. By comparing the attributes of agricultural development with the locational patterns of various functional parameters of agriculture and their spatial arrangement, some interesting findings have been drawn:

1. In spite of homogeneous physiographic characteristics of the valley with its insignificant regional variations in agro-ecological conditions, the significant areal variation in the patterns of agricultural productivity, land as well as labour productivity have been observed. It means that agricultural productivity which is a main parameter of agricultural development, is not directly influenced by the physiographic conditions of land, but controlled by the market forces and urbanisation processes prevailing in the valley.

2. The average existing crop yield index, which is based on three types of paddy crops as mentioned in Chapter-III, is recorded very low (i.e., 44.7qu/ha) in the valley even it is far lower than the Maximum Expected yield level of the area (69 q/ha). As a result, yield-gaps which show different between Maximum Expected and Existing crop-yield are noticed higher in the pattern of land productivity which are closely related to the variations of physiographic conditions of land specially soils and climate. Therefore high and very high land productivity (55 qu/ha) is recorded in the upland areas of the North, medium productivity(40-45 qu/ha) in the Central part of fertile tracts and low and very low productivity level (below 40 qu/ha) in the Southern areas in the valley. Consequently, yeild-gap are recorded lesser in high productivity areas and vice -versa. These yield-gap can be minimised by intensifying modern technological input of agriculture. However, the farmers have started applying modern seed-fertilizer package.

3. The pattern of productivity is observed diversified with respect to labour intensity. Therefore, labour productivity does not influence by the labour input. Increasing more labour in farming practices stablises productivity conditions. It may be because of the condition of 'unlimited supply of labour in agricultural farming system. Therefore, there is a negative relationship of labour productivity with respect to labour intensity. For example, because of rapid growth of population in the valley, a significant increase of total main workers has been record from 2.2 lakh in 1961 to 3.97 lakh in 1991 during the last three decades which shows a big labour pressure on agricultural activities. Therefore, an absolute increase of about 1.2 lakh in the workforce engaging in agricultural activities (i.e., 112.14 percent from 1.06 lakh in 1961 to 2.25 lakh in 1991) may not be able to increase labour productivity proportionately.

In fact, when labour productivity is defined here as the total agricultural production per agricultural worker, it is obvious that the labour productivity and labour intensity must have negative relationship. But the scatterness between them is not smooth, it is curvi-linear in shape with concave slope. It also reveals that labour intensity does not have any effect on productivity. The stagnancy in these conditions can be tackled at this stage of productivity by applying modern technological agricultural inputs.

4. In landuse patterns, it appears to be a negative relationship of cultivated land with waste land. It shows that the expansion processes of agricultural land-use have been taken place in the area which can further be accelerated through applying yield-augmenting techniques.

5. Since the study area is passing through its initial stage of agricultural development and growth, the urbanisation and locational characteristics of activities related to agricultural development influence directly the patterns of agricultural productivity. Say for example, the productivity patterns, if it is compared with the urbanisation patterns in the area, are directly controlled by them. The surrounding areas of Imphal, Bishnupur, Thoubal and Kakching are more developed and having high productivity level rather than the areas of Southern low lands surrounded by the Loktak Lake. As a result, the impact of urban centres and road accessibility, which are observed in the area, influence the agricultural development in the valley.

6. Identifying the growth points in the area which are characterised as villages of high growth rate of population and more number of functions with their larger population size including the urban areas, it is found that the growth persists especially in the vicinity of the Imphal town and its adjoining areas and along with the main roads passing through the South-Western parts of the valley. Therefore, the uniform locational pattern of growth points are not being seen in the valley.

7. In the scatter- diagrams of various activities/facilities related to agricultural development with respect to population size of identified growth points, it is observed that only Imphal city is considered as higher order, i.e., growth pole in the valley and Bishnupur is considered as second (high) order functional point i.e. called 'growth

node'. Bishnupur growth node is weak in its functional characteristics. As a result, it does not have proportoinate size of its influence zone on agricultural landscape.

