1. PRESENT STATUS AND PROBLEMS OF WATER MANAGEMENT OF RICE IN INDIA

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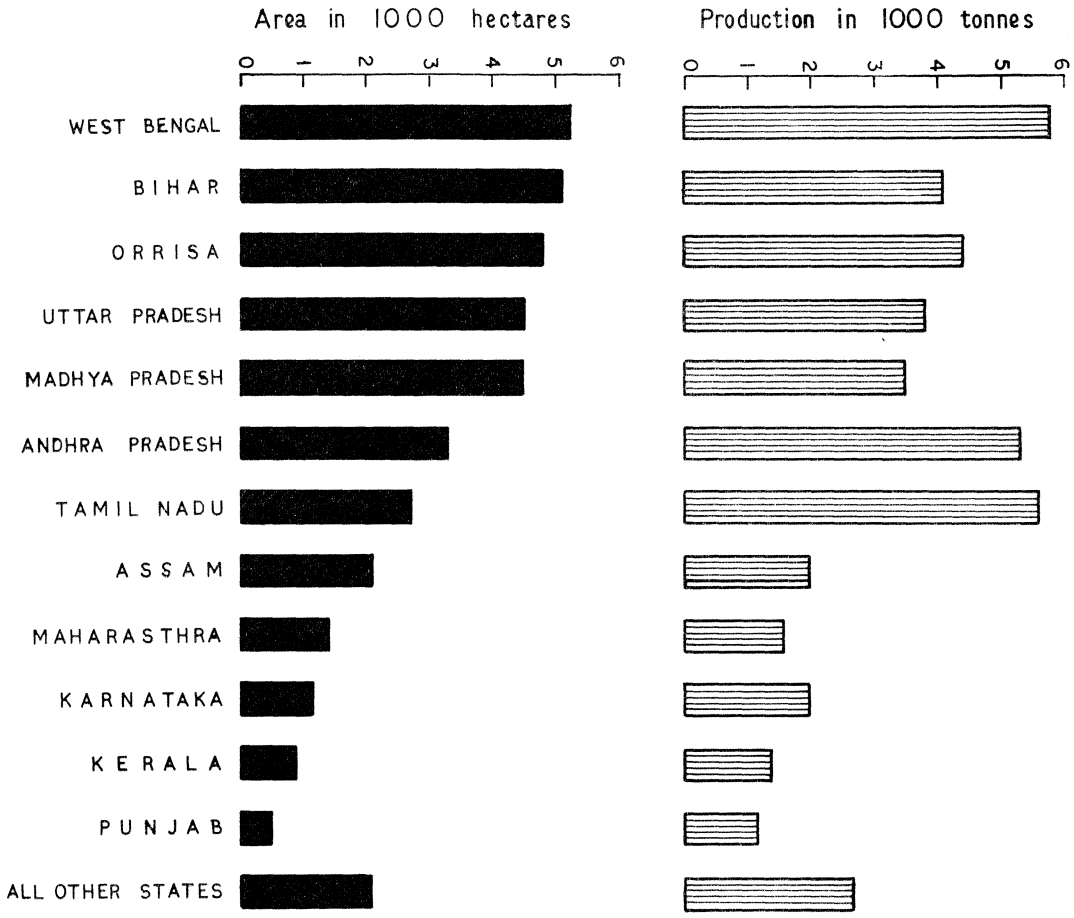
A. General Statistics

A–1: Area and Production:

In India rice is the most important food crop contributing over 40 per cent of the total food grain output in the country. Out of 165 million hectares of cultivated land, 126 million hectares are under food grain crops of which about 30 per cent is covered



(Source: Directorate of Agriculture, West Bengal)

