

(2) Improvement of Production Base and Living Environment

1) Irrigation

Rivers that are able to supply rich amount of water throughout the year in Sindhuli and Ramechhap Districts in Janakapur Zone are Sunkoshi, Tamakosi, Kimti and Likhu Kholas. However, large-scale irrigation for the hill lands in these two districts cannot be made by using the water from these rivers because (1) all rivers are located between steep slopes and their elevations are low so that natural irrigation is impossible (there is no power for pumping) and (2) even if power is available, areas to be irrigated are scattered and each area is small.

Therefore, only way for securing irrigation water is to use water flowing through valleys between steep hills. However, water from numerous valleys is already being utilized very effectively. That is, water available from valleys is already being used for irrigation by farmers as much as they can.

However, their water utilization is restricted by limited funds, materials, equipment and organization for it though they know the possibility of irrigation. Because of strengthening of organizations of Panchayats in recent years and their rich experiences in the past, it seems that they already fully studied the mountain streams having usable amount of water and the irrigable areas.

Table 36 was prepared basing upon the results of studies of many years which were collected by Agricultural Development Offices (ADO) in both Sindhuli and Ramechhap Districts. These results were confirmed on topographic maps (1:63,360 or 1 inch = 1 mile) and rearranged or corrected for water sources, irrigation areas, extent of canals and areas to be benefitted for each Panchayat after conducting preliminary surveying prior to the preparation of this table. (Refer to codes on plans for the numbers shown in the table.)

Type of canals should be of open channel, and all canals are to be excavated manually. Places where water leakage or erosion is expected should be partially constructed with vinyl pipes, and structures such as division works should be constructed with bricks, blocks or plain concrete. The rough estimate for direct construction cost was made for such structural conditions and indicated at the right side of the table. Overhead costs such as design and survey costs are not included in this estimate.

As shown in proposed plans, areas where water is still available are concentrated on the northern slope of the Mahabharat Mountain System, because many forests still remain there and amount of water evaporation is small since sunshine is less.

On the other hand, water sources in Ramechhap District are extremely in shortage, because forests are less and the lands are on the slope facing south. Efforts shall be made to the direction of comprehensive agriculture in this district.

Table 36 Irrigable Area

A. Sindhuli District

| Series No. | Name of Panchayat | Name of river (Water source) | Area to be irrigated (ha) | Cannal length (km) | Area to be benefited | Construction cost (1,000 Rp) |
|------------|-------------------|------------------------------|---------------------------|--------------------|------------------------|------------------------------|
| 1 | Solpathana | Chalne Khola | 18 | 11.2 | Lamatar, Gairi Goan | 224.0 |
| 2 | | Palno Khola | 30 | 6.4 | Jheger, Gothbari | 128.0 |
| 3 | | Sakhu Khola | 10 | 1.6 | Gairi | 32.0 |
| 4 | Khang Sang | Sankhar Khola | 20 | 6.4 | Najkigaon, Gagertar | 128.0 |
| 5 | Mahadev Danda | Kene Khola | 10 | 3.2 | Khalkle kene, Dada | 64.0 |
| 6 | | Nevor Khola | 20 | 1.6 | Pathibara | 32.0 |
| 7 | Tripureshwar | Baksu Khola | 50 | 18.4 | Jogi deke, Katike | 662.4 |
| 8 | | Mad Khola | 55 | 6.4 | Khurhari | 230.4 |
| 9 | Arun Takur | Kukur Khola | 14 | 3.2 | Jyamirtar | 64.0 |
| 10 | | " | 34 | 3.2 | Khagevaresh | 115.2 |
| 11 | | Thakur Khola | 27 | 4.8 | Manwahatar | 96.0 |
| 12 | | " | 10 | 3.2 | Kudule | 64.0 |
| 13 | Dakaha | Aruntakur Khola | 130 | 6.4 | Barirek, Majhola, Doda | 601.6 |
| 14 | Tribhuvan Ambote | Kanya Khola | 34 | 6.4 | Lampatar | 230.4 |
| 15 | | Baksu Khola | 31 | 8.0 | Lamsar | 160.0 |
| 16 | | Langur Khola | 17 | 1.6 | Langur | 32.0 |
| 17 | Dud Bhanjyang | Baksu Khola | 25 | 4.8 | Chhap | 96.0 |

| Series No. | Name of Panchayat | Name of river (Water source) | Area to be irrigated (ha) | Canal length (km) | Area to be benefited | Construction cost (1,000 Rp) |
|------------|-------------------|------------------------------|---------------------------|-------------------|---------------------------|------------------------------|
| 18 | Balajor | Chhadi Khola | 41 | 3.2 | Khachar Khich, Beltar | 115.2 |
| 19 | " | " | 34 | 3.2 | Packrang | 115.2 |
| 20 | " | Chadaha Khola | 44 | 3.5 | Gadomura | 126.0 |
| 21 | Kurthauli | Bhulu Khola | 67 | 2.4 | Dhorleni | 158.4 |
| 22 | " | Khor Khola | 67 | 2.4 | Ratanpur, Belaha | 158.4 |
| 23 | Bhuvaneshwari | Barbise Khola | 10 | 1.6 | Gwartar | 32.0 |
| 24 | " | Ranche Khola | 30 | 4.8 | Dharapani, Bhadaure | 96.0 |
| 25 | Basheshwar | Chokisila Khola | 420 | 15.0 | Baleni, Bada gaon, Haibar | 2,250.0 |
| 26 | Basheshwar | Haibar Khola | 80 | 3.2 | Haibarbadh | 211.2 |
| 27 | Patan Devi | Chadeha Khola | 135 | 5.5 | Sakhamadi, Sakajor, etc. | 517.0 |
| 28 | Ranichuri | Chisepani | 34 | 3.2 | Kundle, Bhir | 115.2 |
| 29 | " | Sarsveti | 102 | 6.4 | Phoksibane, Khebas | 601.6 |
| 30 | Bhimeshwar | Bhadra Kali | 60 | 8.0 | Dhauli | 288.0 |
| 31 | Ratanchura | Daurali Khola | 25 | 3.2 | Bato Nigale | 64.0 |
| 32 | " | Simsim Khola | 15 | 6.4 | Ratanchura | 128.0 |
| 33 | " | Gupti Khola | 25 | 4.8 | Bij Chhap | 96.0 |
| 34 | Sitalpati | Dhobi Khola | 23 | 6.4 | Bhuttum Chainpur | 128.0 |
| 35 | " | Thapa Khola | 15 | 6.4 | Chainpur | 128.0 |

| Series No. | Name of Panchayat | Name of river (Water source) | Area to be irrigated (ha.) | Canal length (km) | Area to be benefited | Construction cost (1,000 Rp) |
|------------|---------------------|------------------------------|----------------------------|-------------------|------------------------|------------------------------|
| 36 | Majhuwa | Sankhu Khola | 25 | 12.8 | Magi | 156.0 |
| 37 | | Bhalu Dhobi Khola | 20 | 6.4 | Majhuwa | 128.0 |
| 38 | | Damini Khola | 15 | 4.8 | Gairy Goan | 96.0 |
| | Bhadrakali | - No data is available - | | | | |
| | Sidheswar | - Fully developed - | | | | |
| | Purand Jhanga Gholi | - No data is available - | | | | |
| 39 | Jhanga Ratmata | Gangate Khola | 45 | 12.8 | Ratmata, Chhile Khark | 460.8 |
| 40 | | Dhamile Khola | 30 | 12.0 | Ratmata, Dadi Gaon | 240.0 |
| | Kusheshwar Dumja | - Under construction - | | | | |
| 41 | Amle Bastipur | Bhatipur Khola | 35 | 8.4 | Damar Khoia, Dhasartol | 302.4 |
| 42 | | Duni Khola | 15 | 3.8 | Tallo Bhogreni | 76.0 |
| 43 | | Dhara Khola | 10 | 2.8 | Shree Se | 56.0 |
| 44 | Netrakali | Marin Khola | 15 | 3.2 | Goltar | 64.0 |
| 45 | | Tamajor | 10 | 1.6 | Anp Danda, Barbise | 32.0 |
| 46 | Rampur | Khandi Khola | 15 | 2.4 | Archale | 48.0 |
| 47 | | Kokhojor Khola | 20 | 2.4 | Pakhure | 48.0 |
| 48 | | Kokhojor Khola | 30 | 3.2 | Kami Gaon Bagartol | 64.0 |
| 49 | Dadi Guranse | Deojor Khola | 68 | 3.2 | Jay Mangala, Del Danda | 211.2 |
| 50 | | Fulwari Khola | 34 | 1.6 | Lami Damar | 57.6 |
| 51 | Kapila Kot | Chaduli Khola | 135 | 4.8 | Chhap Dhamila | 451.2 |