The third order centres are classified 8 in number which are generally the newly emerging towns. Remaining 104 growth points which are big villages of the area are considered as the 'growth villages' in the functional hierarchy of growth pints.

8. Comparing population size with composite centrality index of the growth points, it is found that the composite centrality index of functions/facilities does not follow the similar tendency with population size. There is a deviation in the patterns of composite centrality index. For instance, some growth points of high population size included very less number of functions and *vice-versa*. However, the growth points are the part of spatic-functional organisation through them agricultural developmental activities are to be radiating to the surrounding rural areas.

9. The distributional patterns of production processing enterprises (i.e., agro-based manufacturing, wholesale, retail shops and storage facilities are concentrated at Imphal city and at the growth points located in its surrounding areas. Likewise, the enterprise related to infrastructure for development of agricultural activities (i.e., transport, electricity and financial estate and banking) are also following the same pattern. The locational characteristics of these activities/facilities are diversified in their patterns. As a result, there is a primacy in the distribution of those facilities. Therefore, Imphal city is considered as the 'primate city' of the area which is a big diffusing- centre as well as surplus processing-centre in the valley.

If the population size and composite centrality score of growth points of Imphal valley are arranged according to their rank, it is found that there is a divergence between the distribution of population and centrality scores at the second rank growth points (i.e. Thoubal town for population size and Bishnupur Town for Centrality scores). The rank size curves have maximum distance at third rank growth points where composite index has less degree of concavity in its distribution rather than population size (Fig. 6.1). This distance is also minimising at lower order growth points . It means there is a balance growth of population as well as functions at lower order growth points.

