CHAPTER - VI

CONCLUSION

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6.1.0 Summary

Rice is the most important diet of the Asian people. South and south-eastern Asian countries are the "home" of rice crop. Rice occupies about 145 million hectares of land in the world and the actual production of rice is about 414 million tons. The average yield is 2,885 Kg/ha. India has the largest rice growing area in the world. She has 40 million hectares of rice growing land and out-turn of rice is 82.7 million tons. If we consider the production of rice, China stands first in the world and India gets the second place.

Karnataka has 1.15 million hectares of land (1981) under rice cultivation and she harvests over two million tons of rice every year. Almost all people use rice in their diet in Karnataka. However, more rice is consumed in the southern and the western parts of the state. Considering the preceding discussion and
importance of rice, the researcher wishes to give the present position of rice production and suggestions to improve the productivity, production, suitability of land and capability of land where rice can grow in the state. Based on the findings of the research work, here the researcher also tries to give the marginal and sub-marginal and potential land resource of Karnataka through which productivity can be improved most efficiently and satisfactorily. Here, while giving the suggestions to improve the productivity, the researcher has kept in mind all the geographical conditions, present position of rice production, methods of rice cultivation, problems of the farmers and of the Government officers and modern innovations adapted in rice cultivation. Based on the survey and analysis of the data in the previous chapters, the researcher tries to give the following findings.

6.2.1 Main Findings:

1) Rice is the staple diet crop in south and south-east Asian countries which contribute 91% of the world's rice production and cover about 83% of the world's rice growing area.
2) India has the world's largest rice growing area (40 million hectares) and producing 82.7 million tons of rice per year.

3) Karnataka is one of the important rice growing states in India. She has 1.15 million hectares (3.1% of India) of land under rice and over 2 million tons of rice is grown every year. Rice plays an important role in the economy and social life of the people.

4) Rice grain consists of energy giving starch (78%) strength giving and tissue building protein (7%) and health giving 'B' complex and a few minerals. Rice is the most important food in Karnataka.

5) Geographical conditions have great influence on cultivation of rice crop. Though it can be raised in varying geographic conditions such as altitude, latitude, temperature, rainfall, soil, there are certain limitations of these environmental conditions on rice cultivation. Research works in different branches like geography, agricultural science, botany, climatology, meteorology etc., have proved this fact.
6) Varieties of rice are classified on the basis of duration, season, soils, topography etc.

7) Botanically rice is called "Oryza Sativa" that belongs to grass family. Though there are 27 species, only one species is being cultivated by man all over the world except Africa where "Oryza Glaberrima" specy is grown.

8) There are innumerable varieties of rice cultivated all over the world and more than 4,000 varieties are raised in India. It means that rice cultivation in India is in practice from time immemorial.

9) Rice cultivation in China dates back to 5,000 years. Rice is grown in India also from the same age. There are evidences to prove this hypothesis.

10) The 'Oriental' (Eastern) and the 'Occidental' (Western) types of rice cultivation differ in many aspects viz., traditional methods of cultivation, small land holdings poor farmers who can not afford adequate fertilizer, manure, pesticide, water etc., to the crop. That causes poor yields, 200 Kg/ha. But in the west due
to scientific cultivation, irrigation, fertilizer etc., there is a very high yield of rice, like 6000 Kg. per hectare.

11) Rice is being cultivated in Karnataka (as in India) from time immemorial.

12) There are hundreds (141) of varieties of rice cultivated in Karnataka. Some of these are indigenous and some are new hybrid or improved high yielding varieties.

13) High yield of rice is due to the response of the new varieties, to fertilizers, irrigation and use of pesticides, physiological characters of the plant and modern method of cultivation.

14) There are "indica" and "japonica" varieties of rice cultivated in Karnataka. The "japonica" varieties are short and they respond better to higher doses of fertilizers, manures, and give higher yields than the 'indica' varieties. Indica variety of rice was grown since long time.
15) The "Javanica" variety of rice is low photo-sensitive and does not lodge easily.

16) Rice is a self pollinating crop and naturally different local forms are created. Therefore, there are innumerable varieties of rice.

17) Different varieties of rice have a range of duration from 80 days to 200 days. They are suitable for cultivation in different geographic conditions.