| Series No. | Name of Panchayat | Name of river (Water source) | Area to be irrigated (ha) | Canal length (km) | Area to be benefited | Construction cost (1,000 Rp) |
|-----------------------|-------------------|------------------------------|---------------------------|-------------------|----------------------|------------------------------|
| 52 | | Chaduli Khola | 27 | 3.2 | Bhutaha | 64.0 |
| 53 | | Basari Khola | 135 | 6.4 | Kapila Kot | 601.6 |
| 54 | | Sindule Khola | 20 | 2.0 | Ratamata | 40.0 |
| | Mahendra Bhyeri | - No data is available - | | | | |
| | Hariharpur Gadhi | - No data is available - | | | | |
| B. Ramechhap District | | | | | | |
| 1 | Dhuji | Ghulepu Khola | 15 | 1.8 | Mahadevtar | 36.0 |
| 2 | Betali | Darika Khola | 5 | 0.9 | Ward No.1-4 | 13.5 |
| 3 | Kimti | Kimti Khola | 75 | 3.2 | Kimtitar | 211.2 |
| 4 | Rampur | Chasku Khola | 10 | 1.8 | Chasku | 36.0 |
| 5 | | Bolong Khola | 10 | 1.6 | Lamasoti Damar | 32.0 |
| 6 | Kathjor | Ronajor Khola | 5 | 1.0 | Archale | 15.0 |
| 7 | Phylasi | Latsi Khola | 5 | 2.0 | Aumantar | 30.0 |
| 8 | Chisapani | Chisapani Khola | 5 | 1.5 | Gaikhura | 22.5 |
| 9 | Pakarbas | Bhatauli Khola | 8 | 1.8 | Rajgaun | 27.0 |
| 10 | Gogaltar | Gogan Khola | 5 | 1.2 | Gogantar | 18.0 |
| 11 | Nigalpani | Nigalpani Khola | 8 | 2.9 | Pankar | 43.5 |
| 12 | | Lamochanga Khola | 8 | 2.5 | Mustangtar | 37.5 |
| 13 | Kuaniapani | Gopi Khola | 4 | 1.8 | Ward No.5 | 27.0 |
| 14 | Gunsi | Kani Khola | 20 | 2.0 | Sunsibhadaure | 40.0 |

2) Water for Drinking and Domestic Use

Within the data collected by ADO offices of both Sindhuli and Ramechhap Districts and stated before, a number of irrigation lands with area less than 10 ha. are included. That is, the scale of discharge converted will amount to about 125 to 10 liters/sec in these irrigation lands. However, it seems that farmers will be able to secure the water throughout the year since farmers have experienced and studied this problem for many years in the past. Table 37 shows such water supplies with small amount and small scale for drinking and domestic use (surplus will be used for irrigation). For Ramechhap Bazar and Nigare where population density is relatively high and drinking water is very important, the scheme prepared by long-range specialists of JADP was used as reference and any possibility was taken into consideration (refer to codes in plans for the numbers shown in the table).

Type of canals should be of open channel, and all canals are to be excavated manually. Places where water leakage or erosion is expected should be partially constructed with vinyl pipes, and structures such as division works should be constructed with bricks, blocks or plain concrete. The rough estimate for direct construction cost was made for such structural conditions and indicated at the right side of the table. Overhead costs such as design and survey costs are not included in this estimate.

For Ramechhap Bazar, pipe line should be used throughout.

Table 37-a Rural Water Supply

A. Sindhuli District

| Series No. | Name of Panchayat | Name of river (Water source) | Canal length (km) | Area to be benefited | Construction cost (1,000 Rp) |
|------------|-------------------|---------------------------------|-------------------|----------------------|------------------------------|
| 1 | Solphathana | Palne Khola | 3.2 | Solphathana | 48.0 |
| 2 | Mahadev Danda | Mahadev Khola | 1.6 | Mahadev | 24.0 |
| 3 | Tripureshwar | Thada, Khola | 6.4 | Dadaure | 96.0 |
| 4 | Arun Tukur | Kanya Khola | 4.8 | Kanyatar | 72.0 |
| 5 | " | Sadhne Khola | 3.2 | Sadhne | 48.0 |
| 6 | Dud Bhanjyang | Tyang Khola | 3.2 | Kudle | 48.0 |
| 7 | " | " | 1.6 | Bhavi Nathan | 24.0 |
| 8 | " | " | 1.6 | Dhyamptar | 24.0 |
| 9 | Balajor | Khani Khola | 3.2 | Chhap | 48.0 |
| 10 | | Devre Khola | 3.0 | Shandhen | 45.0 |
| 11 | Bhuvaneshwari | Rancha Khola | 8.0 | Dhaklaiya | 120.0 |
| 12 | Basheshwar | Jumbhe Khola | 1.6 | Darim bot | 24.0 |
| 13 | Tinkanya | Chhechpa Kola | 3.2 | Dhusini | 48.0 |
| | | - No data is available - | | | |
| 14 | Bhimeshwar | Sisne Khola or Ratanchura Khola | 4.8 | Chairpur danda | 72.0 |
| 15 | | Thulo Khola | 1.0 | Simpani | 15.0 |

| Series No. | Name of Panchayat | Name of river (Water source) | Canal length (km) | Area to be benefited | Construction cost (1,000 Rp) |
|------------|-------------------|------------------------------|-------------------|-------------------------|------------------------------|
| 16 | Ratanchura | Simsim Khola | 6.4 | Khaniyakharika | 96.0 |
| 17 | Sitalpati | Niguli Khola | 4.8 | Gairo Nyaupanitar | 72.0 |
| 18 | Majhuwa | Dhabi Khola | 9.6 | Dadagaon | 144.0 |
| 19 | | Odibat Khola | 3.2 | Aasbotesalle | 48.0 |
| 20 | | Nigrali Khola | 3.2 | Gairy Goan | 48.0 |
| | Bhadrakali | - No data is available - | | | |
| | Sidheswar | - Dully developed - | | | |
| 21 | Jhanga Ratmata | Dhamile Khola | 6.4 | Lakhanpur, Pipal Danda | 96.0 |
| 22 | Amle Bastipur | Tado Khola | 2.7 | Phadi | 40.5 |
| 23 | Amle Bastipur | Dar Khola | 4.0 | Hayutar Majhi | 60.0 |
| 24 | Netrakali | Solai Khola | 3.2 | Bhaise Pakha | 48.0 |
| 25 | Rampur | Mane Khola | 0.4 | Besitol | 6.0 |
| 26 | Kapila Kot | Maheshwata Khola | 1.6 | Damar Gaon | 24.0 |
| 27 | | Barun Khola | 1.6 | Chhap Maheshwata, Barun | 24.0 |
| | Mahendra Bhyari | - No data is available - | | | |
| | Hariharpur Gadhi | - No data is available - | | | |

Table 37-b Rural Water Supply

B. Ramechhap District

| Series No. | Name of Panchayat | Name of river (Water source) | Canal length (km) | Area to be benefited | Construction cost (1,000 Rp) |
|------------|-------------------|------------------------------|-------------------|----------------------|------------------------------|
| 1 | Those | Dorje Khola | 2.5 | Those Megchah | 37.5 |
| 2 | Saipu | Banga Khola | 1.5 | Banga | 22.5 |
| 3 | | Saipu Khola | 2.0 | Saipu | 30.0 |
| 4 | Ramechhap | Kirepani Khola | 4.0 | Ramechhap Bazaar | 100.0 |

3) New Lands for Agricultural Development

Lands higher than altitude of 400 meters have been already overdeveloped as agricultural lands so that, in view of forest protection and securing of water sources, new reclamation of agricultural lands cannot be considered any more. However, if population growth in hill lands inevitably demands new agricultural lands, the necessity of reclamation of new agricultural lands will naturally occur. In such a case, in Churia Hills, the southern slope with altitude of 200 m to 400 m which is actually a plateau and a jungle land might be considered for development. However, actual development of this land for agriculture is very questionable by the following three reasons: (1) As described in Chapter 2, geologically this area was formed by the crustal movement of quaternary deposit so that this area is very weak and easily eroded, (2) forest is indispensable for developing water in Tarai, and (3) high costs are expected for reclamation. Thus, agricultural development for this area is not recommended for the time being.