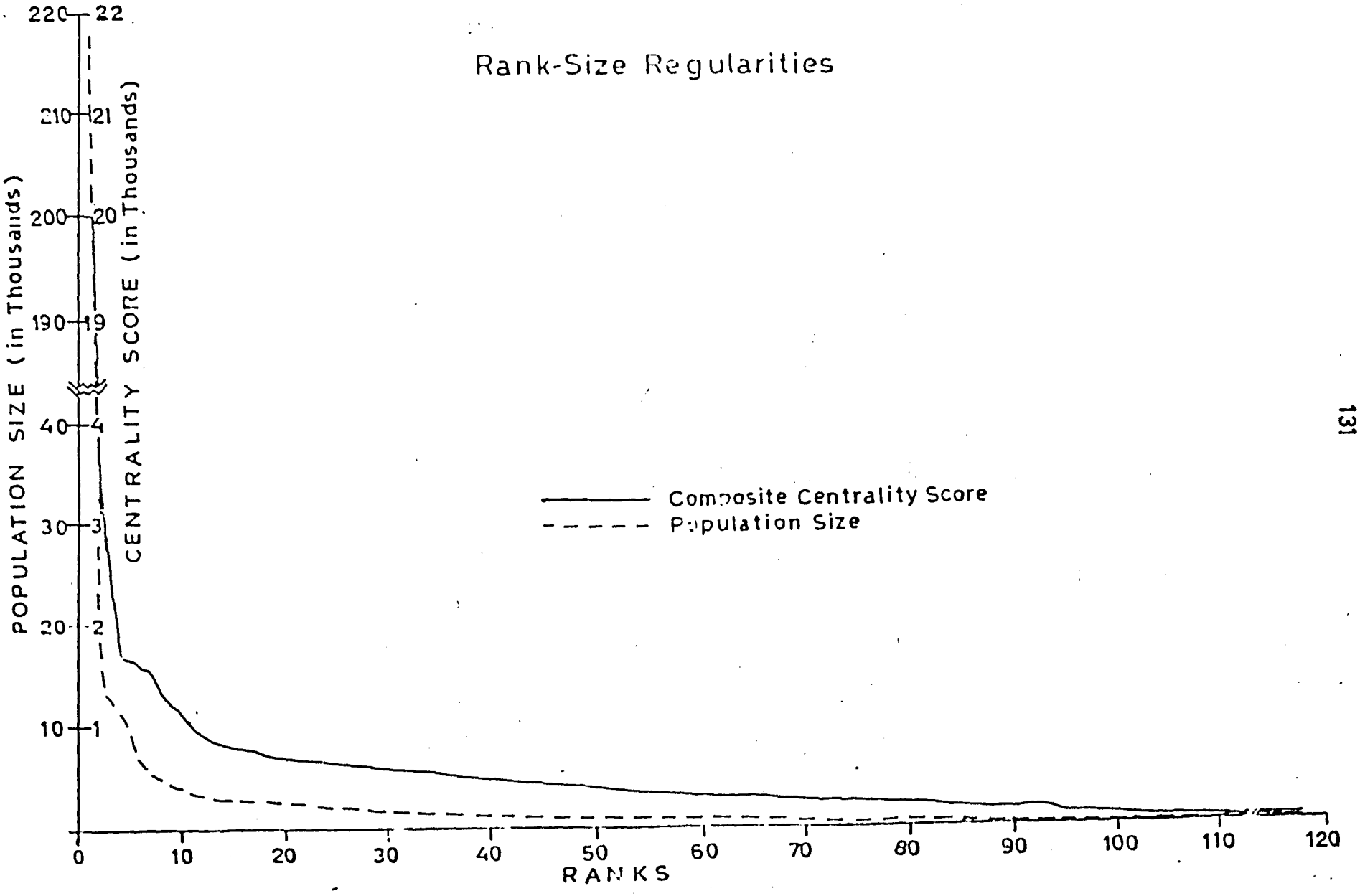

Rank-Size Regularities
POPULATION SIZE (in Thousands)
CENTRALITY SCORE (in Thousands)
220
210
200
190
40
30
20
10
22
21
20
19
4
3
2
1
Composite Centrality Score
Population Size
0
10
20
30
40
50
60
70
80
90
100
110
120
RANKS

Fig.-6.1

10. In the food surplus areas of the valley, the lower order growth points of the spatio-functional organisation are emerging faster with the activities related to local agro-processing functions. Therefore, these points are recognised as 'contact points' where complete integration of resource use and its associated activities are shown. On the other hand the working of spatio-functional organisation in food deficient areas is demand-based.

The functional structure of growth points is unified at lower level with small-size enterprises of agro-based industries and diversified at higher order centres specially at Imphal, Thoubal and Bishnupur.

The storage facilities one not sufficient in the valley. The available storage facilities are being used to store non-agricultural commodities rather than agricultural surplus.

11. So far as the spatial arrangement of various orders of the growth points is concerned, itis clear that the hierarchic patterns of growth villages of lower order growth points which are emerging in the valley, are well organised manner specially in the food deficient areas of the central part of the valley. They serve 3 to 6 dependent villages of their surrounding where the areas of longitudinal belt of transition between the Barail ranges and Loktak lake. There are more number of growth villages which are emerging independently in these belts of surplus production. Therefore, the emergence of growth points in surplus production areas is based on the activities related to available surplus production while the functional nature of growth villages in food deficient areas is based on the functions related to food supply.

12. The spatial arrangement of the middle order growth centres shows a significant arrangement with the growth villages. But the foot hill areas of the North and North-Eastern part and surrounding low-lying areas of the South, are weak in their spatio-functional organisation. As a result, there are areas of having functional-gap in the area. This fact can be elaborated more in the next part of the Chapter.