Fig. 1. State Wise area and Production of rice in India During 1973—74

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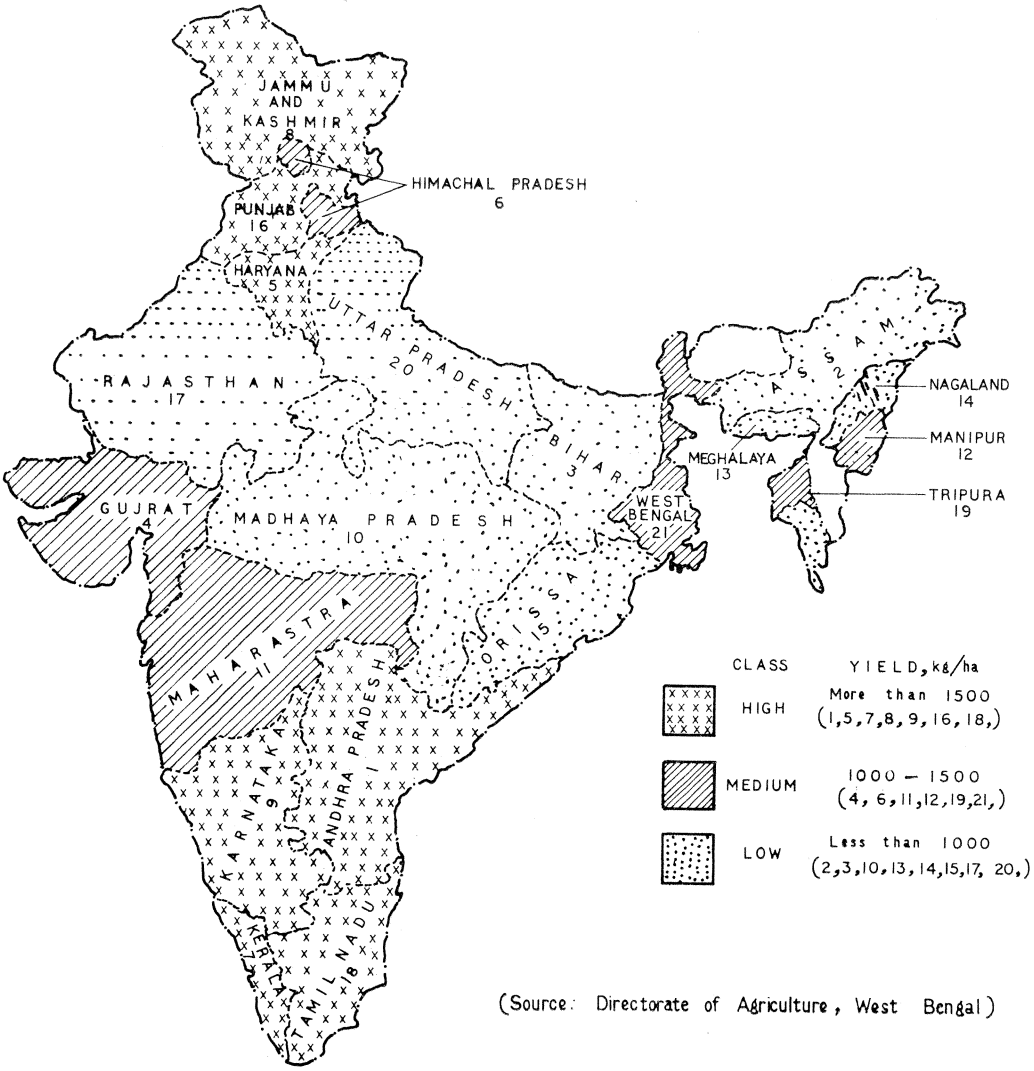


Fig. 2. State Wise Yield per unit area of rice in India During 1973—74

by rice. The present level of production is 43.7 million tonnes from an area of 38.01 million hectares (Anon., 1975). The present statewise area, production and yield of rice in India are given in Figs. 1 and 2.

Rice is grown in all the three principal crop seasons namely autumn, winter and summer. The bulk of the rice crop, covering 94 per cent of its total area is grown during *kharif* season (Anon., 1975) comprising autumn and winter crops.