On the other hand, in Sindhuli District, there are two rivers with relatively large discharges inside of Tarai, the Kamla Nadi flowing to the east and the Marin Khola flowing to the west. The basins of these two rivers are very wide as much as 500 m to 1,000 m. And present grass land of the rivers may be developed as new agricultural land.

According to the data collected by ADO office of Sindhuli District stated before, an irrigation plan was indicated for the both banks of these rivers. Table 38 indicates and covers this plan for the newly reclaimable land. However, this land should be developed not only for the irrigation but also for providing protective means during flood. (Refer to codes in plan for the numbers shown in this table.)

Naturally, there is no possibility of development in Ramechhap District. When population increases there, the possibility of concentration of arable lands and increasing of factor of utilization of land should be pursued.

Table 38 Newly Reclaimable Land

Sindhuli District

| Series No. | Name of Panchayat | Name of river (Water source) | Area to be reclaimed (ha) | Canal length (km) | Area to be benefited | Construction cost (1,000 Rp) |
|------------|-------------------|------------------------------|---------------------------|-------------------|-----------------------------------|------------------------------|
| 1 | Tandi | Kamla Nadi | 670 | 9.6 | Dhansuri | 4,254 |
| 2 | Dakaha | Kamla Nadi | 450 | 19.0 | Bhutai, Basaniya | 4,740 |
| 3 | Dakaha | Kamla Nadi | 250 | 28.0 | Bairaha, Karmaha | 5,250 |
| 4 | Kurthauli | Kamla Nadi | 270 | 6.4 | Ratanpur, Basniya | 2,094 |
| 5 | | Kamla Nadi | 135 | 4.8 | Jhuga, Goan, Klutte | 1,018 |
| | Tinkanya | - No data is available - | | | | |
| 6 | Ranibas | Kamla Nadi | 370 | 16.0 | Dadatol, Bhiman, Renibastar, etc. | 3,954 |
| | Bhadrakali | - No data is available - | | | | |
| | Sidheswar | - Fully developed - | | | | |
| 7 | Dadi Guranse | Marin Khola | 340 | 12.8 | Dadi, Kharkhole, Mahadov, etc. | 3,348 |
| 8 | | Marin Khoda | 210 | 16.0 | Chanaut, Oibtar, etc. | 2,482 |
| 9 | Kapila Kot | Marin Khola | 85 | 3.2 | Sakan | 568 |
| 10 | | Marin Khola | 49 | 4.8 | Mathuli, Nakkali | 379 |
| | Mahendra Bhyari | - No data is available - | | | | |
| | Hariharpur Gadhi | - No data is available - | | | | |

4) Small-scale Power Generation

In Nepal, electric power supply is still limited to cities and their vicinities. In small towns and development centers scattered throughout the country, small-scale diesel power generators are occasionally seen, but diesel generators are not economical in Sindhuli and Ramechhap Districts since fuel transportation is very difficult there and operating costs (foreign currency) are very high.

For the hydraulic power generation, the following four important factors must be satisfied: (1) Discharge head should be stable throughout the year; (2) sufficient water should be available; (3) distance of power transmission should be short; and (4) flow-down of rock should not too much and safe intake structures should be provided.

The Government of Nepal and the specialists of JADP have performed survey for fulfilling the requirements stated above throughout whole areas in Sindhuli and Ramechhap Districts. As a result, power transmission to Sindhulimari and Bhangeri or Ramechhap Bazar where population is relatively concentrated has been newly planned. Two schemes have been prepared for the former and one scheme for the latter, and thus a total of three schemes are now established. The outline of the schemes is indicated below.

The First Scheme: (Small Hydraulic Development Board, 1977.
Refer to No.1 of accompanied drawing.)

| | |
|---|--------------------|
| Power supply area: | Sindhulimali |
| Name of river: | Marin Khola |
| Area of river basin: | 53 km ² |
| Total head: | 17.0 m |
| Effective head: | 14.6 m |
| Drought water discharge: | 450 liters/sec |
| Design flood discharge: | 500 liters/sec |
| Design discharge of canal for power generator: | 410 liters/sec |

Design discharge of penstock: 1,100 liters/sec
 Capacity of reservoir: 8,300 m³
 Penstock diameter: 900 mm
 Number of units: 2 sets
 Turbine capacity: 60kW x 2
 Transmission distance: 9 km
 Rough estimate of construction cost: Rp. 2,333,000

The Second Scheme: (JADP Report; previously not published;
 Refer to No.2 of accompanied drawings.)

Power supply area: Sindhulimali
 Name of river: Gairamtar Khola,
 tributary of
 Garauli Khola
 Area of river basin: 10.7 km²
 Total head: 70 m
 Effective head: 55 m
 Drought water discharge: 60 liters/sec
 Maximum effective discharge: 200 liters/sec
 Design discharge of canal
 for power generation: 0.2 m³/sec
 Number of unit: 1 set
 Turbine capacity: 25 kW
 Transmission distance: 2.5 km

The Third Scheme: (Small Hydraulic Development Board, 1977;
Refer to No.3 of accompanied drawings.)

| | |
|--|-------------------------|
| Power supply area: | Bhangeri (Ramecyhap) |
| Name of river: | Goksila Khola |
| Area of river basin: | 15.6 km ² |
| Total head: | 100.0 m |
| Effective head: | 92.0 m |
| Drought water discharge: | 100 liters/sec |
| Design flood discharge: | 215 m ³ /sec |
| Design discharge of canal for power generation: | 80 liters/sec |
| Penstock design discharge: | 80 liters/sec |
| Penstock diameter: | 250 mm |
| Number of units: | 2 sets |
| Turbine capacity: | 30kW x 2 |
| Transmission distance: | 9 km |
| Rough estimate of construction cost: | Rp. 1,843,000 |

(3) Scheme for Long-term Development
(Regional Development Trunk Highway Plan)

Present highway situations in Janakapur Zone is that east-west highway (2-lane, all-weather type) runs through northern section of three districts of Tarai and goes to Kathmandu. In addition, there is another highway of 2-lane and all-weather type which passes through Janakapur and Jaleswar and goes to India.

These two roads are the only all-weather type roads completed at present time, but there is another motorway presently under construction and expected to be completed in 1981 which will run from Kathmandu to Jiri through hills and mountain.

Therefore, in the hill areas of the design object, there is no all-weather type motorway at present time. Since most portion of existing roads pass through river basins, transportation by motor vehicles can be performed only during limited period within the dry season. The most important road among them is the one which goes from east-west highway to Sindhulimari (center of Sindhuli District) through the Rato Nadi and Gwan Khola. This is the only road that combines the east-west highway to Sindhulimari. Therefore, eastern and western traffic of Sindhuli District should be made by utilizing Sindhulimari as the central core of traffic. Recently completed road that connects Sindhulimari to Ambote (in the eastern section of Sindhuli District) utilizes river land and the gradient of the road is very steep in valleys so that this road is considered to be inadequate even during dry season. Thirdly, the road that connects Sindhulimari to Mahendrajyadi (in the western section of Sindhuli District) passes through the river basin of the Marin Khola so that this is usable for motor vehicles during very limited period only. A network of pedestrian roads is existing throughout both districts but there is no other motorway other than those described above.

In making the road plan, the following four items must be taken into consideration: (1) New roads should be connected to east-west highway as much as possible; (2) since running of road across Mahabburat Mountain System is very difficult because of steepness and large difference in altitude, such a road should be considered only for a distant future; (3) however, at right bank side of Sunkoshi Khola, a buss road from Katmandu has been opened to a point about 25 km away from Nepalthok; and (4) a new road between Katmandu and Jiri will be opened very soon. In the planning, these four points stated above were taken into consideration, and new proposed roads are all connected to existing roads or to roads under construction in order to form a network of trunk road for regional development. Since traffic of all design roads is considered to be not heavy, gravel road (40 to 50 cm) with effective width of 3.0 m and shoulder width of 0.75 to 1.0 m will be considered.