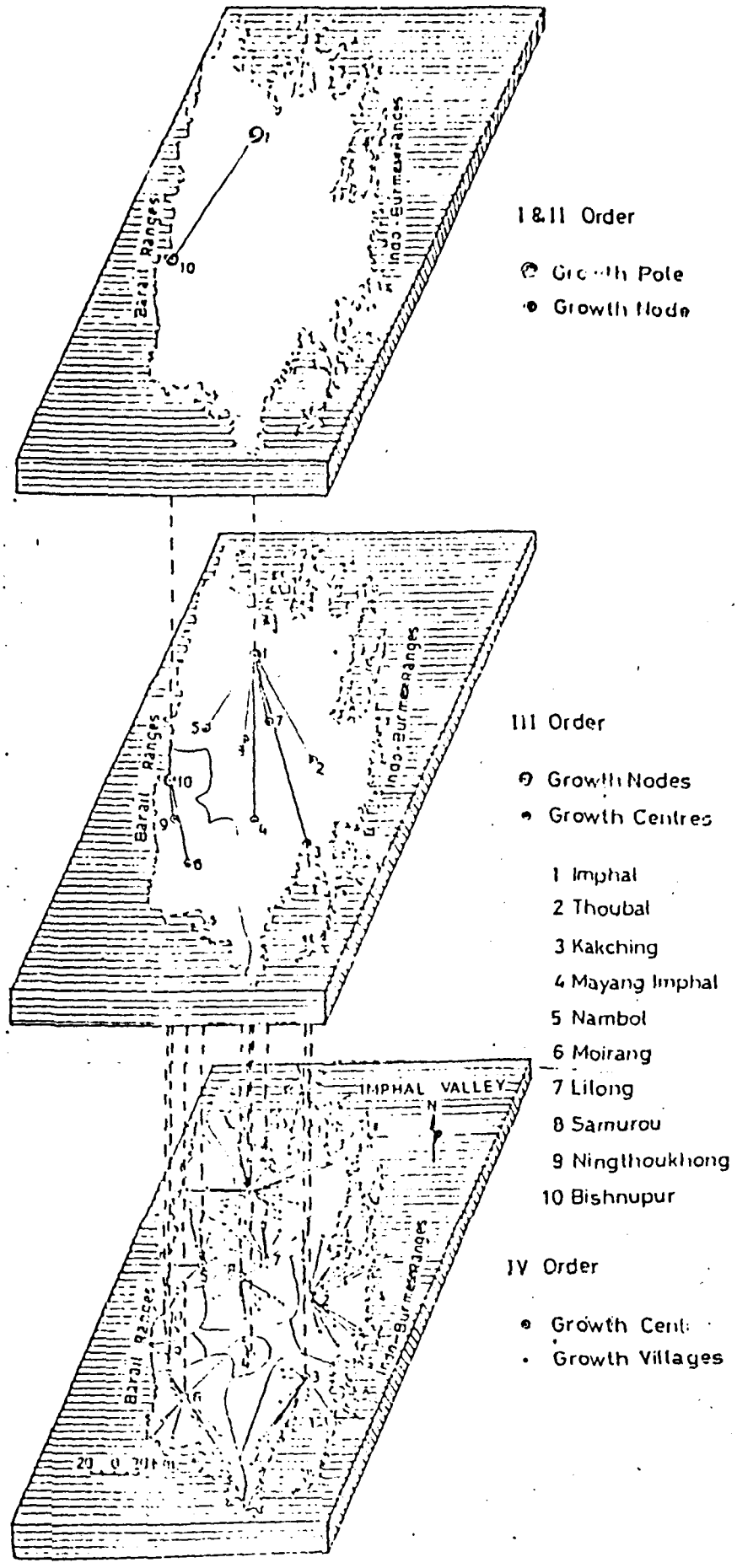
6.3: Suggestions

The suggestions for the development of agricultural landscape may be put forward in many ways. The Chapter-V of the present piece of research here shows the weakness of spatio-functional organisation working in the agricultural landscape in Imphal valley. The above cited findings are also indicating the weaknesses of spatial organisation prevailing in the area. Here, these parts can be generalised to make a model of development not only for the specific geographical situation of Imphal valley, but also for the entire North-Eastern areas of intensive cultivation. Since we are oriented our mind towards the generalisations with respect to the locational system and functional nodality, we may be able to synthesise the facts of interaction and integration of services/ facilities and their evolving spatial arrangement in the locational system.