The distribution pattern of rice cultivated area and the production potentiality in different parts of the country is apparently governed by two major factors namely, (i) the onset and retreat of monsoon (Fig. 3) and distribution of rainfall (Fig. 4) and (ii) the source and availability of irrigation water. The eastern part of the country comprising the states of Assam, Bihar, Manipur, Tripura and West Bengal, where 75 per cent of the rice area is under rainfed condition, accounts for about 45 per cent of

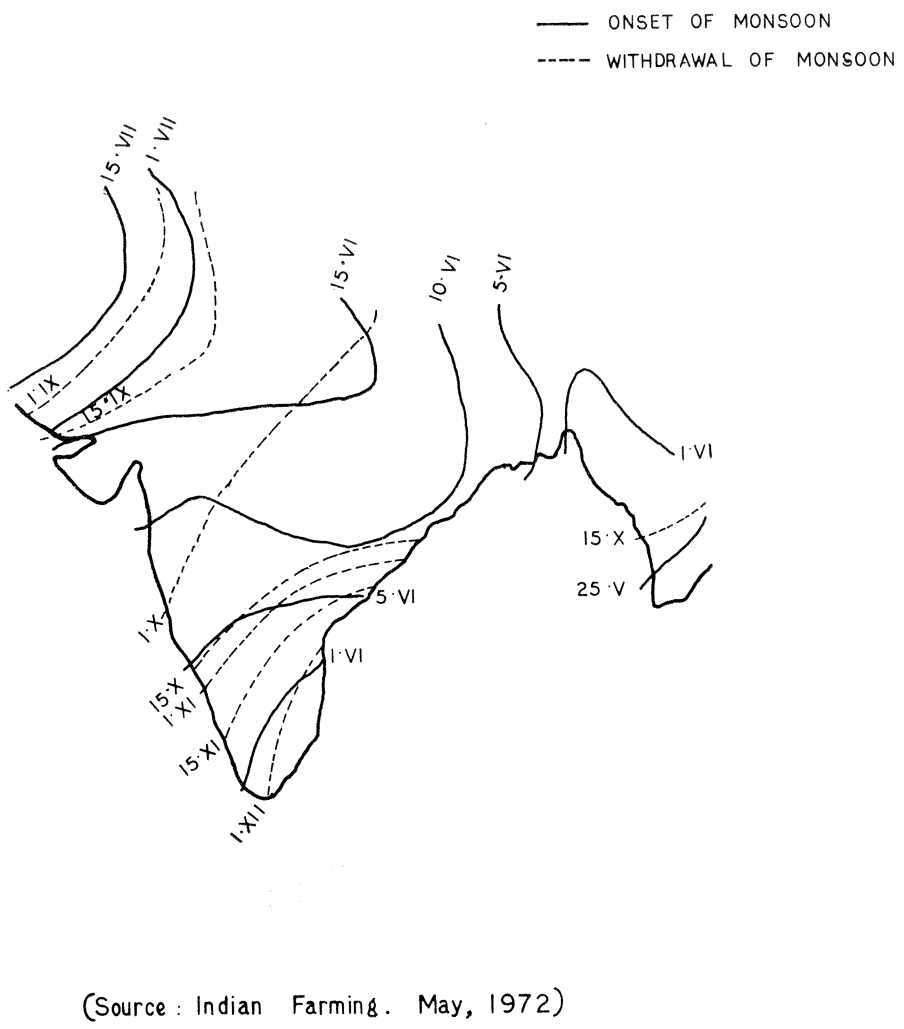


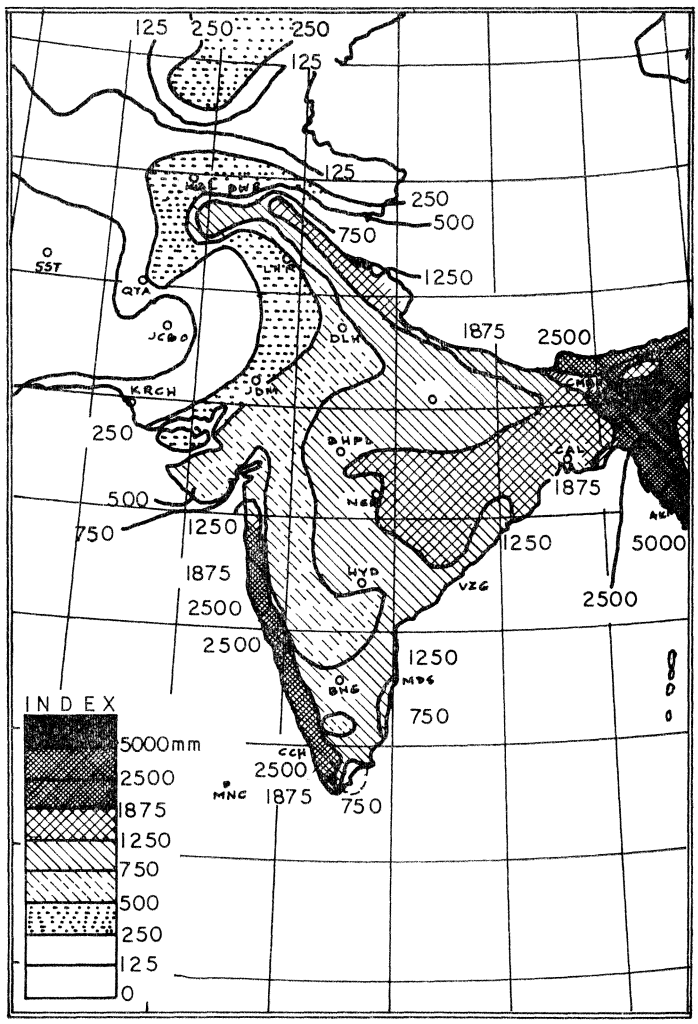
Fig. 3. Dates of onset and Withdrawal of Monsoon

the total rice area and contribute about 43 per cent of total rice production of the country.

The average productivity of the rice in India is 1.15 tonnes per hectare. Of the important rice growing states in the country, the lowest state average is 0.79 tonnes per hectare in Madhya Pradesh where less than 10 per cent of the rice area is irrigated and highest is 2 tonnes per hectare in Tamilnadu where 90 per cent of the rice area is having irrigation facilities (Fig. 2). In general, the production of rice in India has made slow but steady progress ranging from a base level production of 39 million tonnes (1968–69) to 44 million tonnes.

A–2: Irrigation resources and development:

Since the last 30 years the area irrigated from major and medium irrigation projects has gone up from 9.7 million hectares to 20 million hectares. The area under minor irrigation scheme has risen from 13 million hectares to 20 million hectares, (Swaminathan, 1972). It has been estimated that the annual development of irrigation resources on an average brings additional land of 0.84 million hectares under irrigation which