Traffic in south of Mahabburat Mountain System in Sindhuli District will be planned in such a manner that Sindhulimali will be treated as center of transportation and roads will be connected to the east-west highway. For the roads from Sindhulimali to east-west, the existing roads will be altered, repaired and improved.

| <u>No. on drawing</u> | <u>Road section</u> | <u>Distance</u> (km) | <u>Rough estimate of const. cost</u> (million yen) |
|-----------------------|------------------------------------|-------------------------|---|
| 1. | East-west Highway ... Sindhulimali | 39 | 1,400 |
| 2. | Sindhulimali Ambote | 45 | 1,500 |
| 3. | Sindhulimali Karamaya | 58 | 1,800 |

For the portion in north of Mahabhurat in Sindhuli District, the bus road from Kathmandu will be extended.

| | | | |
|----|--------------------------|----|-------|
| 4. | Drikel Solpa Thana | 90 | 3,200 |
|----|--------------------------|----|-------|

As trunk road in Ramechhap District, road users may be able to select either road to Kathmandu via Jiri or road to Kathmandu via Kurkot depending upon the area, by connecting Jiri to Kurkot (Road No.4) with a road along left bank of Kimti Khola and left bank of Tamakosi Khola. Also, for the road to Bangeri (Ramechhap Bazar), existing road will be modified and improved.

| <u>No. on drawing</u> | <u>Road section</u> | <u>Distance</u> (km) | <u>Rough estimate of const. cost</u> (million yen) |
|-----------------------|----------------------|-------------------------|---|
| 5. | Jiri Kurkot | 55 | 1,900 |
| 6. | Bangeri Kurkot | 20 | 1,000 *Note |

As plan for distant future, construction of motorway between Kurkot and Sindhulimali across the Mahabhurat Mountains will be necessary. This will become an extremely important road that connects Tarai to hill areas in north of Mahabhurat.

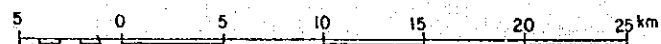
| | | | |
|----|---------------------------|----|-------|
| 7. | Kurkot Sindhulimali | 40 | 2,000 |
|----|---------------------------|----|-------|

*Note: Construction cost for bridge across Sunkosi Khola is not included.

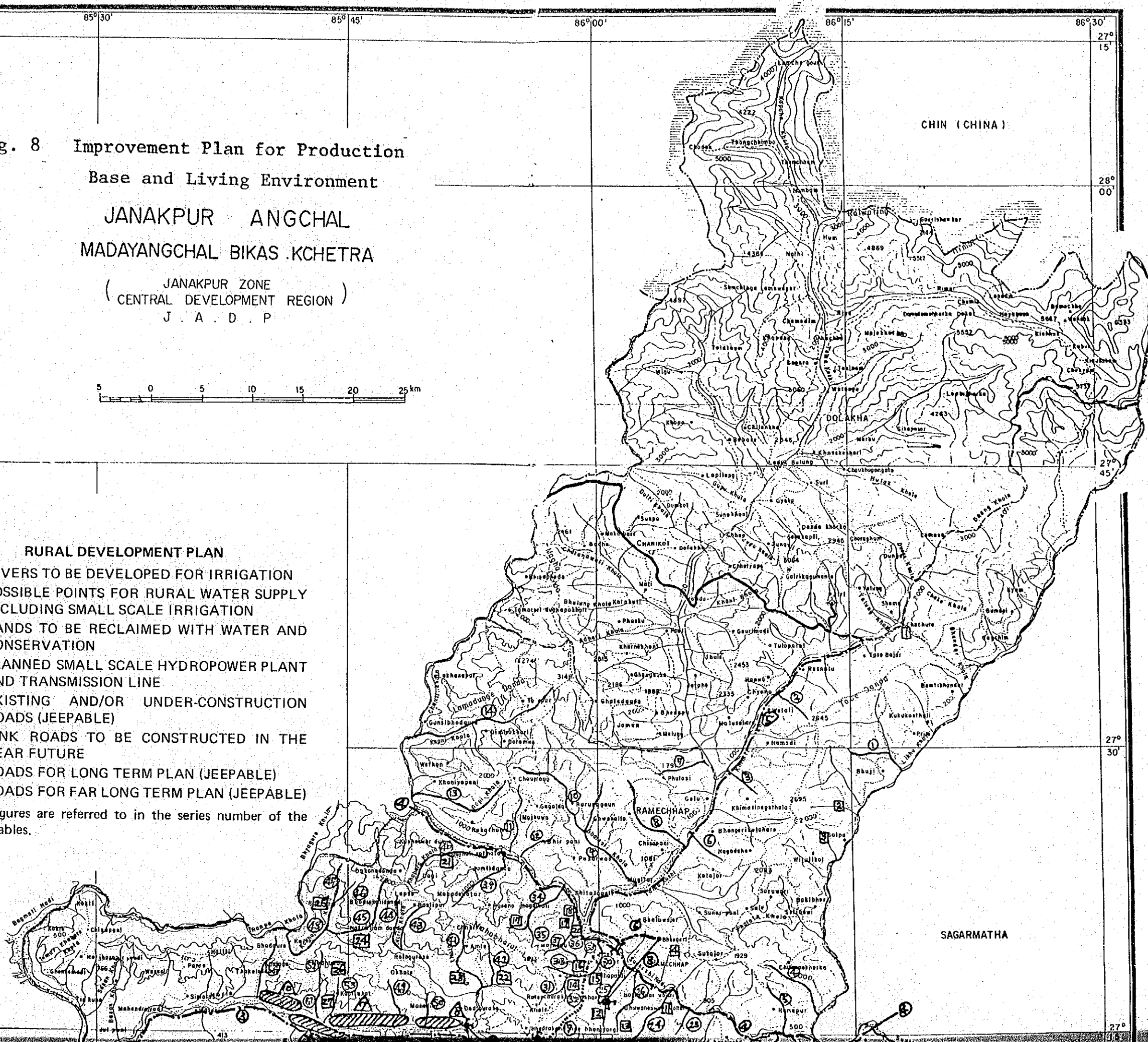
Fig. 8 Improvement Plan for Production Base and Living Environment