The four tier of the functional organisation which is working in Imphal valley for agricultural development does not have perfect regularities in existing conditions of its working. Say for example, the increasing of number of growth points from higher to lower orders with the decrease of their average population size is the main regularity of spatio-functional organisation. The attributes related to locational characteristics of the systems is neither working on market principle (K = 3) nor following the norm of administrative principle (K = 7) of its spatial organisation. But the working of the system follows the transport principle (K = 4) with some weakness (Fig.-6.2). Second order centres are only two in existing conditions instead of four in normative case . Out of these two Bishnupur is having comparatively low size of its population, and therefore, there are irregularities in average population size and and number of growth points of next higher order served (Table - 6.1). As a result, it can be suggested that there is a need of fast transformation of functional organisation from Middle to Higher order growth points. The following middle order growth points may be developed as high order points to strengthening their functional structure:

IMPHAL VALLEY

Spatial Arrangement of Locational System



I & II Order

- Growth Pole
- Growth Node

III Order

- Growth Nodes
- Growth Centres

1 Imphal
2 Thoubal
3 Kakching
4 Mayang Imphal
5 Nambol
6 Moirang
7 Lilong
8 Samurou
9 Ningthoukhong
10 Bishnupur

IV Order

- Growth Centres
- Growth Villages

Fig-62

(i) Thoubal town which is recognised as middle order centre in existing organisation should be developed as market centres based on agricultural activities.

(ii) Lilong town should be developed with the enterprises related to agricultural innovations, so that it should act as a 'magnet centre' to check the direct interaction with the Imphal city.

(iii) Kakching town which is located at the functional zone of the foothill of South-East is growing faster and should grow at High order growth point, so that the functional gap at this order can be minimised.

Table-6.1 Functional Hierarchy and Spatial Ordering of Growth points.

Order	No.of Growth	Average population	Population served
I Higher	1	2,00,000	-
II High	2	1,00,000	3,72,000
III Medium	8	74,000	35,000
IV Low	71	6,500	10,000

(iv) The lower order growth points are emerging fast and integrating the agricultural space in its spatial arrangement. However, a few more villages may be suggested to provide more functional strength at this stage.

(v) In order to determine the priority of the development of road network, it can be suggested that the road conectivity, strong road network is required at the lower order growth village (IV order). The low lying areas of the South should be paid more attention for construction of new Block level roads to increase the conectivity in rural areas. Higher degree of road connectivity will be helpful in intensifying the functional interaction patterns of Imphal valley.

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Appendix-I: Total Population, Growth, Administrative Status and Centrality Scores of Various Growth Points in Imphal Valley(1991)

Location Code	Name Growth Points	Total Population	Decadal Population	Status	E	I	A	Composite Index
1.	Imphal	198,535	26.76	M	21,011	594.55	217.22	21822.77
2.	Thoubal	33,011	77.76	M	494	124.47	74.72	693.19
3.	Kakching	24,437	15.27	M	810	78.27	46.02	934.29
4.	MayangImphal	16,570	126.30	NAC	578	41.59	7.13	586.54
5.	Nambol	16,021	22.58	M	452	50.92	16.29	519.21
6.	Moirang	15,443	20.59	M	1,058	85.53	46.02	1143.53
7.	Lilong(Thou)	15,211	36.64	NAC	404	32.61	7.13	436.61
8.	Khangabok	12,925	42.03	V	10	45.83	-	95.83
9.	Thanga	12,386	17.59	V	102	63.34	-	165.34
10.	Samurou	11,858	36.06	NAC	428	13.50	-	441.50
11.	Thongkhong luxmi Bazar	9,910	NA	NAC	262	20.27	-	282.27
12.	Ningthoukhong	9,458	33.51	NAC	1,192	23.83	-	1215.83
13.	Lilong	9,427	37.16	NAC	270	19.50	7.13	296.63
14.	Thongju	8,296	26.48	V	91	23.84	-	114.84
15.	Kakching khunou	8,234	NA	NAC	253	21.23	-	274.23
16.	SangaiYumpham	8,213	125.76	V	68	19.53	-	87.53
17.	Bishnupur	8,040	43.24	M	2,957	37.78	74.72	3,069.50
18.	Lamjaotongba	7,340	NA	CT	264	19.02	-	283.02
19.	Kumbi	7,251	14.59	NAC	167	38.87	7.13	213.00
20.	Wangathinungei	7,148	16.72	V	142	17.03,	-	159.03
21.	Yairipok	6,911	53.14	NAC	96	16.69	7.14	119.82
22.	Khetrigao	6,872	29.17	V	240	21.52	-	257.03