(Source: Fertiliser Statistics 1971-72. The Fertiliser Assn. of India, New Delhi)

Fig. 4. Anual Rainfall in India (millimeters)

is probably the highest growth rate in the world. The four different groups of irrigation sources namely canals, tanks, tube wells and other cover 41.0, 16.7, 33.7 and 8.6 per cent respectiveily of the total irrigated area (Dakshinamurty, 1973).

Out of 39 million hectares of gross irrigated area in the country, 27 million hectares (about 70 per cent) are under cereals. Of this rice alone occupies around 14 million hectares (37 per cent). Although a major part of irrigation water (45 per cent) is diverted to rice, yet it covers only 38 per cent of the total cultivated area under rice crop. In other words 62 per cent of rice area in the country is rainfed (Dastane *et al.*, 1970).

B. Problems in Rice Cultivation

The crop is largely grown in kharif season which exposes it to vagaries of monsoon having too much water bringing flood or too little rainfall to cause drought (Fig. 5). 1) The country being large the climatic zones may be grouped into Eastern, Western, Northern, Southern and Central regions with particular reference to rice cultivation. Eastern and North-Eastern regions where heavy rainfall occurs during early growth stage of the crop, the seedling establishment is affected adversely. Further, heavy precipitations at latter part of the crop growth, flood the low-lying areas and completely ruin the crop. The coastal areas of these states often get cyclonic rains causing flood and inundation of the rice fields in low-lying areas which are mostly ill drained. Under