JANAKPUR ANGCHAL
MADAYANGCHAL BIKAS KCHETRA









(JANAKPUR ZONE
CENTRAL DEVELOPMENT REGION)
J . A . D . P



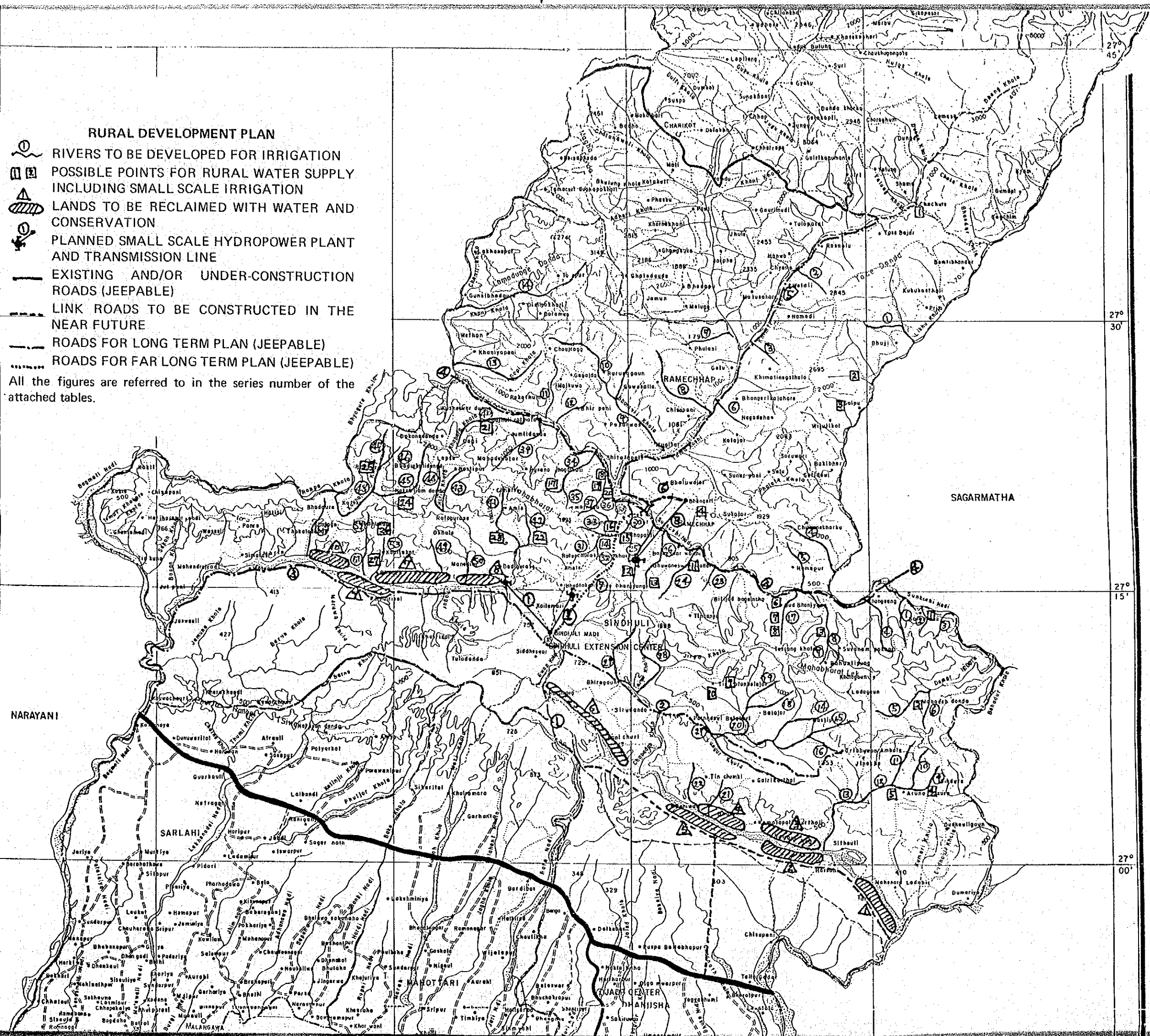
- RURAL DEVELOPMENT PLAN**
- RIVERS TO BE DEVELOPED FOR IRRIGATION
 - POSSIBLE POINTS FOR RURAL WATER SUPPLY INCLUDING SMALL SCALE IRRIGATION
 - LANDS TO BE RECLAIMED WITH WATER AND CONSERVATION
 - PLANNED SMALL SCALE HYDROPOWER PLANT AND TRANSMISSION LINE
 - EXISTING AND/OR UNDER-CONSTRUCTION ROADS (JEEPABLE)
 - LINK ROADS TO BE CONSTRUCTED IN THE NEAR FUTURE
 - ROADS FOR LONG TERM PLAN (JEEPABLE)
 - ROADS FOR FAR LONG TERM PLAN (JEEPABLE)
- All the figures are referred to in the series number of the attached tables.



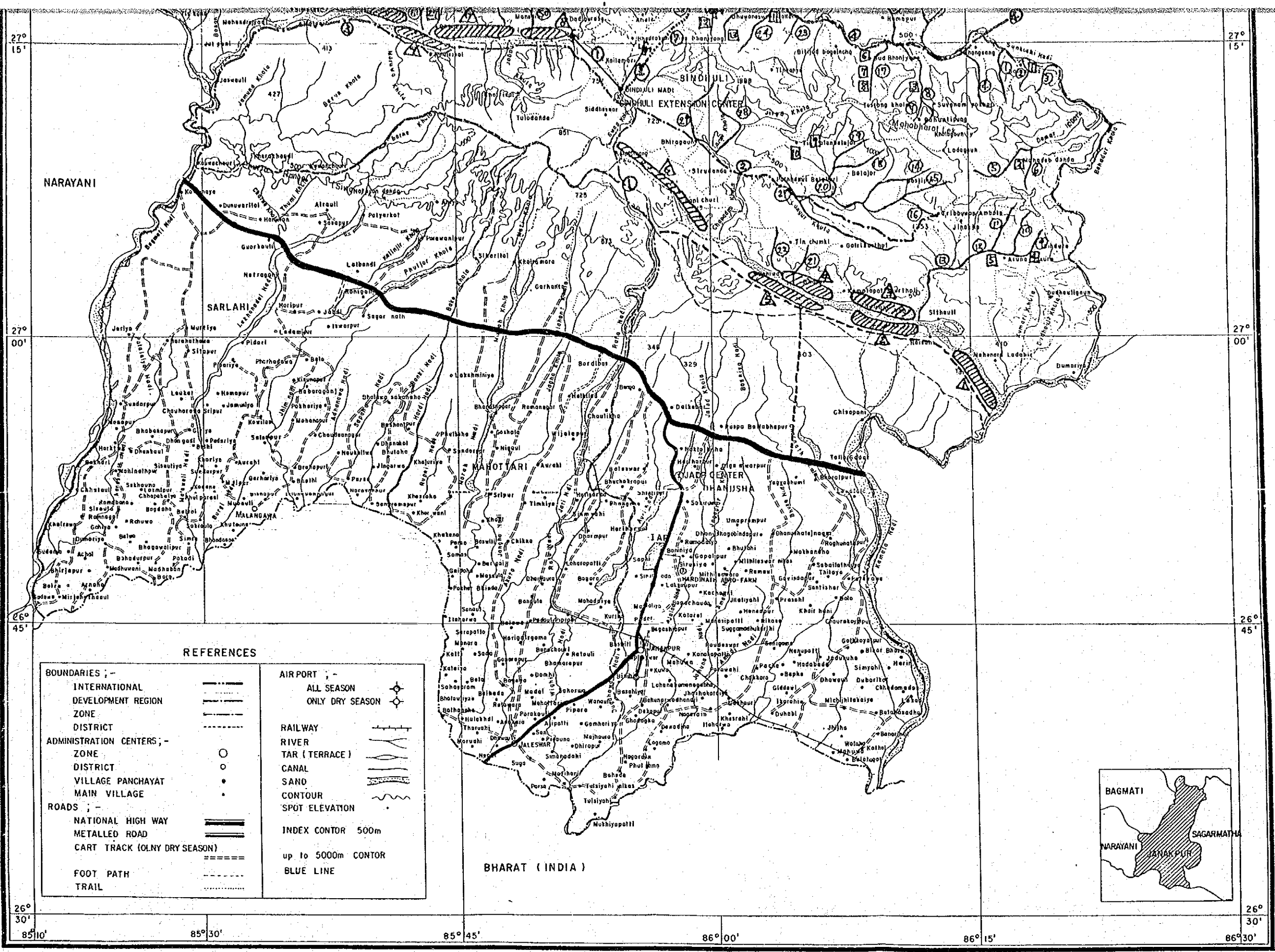
27° 45'
27° 30'
27° 15'
27° 00'

- ### RURAL DEVELOPMENT PLAN
-  RIVERS TO BE DEVELOPED FOR IRRIGATION
 -  POSSIBLE POINTS FOR RURAL WATER SUPPLY INCLUDING SMALL SCALE IRRIGATION
 -  LANDS TO BE RECLAIMED WITH WATER AND CONSERVATION
 -  PLANNED SMALL SCALE HYDROPOWER PLANT AND TRANSMISSION LINE
 -  EXISTING AND/OR UNDER-CONSTRUCTION ROADS (JEEPABLE)
 -  LINK ROADS TO BE CONSTRUCTED IN THE NEAR FUTURE
 -  ROADS FOR LONG TERM PLAN (JEEPABLE)
 -  ROADS FOR FAR LONG TERM PLAN (JEEPABLE)

All the figures are referred to in the series number of the attached tables.

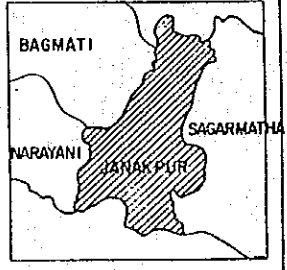


27° 45'
27° 30'
27° 15'
27° 00'



REFERENCES

| | | | |
|------------------------------|---------------|--------------------|---------------|
| BOUNDARIES ; - | | AIRPORT ; - | |
| INTERNATIONAL | — — — — — | ALL SEASON | ✈ |
| DEVELOPMENT REGION | — · — · — · — | ONLY DRY SEASON | ✈ |
| ZONE | — · — · — · — | | |
| DISTRICT | — · — · — · — | RAILWAY | — + — + — + — |
| ADMINISTRATION CENTERS ; - | | RIVER | — — — — — |
| ZONE | ○ | TAR (TERRACE) | — — — — — |
| DISTRICT | ○ | CANAL | — — — — — |
| VILLAGE PANCHAYAT | ● | SAND | — — — — — |
| MAIN VILLAGE | ● | CONTOUR | — — — — — |
| ROADS ; - | | SPOT ELEVATION | ▲ |
| NATIONAL HIGH WAY | ==== | INDEX CONTOR 500m | — — — — — |
| METALLED ROAD | ==== | up to 5000m CONTOR | — — — — — |
| CART TRACK (OLNY DRY SEASON) | — · — · — · — | BLUE LINE | — — — — — |
| FOOT PATH | — · — · — · — | | |
| TRAIL | — · — · — · — | | |



BHARAT (INDIA)

26° 30' 85° 10' 26° 30' 85° 30' 26° 30' 85° 45' 26° 30' 86° 00' 26° 30' 86° 15' 26° 30' 86° 30'

5. Methods of Extension and Implementation of Improvement Measures

Of the several improvement measures stated in the previous chapter, some measures can be relatively easily started now and their effects will be expected to all areas concerned. One of such measures is the improvement of farming techniques. This will directly cause the improvement of self-supporting forces and increases of incomes of the farmers. However, this shall be applied not only to cultivation but also to livestock and forest land utilization since the improvement must be made for the whole aspect of agriculture.