23.Kwakta	6,841	NA	V	64	14.02	-	88.02
24.Andro	6,797	NA	NAC	88	11.95	-	99.95
25.Wangoi	6,764	-6.16	NAC	52	19.17	16.29	87.46
26.Wangoi Ahallup	6,460	43.84	V	28	18.62	-	46.62
27. Heirok	6,407	28.27	V	100	12.47	-	112.47
28. Sajor Leikai	6,300	28.47	V	345	10.85	-	355.84
29. Wabagai	6,228	21.71	V	60	21.88	-	81.88
30. Naorya Pakhanglakpa	5,803	220.51	V	236	13.66	-	249.66
31. Leimapokpam	5,803	22.21	V	16	18.47	-	34.47
32. Lamsang	5,635	23.39	NAC	148	18.06	7.13	173.19
33. Wangjing	5,609	20.36	NAC	220	24.03	-	244.03
34. Saiton	5,359	55.24	V	267	12.73	-	279.73
35 Sikhong Sekmai	5,339	12.21	NAC	288	17.65	-	305.65
36. Oinam	5,307	8.91	NAC	94	22.51	7.13	123.64
37. Hiyanglam	5,219	200.03	V	44	21.95	-	65.95
38.Sagang	5,139	27.74	V	249	17.64	-	266.70
39. Kwakta	5,041	NA	NAC	110	13.92	-	123.92
40. Heingang	4,928	36.25	V	110	31.38	-	141.38
42. Langmeidong	4,632	23.22	V	50	16.44	-	66.44
43. Wangoo	4,509	26.27	V	4	29.91	-	31.91
44. Heirok-II	4,400	26.55	V	68	18.66	-	86.66
45. Porompat	4,306	32.74	V	122	27.28	46.02	195.30
46. Bijay Govinda	4,304	NA	CT	223	21.53	-	244.53
47. Sekmai Br.	4,288	6.45	NAC	130	21.51	7.13	158.64
48.Sugnu	4,058	-6.91	NAC	268	25.39	-	293.39
49. Laipham Siphai	3,971	68.62	V	134	4.82	-	138.82

50.	Patsoi	3,805	27.77	V	24	19.54	- 43.54
51.	Iroisemba	3,801	-12.20	V	232	8.56	- 204.56
52	Sagolband	3,780	113.32	V	95	10.08	- 105.08
53.	Keinou	3,733	22.88	V	162	19.01	- 181.01
54.	Kakching Khunou	3,716	40.33	V	248	18.78	- 266.78
55.	Lamlai	3,606	21.87	NAC	194	17.72	- 211.72
56.	Keirak	3,576	18.73	V	94	11.65	- 105.65
57.	Laikot	3,561	61.72	V	119	4.33	- 123.33
58.	Sangai prou Mamang	3,445	32.70	V	208	7.06	- 215.06
59.	Khurkhul	3,344	15.67	V	32	20.89	- 52.89
60.	Nachou	3,256	26.10	V	90	11.21	- 101.21
61.	Pallel	3,230	55.21	V	145	16.64	- 161.64
62.	Maibam Konjil	3,108	50.82	V	48	5.36	- 53.36
63.	Changangei	3,098	27.12	V	48	4.33	- 52.33
64.	Konthoujam	3,025	18.07	V	16	28.67	- 44.67
65.	Uchiwa Santhal	3,009	95.14	V	50	3.30	- 53.30
66.	Thinugei	2,899	26.43	V	38	11.39	- 49.39
67.	Khoirom	2,875	65.61	V	46	14.15	- 60.15
68.	Tellou	2,865	106.42	V	30	1.03	- 31.03
69.	Chairel	2,863	94.23	V	6	6.83	- 12.83
70.	Torbung	2,863	68.31	V	2	1.03	- 3.03
71.	Langthabal	2,686	30.96	V	110	5.85	- 115.85
72.	Uchiwa	2,677	- 7.47	V	16	14.20	- 30.20