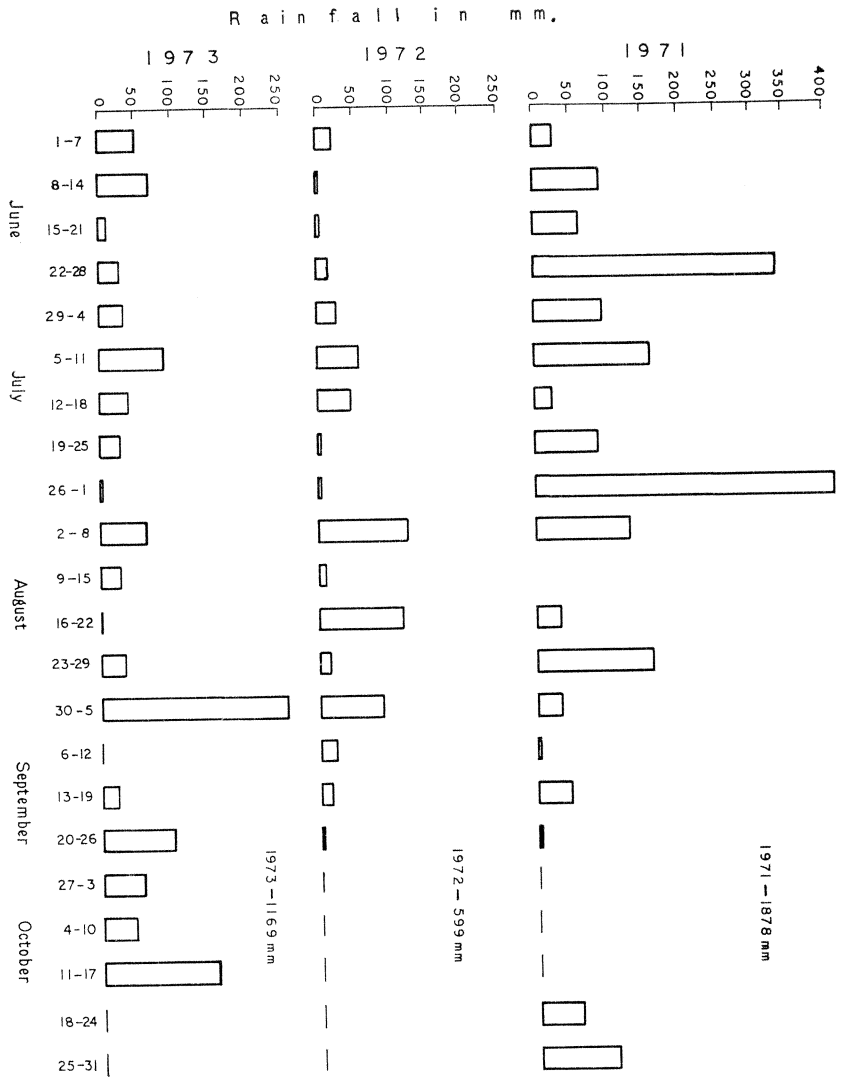


Fig. 5. Weekly Rainfall Distribution during KHARIF Season 1971—73 (Rainfall data recorded at Indian Institute of technology, Kharagpur, India)

such situation severe damage to rice crop is not uncommon. Under rainfed condition *kharif* season plantings in southern parts of the country tend to get delayed due to late monsoon which also delays release of canal water. In north and central regions often due to uneven and scanty rainfall the drought conditions prevail more than once in the life of the crop resulting in crop failure.

2) Considerable gap between two consecutive rains affects upland crop mostly, on the other hand the low lands which are mostly ill drained the crops get flooded due to heavy rains. If inundation continues for a week or more the crop fails and such occurance is not uncommon in one or other part of the country. About 8 million hectares of rice land remain ill drained and about half of the area has problems of salt accumulation (Vamadevan, 1973).

3) In monsoon season the cloudy weather prevails and proves limiting for getting high yields. During this period the daily average sunshine hours range from 2 to 5 hours while the optimum requirement of crop being 7 hours/day or above (Moomaw and Vergara, 1964). In addition to this, at later stages of growth (flowering) temperature remains high which causes high rate of respiration and ultimately poor yield.

4) Nearly 7.3 million hectares of land is affected by salinity or alkalinity and rice is normally cultivated over half of this area (Vamadevan, 1973). The problem is particularly gaining importance in Indogangetic plains and in the Chambal command areas of Rajasthan and Madhya Pradesh due to rise in subsoil water level and gradual movement of salts to the root zone of the crop. Large areas of land in the coastal regions of West Bengal, Orissa, Andhra Pradesh, Kerala, Maharastra and Gujarat are also saline due to salt water inundation from the adjoining sea.