Measures for agricultural water resources development, readjustment of arable lands and road construction will require civil construction works and will be accompanied with very difficult problems in engineering, funds, machinery transportation and maintenance and management after construction because of severe topographic conditions in such hill areas. Thus, immediate implementation of all of these measures seems to be very difficult.

Methods of implementation and diffusion of main improvement measures derived from the results of our survey are indicated below.

(1) Establishing Pilot Farms for Management

In order to carry out farming improvement measures made for each of crops and to diffuse such measures to farmers, progressive farmers with willingness to make progress shall be selected for carrying out the plan and for intensively teaching techniques to these farmers as improvement models. In addition to technical assistances to these farmers, seeds and other materials such as agricultural chemicals needed for farming improvement should be also supplied to them.

It is desirable to have such pilot farms in many places throughout whole areas for the effects of demonstration in future but, for the time being, number of such pilot farms shall be determined basing upon the actual capacity of promoting agencies and JADP.

(2) Implementation of Application Tests

Various techniques included in the improvement plan were selected from various data and knowledge of specialists and only those which considered to be actually applicable in the fields were employed. Therefore, all of them have been not necessarily proved to be effective in hill areas of Janakpur Zone.

Therefore, practicability of necessary techniques should be checked and tests needed for promoting further improvement must be performed. For this purpose, Sindhuli Farm provided for promoting the extension activities in hill areas should be utilized and, if necessary, part of fields of pilot farms should be used for the application tests. However, in this case, any loss caused as a result of failure of test must be naturally compensated for the farmers. Also, possibility of giving functions of producing improved seeds to the Sindhuli Farm and pilot farms should be reviewed.

(3) Establishment of Communication System for Villages

It is desirable to have a simple assembly hall at each Panchayat to promote extension activities, to make publicity for various policies of government and to promote healthy recreation activities of farmers.

(4) Measures for Promoting Water Resources Development and Environment Improvement Work

Results of survey for possible points of water intake and schemes of long-range road improvement have been already stated. As described before, it is very difficult to promote all such measures and schemes now at once. Special precautions to be taken in carrying out these measures are; (1) measures which will bring higher effects should be carried out first for each fiscal year; (2) maintenance and management organs by farmers should be established after construction and they should be guided by government; and (3) feasibility studies for design should be thoroughly made prior to implementation.

Concerning item (3) above, more technical survey will be required before execution of measure since this plan was made for roughly outlining the possibility of development after utilizing existing informative materials and surveying at few points within very limited period of survey time with cooperation of ADO.

(5) Experimental Implementation of Overall Development Model Project for Village Management

In the agricultural management in hill areas, cultivation, livestock and forestry are closely interconnected and carried out as an unit. Role and problems of each of these are briefly summarized hereafter.

(1) Cultivation practice is of course playing an important role of food production. Important problems to be solved for increasing production are maintaining soil fertility and improving water reserve property. For maintaining soil fertility, compost is widely being used but straws and stems that are effective for improving water reserve property are mostly used for fuel and feed and not returned to the soil.

(2) Concerning buffaloes and cattle, they are performing important roles as work cattle, sources of compost, cash income sources and protein supply sources. However, the number of livestock has been analyzed to be excessive in general because vegetation in the forest lands has been destroyed for fulfilling the feed requirements for the livestock and straws and stems yielded by field practice are being given away to livestock.

(3) Forest lands have the functions of land conservation, supplying of materials for firewood and charcoal, and as source of feed but forests now have a strong tendency to become thinner and to have more shrubs with less trees because of excessive collection of trees for feed, firewood and charcoal.

As described above, these three items are closely related to each other, and present situation is considered to be very bad due to depriving forest of trees by livestock.

As measures to cope with this problem, more efficient livestock section is to be established by improving varieties of livestock, proper number of livestock should be then maintained accordingly, utilization of forests should be rationalized, and farming techniques with good balance between the two should be established as a unit. Experimental execution of the pilot farms for management is considered to be effective means for improving the farming in the hill areas.

The scale of the work should be limited to a Panchayat or to a certain part within Panchayat. Basically, it is more desirable to perform this kind of work by the cooperation among farmers. But the work should be controlled by Panchayat since strong and systematic guidances by the administration seems to be required under present circumstances. In addition, improvement of water resources should be combined to such work in unity in order to increase overall production force. Thus, it is desirable to select such areas where new water resources development can be possible.

When this method is performed successfully, the farming in the hill areas will be further improved by diffusing this method to such areas.

6. Effects of Development

We shall now discuss the economic effects to be produced by the implementation of the above-mentioned farming improvement project and the project to develop irrigation facilities and farmlands.

The effects of this development will comprise many things including not only the increased production of crops resulting from the improvement of farming and development of agriculture but also such external effects as improvement of living conditions by the construction of roads and the spread of education by the increase of economic potential.

However, we shall here discuss only the direct effects of food production increase from improvement of farming and development of irrigation facilities and farmlands and make related estimates. Therefore, the effects are specifically the following three: 1) effect by the improvement of farming techniques (spread of improved crop varieties, improvement of management practices, etc.), 2) effect by the practice of additional irrigation, and 3) effect by the development of new farmlands.

(1) Premises of Effect Estimation

1) In estimating development effects, it will be necessary to determine the extent to which the project can be accomplished in the near future. Even if a farming improvement project is formed, it will take some time before it can be completely accomplished in view of the present disseminating organizations, the educational level of farmers, the availability of management funds and the supply of equipment and materials.

So three stages: the case where the plan was accomplished 30%, the case where it was accomplished 50% and the case where it was accomplished 100% were used in estimating the development effects.

2) As regards post-improvement crop systems, switch from the dry field system with maize as the staple crop to the system with rice as the staple crop will take place in areas where irrigation will be newly started. So, development effects in these areas are estimated on the premise that maize, the present crop, will disappear and be replaced by a "rice/wheat" system.

3) Even in areas prevailing up-land crops, the crop system will change with the improvement of farming techniques and certain changes by crops in arable areas will result. However, this area estimation is difficult. Besides, land utilization rates are already fairly high. So, cultivated areas by crops in the up-lands are assumed as unchanged from the present state and only yield increases due to the improvement of farming techniques are estimated.

4) The present cultivated areas by crops and the present yields are according to the agricultural statistics of 1976 ~ 77.

5) The proposed yields are as indicated in Table 39. Basically, they derive from the test data of testing organizations. Since, however, test data are widely scattered, as can be seen from Table 40~42 appended herewith for reference sake, the proposed yields are generally determined by referring also to the results of JTA and AA hearings.

Table 39 Per ha. Present and Proposed Yields

(Unit: ton)

| District | Crop Item | Rice | | Wheat | | Maize | | Millet | | Barley | |
|----------------------------|--------------------|---------|----------|---------|----------|---------|----------|---------|----------|---------|----------|
| | | Present | Proposed | Present | Proposed | Present | Proposed | Present | Proposed | Present | Proposed |
| Sindhuli District | | 2.39 | 3.85 | 0.99 | 1.70 | 2.08 | 3.13 | 1.16 | 1.50 | 0.90 | 1.16 |
| Ramechhap District | | 2.33 | 3.85 | 1.11 | 1.70 | 2.12 | 3.13 | 1.20 | 1.50 | 0.90 | 1.16 |
| Using present yield as 100 | Sindhuli District | 1.00 | 1.61 | 1.00 | 1.72 | 1.00 | 1.50 | 1.00 | 1.29 | 1.00 | 1.29 |
| | Ramechhap District | 1.00 | 1.65 | 1.00 | 1.53 | 1.00 | 1.48 | 1.00 | 1.25 | 1.00 | 1.29 |

- Notes:
- 1 The present yields are based on the actual yields of 1976/77 in the agricultural statistics.
 - 2 The proposed yields of rice and wheat are based on the results at Khandbari included in the test data.
 - 3 The figures for maize are determined by correcting related test data with JTA hearings.
 - 4 The figures for millet and barley are generally determined by applying the yield increase rate for wheat since there are no related test data.