73. Oinam							
Thingel	2,649	90.43	V	39	6.11	-	45.11
74. Potsangbam	2,617	31.38	V	148	7.60	-	155.60
75. Utlou	2,583	16.93	V	175	10.15	-	185.15
76. Langjing-II	2,533	116.35	V	312	6.32	-	138.32
77. Samusang	2,481	153.94	V	22	3.27	-	25.27
78.Luwangsangbam	2,399	32.03	V	40	13.35	-	53.35
79. Khoijuman							
Khulen	2,380	54.03	V	30	11.45	-	41.35
80. Nungoi	2,271	66.13	V	42	2.06	-	44.06
81. Kodompokpi	2,242	16.11	V	30	12.68	-	42.68
82. Phubala	2,073	22.74	V	88	9.30	-	97.30
83. Phayeng	2,071	6.21	V	22	16.96	-	38.96
84. Khongampat	2,032	20.81	V	22	10.62	-	32.62
85. Naran Seina	1,940	16.17	V	70	12.42	-	82.42
86. Heirok	1,932	55.93	NAC	64	15.66	-	79.66
87. Toupokpi	1,865	164.16	V	20	1.24	-	21.24
88. Haoreibi	1,860	32.67	V	34	12.24	-	46.24
89. Ithai	1,801	17.30	V	38	12.98	-	50.98
90. Leimaram	1,778	19.65	V	32	13.76	-	45.76
91. Wangbal	1,717	24.06	V	28	3.30	-	31.30
92. Khumbong	1,703	33.99	V	34	18.59	-	52.35
93. Khongjom	1,671	34.43	V	24	18.50	-	32.50
94. Heikrujam	1,588	17.72	V	6	9.92	-	15.92
95. Maklang	1,404	36.84	V	18	10.83	-	28.83
96. Tangjeng	1,329	120.03	V	22	8.89	-	30.89
97. IromThokchom	1,267	191.26	V	2	7.60	-	9.60
98. Hengul	1,146	253.70	V		1.03	-	10.03

99. Sunusiphai	1,143	22.64	V	30	4.33	-	42.33
100.Takhok Awang	1,023	72.51	V	26	1.03	-	27.03
101.Agnom Lawai	1,016	62.36	V	42	1.03	-	43.03
102.Chairel	952	77.61	V	20	4.49	-	24.49
103.Thangtek	874	133.69	V	6	3.30	-	9.30
104.Manthou	843	381.71	V	18	-	-	18.00
105.Chandrakhong	819	90.47	V	8	4.30	-	12.30
106.Sagolmang	815	66.57	V	28	25.05	7.13	60.18
107.Pechi	814	73.93	V	10	1.03	-	11.03
108.Itham	699	53.96	V	16	1.03	-	17.03
109.Keingam	661	122.56	V	6	-	-	6.00
110.Waithou Chiru	525	75.59	V	24	1.03	-	25.03
111.Nungoi	523	66.56	V	4	1.03	-	5.03
112.Wakha	302	170.38	V	4	1.03	-	5.03
113.Ningel	241	11.57	V	2	1.03	-	3.03
114.Langthrei Loukol	143	297.22	V	10	-	-	10.00

Abbreviation: E= Economic Enterprises, I= Infrastructural Facilities, A= Administrative Services, V= Village , NAC + Notified Area Committee, CT= Census Touwn ,M= Municipalities.