5) Rice being grown under submerged condition, high seepage and percolation losses which amount to as much as 60 per cent of the total, projects the problem of water management in rice field. However the losses vary with the soil types and seasons. The cultivation of rice on the light soils or in dry season accentautes the losses which at times are so great that the rice cultivation becomes uneconomical.

C. Technological Development in Rice Cultivation

With the available technology in the water management and other inputs, our production can be boosted from 1.15 tonnes per hectare to as high as 3.5 tonnes per hectare. This assessment could be made on the basis of our country wide crop cutting experiments where very high crop yields (*Rabi* 7.5 and *Kharif* 5.3 tonnes per hectare) under ideal management has been reported (Anon., 1971).

C–1: High yieldinging varietal programme:

Indian Council of Agricultural Research (ICAR) initiated all India coordinated programme in 1965 for the varietal improvement through breeding with dwarf varieties, (Shastry, 1972). A series of high yielding varieties of different duration, so far released, are grouped below:

Short (90–115 days)—Cauveri, Bala, Shabarmati, Jamuna, Padma, Krishna, Kanchi, Rataa.

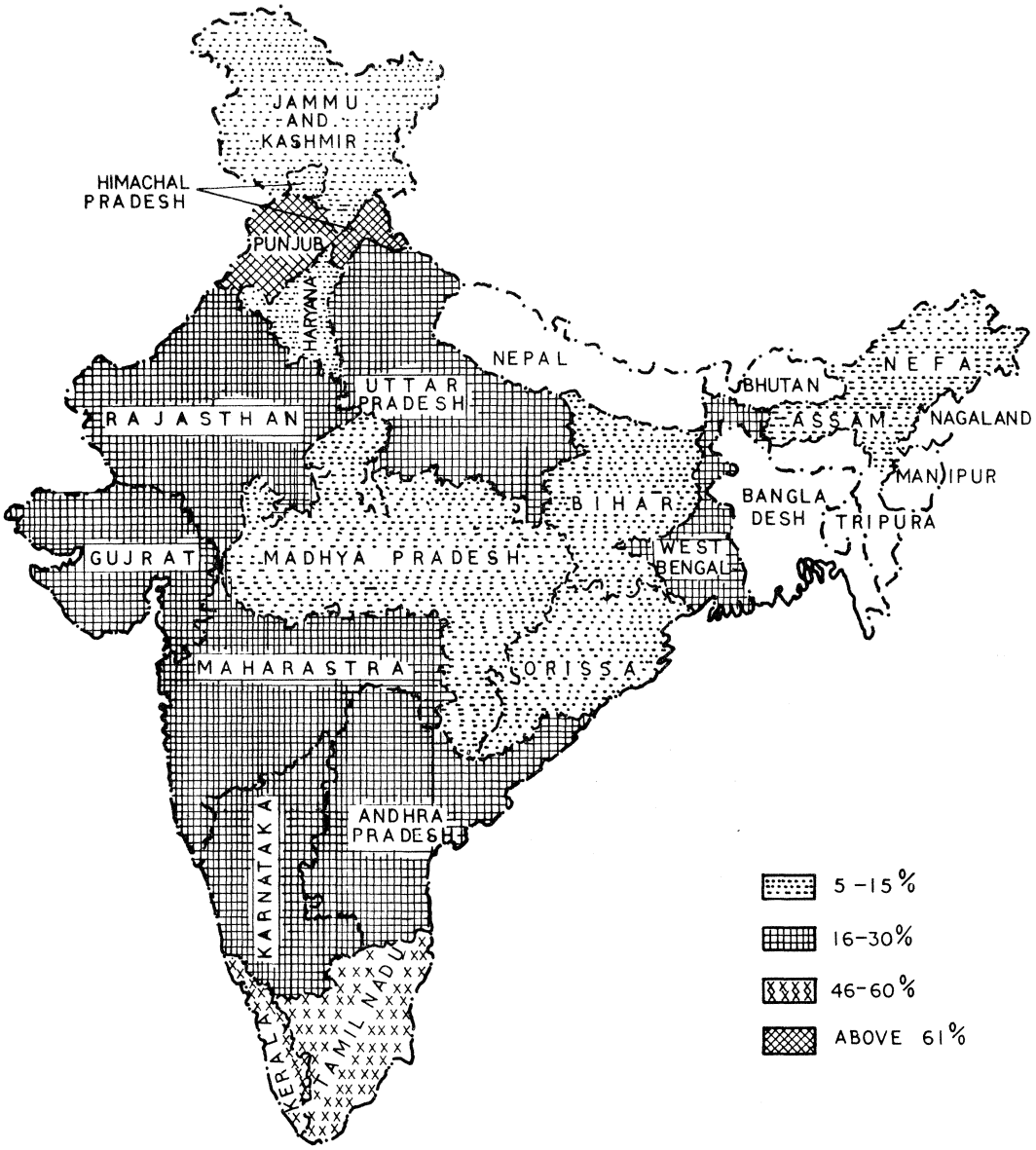
Medium (116–135 days)—Jaya, IR 8, IR 20, Jayanti, Sona, Vijaya.