Table 40 Yield Comparison of Local and Improved Rice Varieties.
Cropping Systems Sites. Tons/ha. of 14% Moisture

| Sites | Local | Improved | % increase in Yield |
|-------------------|-------|----------|---------------------|
| Khandbari | 2.34 | 3.85 | 64.5 |
| Pundi Bhumdi | 1.86 | 2.90 | 56.0 |
| Chanr Johari | 2.15 | 3.01 | 40.0 |
| Lele | 1.90 | 4.40 | 131.0 |
| Parsa (Irrigated) | 1.98 | 3.50 | 76.0 |
| Parsa (Rainfed) | 1.49 | 3.20 | 122.0 |
| Khumal | | 4.50 | |

Table 41 Grain Yield of a Local and Improved Variety of
Maize in the Cropping Systems Research Sites.
Yields in Tons/ha. at 14% Moisture.

| Siter | District average | Local | Improved (Khumal Yellow) |
|--------------|------------------|-------|-----------------------------|
| Lele | 1.8 | 3.6 | 4.9 |
| Khandbari | 1.9 | 3.2 | 4.8 |
| Pundi Bhumdi | 1.4 | 1.4 | 4.6 |

Table 42 Grain Yields of Some of Winter Crops.
Cropping System Research Sites Tons/ha.

| Crops/Sites | Khand- hari | Pumdi Bhumdi | Chaur Janari | Lele | Parsa 1 | Parsa 2 |
|-------------|----------------|-------------------|-----------------|-----------------------------|---------|---------|
| Wheat | | | | | | |
| RR-21 | 1.704 | 1.870 | 2.677 | 2.785 | 1.697 | |
| Local | | | 1.800 | | | |
| Barley | | | | | | |
| Improved | | 1.950 | | 3.020 | 1.119 | 0.766 |
| Local | | | | | | 0.852 |
| Lentils | | 0.320 to 0.600 | | 0.477 (Inter Cropped) | 0.908 | 0.260 |
| Potato | | 1.245 | | | 1.330 | |
| Linseed | | 0.540 | | | | |

Table 43 How Proposed Yields Were Determined (Reference)

(Unit: t/ha)

| Division | Rice | | Wheat | | Maize | | Millet | Barley | |
|-----------------------------------|---------------|------------------|---------------|------------------|---------------|------------------|---------------|---------------|------------------|
| | Local variety | Improved variety | Local variety | Improved variety | Local variety | Improved variety | Local variety | Local variety | Improved variety |
| Survey results on farm management | 1.563 | 2.627 | - | 1.940 | 575 | 1.565 | 1.267 | - | - |
| Results of JTA and AA hearings | 1.756 | 2.926 | - | 3.266 | 2.178 | 3.130 | - | - | - |
| Data of testing organizations | 2.340 | 3.850 | - | 1.704 | 2.733 | 4.767 | - | - | 1.950 |

6) The improved varieties are already commonly used to some extent. According to the hearing of Sindhuli District ADO, the diffusion rates are approximately 14% for rice, 100% for wheat and 11% for maize. The results of a survey on the realities of farmers show that management using chemical fertilizers is not much in practice except by some advanced farmers in the paddy field areas.

The effects of certain improving techniques employed under these present conditions are believed to be incorporated in the present yields of the statistics as a matter of course. So, no such things as deducting for this are done in tentatively calculating effects by the projects.

(2) Calculation of Development Effects

Tables 44 ~ 46 show the results of tentative calculation of the increased grain outputs by districts - also the total - and by the three stages into which, as stated already, the proposed accomplishment rates are divided.

Table 44 Grain Yield Increasing Effect in Sinduli District

| Division | Area under cultivation (ha.) | | | | | | | | | | Per ha. yield (t) | | | | | Yield (t) | | | | |
|------------------------------------|---|--------|-------|--------|--------|------|-------|-------|--------|--------|-------------------|--------|--------|--------|--------|-----------|-------|-------|--------|--------|
| | Rice | Wheat | Maize | Millet | Barley | Rice | Wheat | Maize | Millet | Barley | Rice | Wheat | Maize | Millet | Barley | Rice | Wheat | Maize | Millet | Barley |
| | 8,147 | 1,596 | 9,600 | 2,150 | 255 | 2.39 | 0.99 | 2.08 | 1.16 | 0.90 | 19,471 | 1,577 | 19,980 | 2,500 | 229 | | | | | |
| Present state (1976/77) | Accomplishment rate 30% | 2,444 | 479 | 2,880 | 645 | 77 | 3.85 | 1.70 | 3.13 | 1.50 | 1.16 | 814 | 9,014 | 968 | 89 | | | | | |
| | Present farming | 5,703 | 1,117 | 6,720 | 1,505 | 178 | 2.39 | 0.99 | 2.08 | 1.16 | 0.90 | 1,106 | 13,978 | 1,746 | 160 | | | | | |
| | Total | 8,147 | 1,596 | 9,600 | 2,150 | 255 | | | | | | 1,920 | 22,992 | 2,714 | 249 | | | | | |
| | Effect of farming technique improvement 50% | 4,074 | 798 | 4,800 | 1,075 | 128 | 3.85 | 1.70 | 3.13 | 1.50 | 1.16 | 1,357 | 15,024 | 1,613 | 148 | | | | | |
| Proposal | Present farming | 4,073 | 798 | 4,800 | 1,075 | 127 | 2.39 | 0.99 | 2.08 | 1.16 | 0.90 | 790 | 9,984 | 1,247 | 114 | | | | | |
| | Total | 8,147 | 1,596 | 9,600 | 2,150 | 255 | | | | | | 2,147 | 25,008 | 2,860 | 262 | | | | | |
| | Accomplishment rate 100% | 8,147 | 1,596 | 9,600 | 2,150 | 255 | 3.85 | 1.70 | 3.13 | 1.50 | 1.16 | 31,366 | 2,713 | 30,048 | 3,225 | 296 | | | | |
| | Total | 8,147 | 1,596 | 9,600 | 2,150 | 255 | | | | | | 31,366 | 2,713 | 30,048 | 3,225 | 296 | | | | |
| Effect of newly started irrigation | Accomplishment rate 30% | 740 | 740 | 740 | - | - | 3.85 | 1.70 | 3.13 | 1.50 | 1.16 | 2,849 | 1,258 | 1,539 | - | - | - | - | - | - |
| | Accomplishment rate 50% | 1,233 | 1,233 | 1,233 | - | - | 3.85 | 1.70 | 3.13 | 1.50 | 1.16 | 4,747 | 2,096 | 2,565 | - | - | - | - | - | - |
| | Accomplishment rate 100% | 2,466 | 2,466 | 2,466 | - | - | 3.85 | 1.70 | 3.13 | 1.50 | 1.16 | 9,494 | 4,192 | 5,129 | - | - | - | - | - | - |
| | Total | 8,887 | 2,336 | 8,860 | 2,150 | 255 | | | | | | 25,888 | 3,178 | 21,453 | 2,714 | 249 | | | | |
| Grand total | Accomplishment rate 50% | 9,360 | 2,829 | 8,367 | 2,150 | 255 | | | | | | 30,166 | 4,243 | 22,443 | 2,860 | 262 | | | | |
| | Accomplishment rate 100% | 10,613 | 4,062 | 7,134 | 2,150 | 255 | | | | | | 40,860 | 6,905 | 24,919 | 3,225 | 296 | | | | |
| | Total | 2,829 | 2,829 | - | - | - | 3.85 | 1.70 | - | - | - | 10,892 | 4,809 | - | - | - | - | - | - | - |
| Development of new farmlands | | | | | | | | | | | | | | | | | | | | |