Long (over 135 days)—Pankaj, Jagannath.

The percentage coverage with high yielding rice varieties varied widely among different states of the country which is presented through Fig. 6. Fig. 7 depicts the relative coverage of high yielding and local varieties since last eight years.

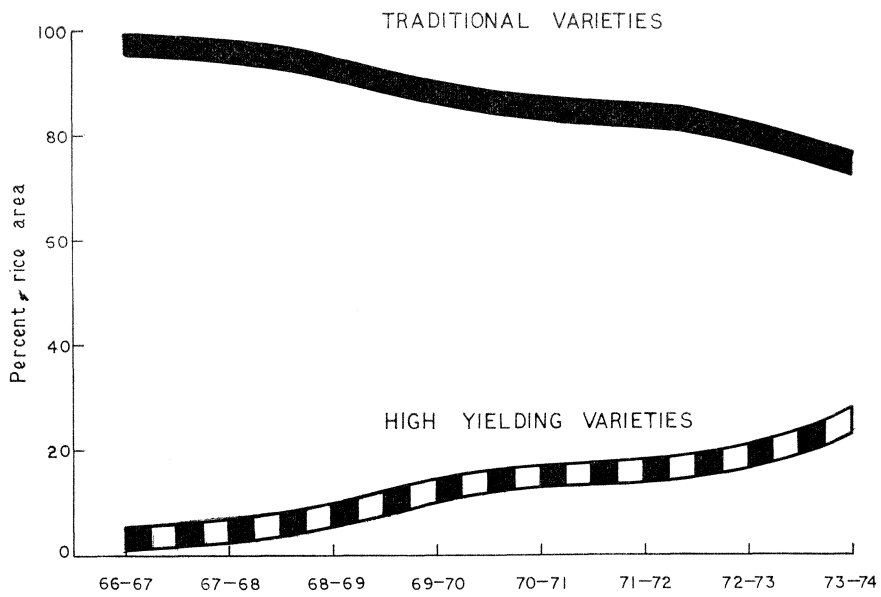
C–2: Water management:

Water management practice for rainfed crop mostly relates to surface drainage removing the excess water from the rice field which otherwise cause flood due to high rainfall. Whereas in case of irrigated crop the major emphasis has been to economise



(Source: Indian Farming, 1972)

Fig. 6. Percentage of the rice area under high yielding varieties



(Fertilizer statistics: Fertilizer Association of India New Delhi)

Fig. 7. Relative coverage of high yielding and local varieties in different years

water by minimizing the losses without affecting crop yield rather improving the yield.

In the country there are two major irrigation sources namely canal and tube wells which provide 75 per cent of the total irrigation water. Most of the canal irrigated area in the country follows the field to field irrigation system resulting in poor irrigation efficiency. However, there is considerable awakening among the farmers who have realised the disadvantages of the system. They have started using a shallow depth of water at critical growth stages of crop wherever possible. On the other hand under tube well irrigation system the water distribution is either by constructing field channels or laying out under ground pipe lines. Thus the losses are minimized and a high irrigation efficiency are being attained.

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