Table 45 Grain Yield Increasing Effect in Ramechap District

| Division | Area under cultivation (ha.) | | | | | | | | | | Per ha. yield (t) | | | | | | | | | | Yield (t) | | | | |
|---|------------------------------|-------|-------|--------|--------|-------|-------|-------|--------|--------|-------------------|--------|--------|--------|--------|--------|--------|-------|--------|--------|-----------|-------|--------|--------|--|
| | Rice | | | | | Maize | | | | | Millet | | | | | Barley | | | | | Wheat | Maize | Millet | Barley | |
| | Rice | Wheat | Maize | Millet | Barley | Rice | Wheat | Maize | Millet | Barley | Rice | Wheat | Maize | Millet | Barley | Rice | Wheat | Maize | Millet | Barley | Wheat | Maize | Millet | Barley | |
| Present state (1976/77) | 4,200 | 855 | 7,700 | 2,370 | 78 | 2.33 | 1.11 | 2.12 | 1.20 | 0.90 | 949 | 16,320 | 2,850 | 70 | 9,800 | 437 | 7,230 | 1,067 | 27 | | | | | | |
| | 1,260 | 257 | 2,310 | 711 | 23 | 3.85 | 1.70 | 3.13 | 1.50 | 1.16 | 4,851 | 664 | 11,427 | 1,991 | 6,850 | 664 | 11,427 | 1,991 | 50 | | | | | | |
| | 2,940 | 598 | 5,390 | 1,659 | 55 | 2.33 | 1.11 | 2.12 | 1.20 | 0.90 | 6,850 | 11,701 | 3,058 | 77 | 11,701 | 1,101 | 18,707 | 3,058 | 77 | | | | | | |
| | 4,200 | 855 | 7,700 | 2,370 | 78 | | | | | | | | | | | | | | | | | | | | |
| Effect of farming technique improvement | 2,100 | 428 | 3,850 | 1,185 | 39 | 3.85 | 1.70 | 3.13 | 1.50 | 1.16 | 8,085 | 12,051 | 1,778 | 45 | 8,085 | 728 | 12,051 | 1,778 | 45 | | | | | | |
| | 2,100 | 427 | 3,850 | 1,185 | 39 | 2.33 | 1.11 | 2.12 | 1.20 | 0.90 | 4,893 | 8,162 | 1,422 | 35 | 4,893 | 474 | 8,162 | 1,422 | 35 | | | | | | |
| | 4,200 | 855 | 7,700 | 2,370 | 78 | | | | | | | | | | | | | | | | | | | | |
| | 4,200 | 855 | 7,700 | 2,370 | 78 | | | | | | | | | | | | | | | | | | | | |
| Proposal | 4,200 | 855 | 7,700 | 2,370 | 78 | 3.85 | 1.70 | 3.13 | 1.50 | 1.16 | 16,170 | 24,101 | 3,555 | 90 | 16,170 | 1,454 | 24,101 | 3,555 | 90 | | | | | | |
| | 55 | 55 | Δ 55 | - | - | 3.85 | 1.70 | 2.12 | - | - | 212 | Δ 117 | - | - | 212 | 94 | Δ 117 | - | - | | | | | | |
| | 92 | 92 | Δ 92 | - | - | 3.85 | 1.70 | 2.12 | - | - | 354 | Δ 195 | - | - | 354 | 156 | Δ 195 | - | - | | | | | | |
| | 183 | 183 | Δ 183 | - | - | 3.85 | 1.70 | 2.12 | - | - | 705 | Δ 388 | - | - | 705 | 311 | Δ 388 | - | - | | | | | | |
| Effect of newly started irrigation | 4,255 | 910 | 7,645 | 2,370 | 78 | | | | | | | | | | | | | | | | | | | | |
| | 4,295 | 947 | 7,608 | 2,370 | 78 | | | | | | | | | | | | | | | | | | | | |
| | 4,383 | 1,038 | 7,517 | 2,370 | 78 | | | | | | | | | | | | | | | | | | | | |
| | 4,383 | 1,038 | 7,517 | 2,370 | 78 | | | | | | | | | | | | | | | | | | | | |
| Grand total | 4,200 | 855 | 7,700 | 2,370 | 78 | | | | | | | | | | | | | | | | | | | | |
| | 4,295 | 947 | 7,608 | 2,370 | 78 | | | | | | | | | | | | | | | | | | | | |
| | 4,383 | 1,038 | 7,517 | 2,370 | 78 | | | | | | | | | | | | | | | | | | | | |
| | 4,383 | 1,038 | 7,517 | 2,370 | 78 | | | | | | | | | | | | | | | | | | | | |

Note: There is no plan to develop new farmlands in Ramechap District.

Table 46 Total of Increased Outputs and Rates of Production Increase

| Division | | Rice | Wheat | Maize | Millet | Barley |
|---|-------------------------------|---------|---------|---------|--------|--------|
| Present state | | 29,271t | 2,526t | 36,300t | 5,350t | 299t |
| If 30% target is accomplished | Farming technique improvement | 34,740 | 3,021 | 41,699 | 5,772 | 326 |
| | Newly started irrigation | 3,061 | 1,352 | Δ1,656 | - | - |
| | Total | 37,801 | 4,373 | 40,043 | 5,772 | 326 |
| If 50% target is accomplished | Farming technique improvement | 38,397 | 3,349 | 45,221 | 6,060 | 342 |
| | Newly started irrigation | 5,101 | 2,252 | Δ2,760 | - | - |
| | Total | 43,498 | 5,601 | 42,461 | 6,060 | 342 |
| If 100% target is accomplished | Farming technique improvement | 47,536 | 4,167 | 54,149 | 6,780 | 386 |
| | Newly started irrigation | 10,199 | 4,503 | 5,517 | - | - |
| | Total | 57,735 | 8,670 | 48,632 | 6,780 | 386 |
| Increase rate | If 30% is accomplished | 129.1% | 173.1% | 110.3% | 107.9% | 109.0% |
| | If 50% is accomplished | 148.6 | 221.7 | 117.0 | 113.3 | 114.4 |
| | If 100% is accomplished | 197.2 | 343.2 | 134.0 | 126.7 | 129.1 |
| Where development new farmlands is included | | 68,627t | 13,479t | | | |
| Production increase rate in above instance | | 234.5% | 533.6% | | | |

In this case, the development of new farmlands in Sindhuli District is not included in the three-stage calculation because the developable places are concentrated in the terraces of large rivers and can only be developed in parallel with large-scale river improvement by the national government.

What is especially noteworthy about the results of the calculation is that the effect of farming technique improvement is particularly great, compared with the other effects, because the improvement of farming techniques can be carried out anywhere with the effort to diffuse them but the start of new irrigation and the development of new farmlands are feasible only in certain areas where water and developable places exist.

Therefore, guidance in farming techniques, the supply of necessary seeds, fertilizers, farming equipment, etc. and the securing of management funds will be most important to increase agricultural productivity in the Hill Area.

Next to come by way of improving the management base are the securing of water and the development of farmlands.

We shall not compare the present plan with the long-term JADP plan to end in 1987/88. Table 47 makes this comparison on the assumption that the present plan is accomplished 100%; although the direct comparison of the two plans is disputable because different calculative methods are used in them.

Table 47 Comparison with Long-term JADP Plan

| Division | Rice | | Wheat | | Maize | |
|----------------|------------|------------|------------|------------|------------|------------|
| | Area (ha.) | Output (t) | Area (ha.) | Output (t) | Area (ha.) | Output (t) |
| Long-term plan | 14,889 | 52,014 | 5,700 | 15,690 | 25,000 | 65,000 |
| Present plan | 17,825 | 68,627 | 7,949 | 13,479 | 14,293 | 48,632 |

Note: Both "area" and "output" include those of farmlands to be newly developed.

As can be seen from this table, both the area and the output under the present plan exceed those under the long-term plan in the case of rice. For wheat, the area is larger but the output is smaller. For maize, both the area and the output are considerably smaller.

Though, as stated already, different calculating methods are used in the two plans, the larger area and output for rice and the smaller area and output for maize may be attributable, among other things, to the fact that shifting insofar as possible from maize fields to paddy fields is planned, based on the detailed study of water sources in the recent survey.

The proposed yield of wheat may be larger in view of the foregoing test data and the results of survey on advanced farmers. The proposed yield is modestly estimated, for one thing, to stress the safety of the plan because the present yield in the statistics is small. Therefore, as far as wheat is concerned, there will be little difference from the long-term plan if a somewhat high proposed yield within the test data is to be employed.