18) Rice varieties are classified on the basis of colour and size of the grain, length of the grain (varies from 5.3 to 11.8 mm.)

19) Qualitative character pertain to colour, smell, texture of the hulled rice.

20) Price of rice formerly was fixed by the merchants by considering the size (fine, medium and coarse), smell, taste, cooking quality etc. Now the Government determines the price. However, the price varies according to demand and supply and production of rice. Price depends also upon the variety, such as coarse (Cheap), medium (middle) and fine (costly).
21) Different varieties of rice are raised in different tracts like the coastal belt, the malnad region and the maidan area. They include the local varieties and the high yielding varieties.

22) The area under high yielding varieties is increasing continuously in Karnataka.

23) Rice is given first priority in distributing high yielding seeds (3,75,519 quintals 1980) by the Government in Karnataka. Production of high yielding varieties has been doubled from 7.1 lakh tons (1973-74) to 14 lakh tons (1982).

24) The farmers who were wise and practical minded adopted new varieties soon, while some waited till the results appeared favourable. Some could not afford the required quantity of fertilizers, pesticides etc.

25) The University of Agricultural Sciences, Bangalore has led the state in improving and extending high yielding varieties. It has educated farmers as how to adapt modern methods, and in this respect, it deserves appreciation by the people of Karnataka and the rest.
26) There are different methods of cultivation of rice in different tracts like the coastal belt, the malnad and the maidan: (i) Dry or rainfed cultivation and (ii) West or irrigated cultivation.

27) Rice cultivation requires a lot of labour force at various stages. It is difficult to get sufficient labourers during the period of transplanting, harvesting, threshing etc.

28) The Japanese method of rice cultivation is introduced in Karnataka in 1953. More and more area (3.7 lakh hect.) has been brought under this method and that has increased the production.

29) Scientific method of rice cultivation, sowing or transplanting, proper irrigation, proper use of fertilizers and manures, managing the land and soil are proved helpful to increase the yield and production of rice in Karnataka.

30) Several banks, Co-operative societies etc., are lending money to the farmers for several agricultural purposes and enabling them to increase the yield and out-turn of paddy.
31) Reorganization of the Karnataka state has favoured agricultural development, especially rice cultivation in the state.

32) The geographic location of Karnataka is in the tropical monsoon region. The coastal belt has 7.3% of the state's area, the malnad region shares 18.2% and the maidan has 74.5% of the state. The coastal belt receives the highest amount of annual rainfall which is about 500 cm. The malnad region gets "medium" amount of rainfall of 125 cm. per annum. The maidan gets only about 55 to 85 cm. Thus there is an imbalanced distribution of rainfall in the state; the smallest region (coastal belt) gets the maximum rainfall and the largest region (maidan) receives the minimum rainfall. Therefore, it is necessary to cultivate rice through irrigation in the maidan region. Rainfed rice cultivation is practised in the other regions, with supplement of irrigation.

33) The geographic conditions such as rainfall, temperature, soil etc., are quite favourable for rice cultivation in larger parts of Karnataka.
34) Rice occupies the second place (next to jowar) in area (1.2 million hect.) among the cereals. Production of rice is the largest (2.3 million tons 1978-79); (1.3 m.tons was in 1959-60). There is an increase by 77% of rice production. The average yield of rice has increased from 1,413 Kg/ha. (1959-60) to 2000 Kg/ha. (in 1978-79). There is about 43% increase in the yield of rice. The reasons for the increase in production and yield are (i) the improved varieties, (ii) better methods of cultivation (fertilizers), (iii) irrigation, (iv) pesticides etc.

35) Distribution of rice growing area has been studied by taking district-wise and taluka-wise area, and "rice zones" have been mapped and different concentrations such as very high, high, medium, low and very low have been shown.

36) Agricultural efficiency (yield index) has been calculated (1978-79) by using the formula,

\[ I_{Ya} = \frac{Y_c}{Y_r} \times 100 \]
suggested by Jasbir Singh. Map has been drawn to show agricultural efficiency of rice cultivation in the state. (\(I_y\) is the yield index of crop 'a', \(Y_c\) is the hectare yield of crop 'a' in the component areal unit, and \(Y_r\) is the yield of crop 'a' in the entire region.

37) Index numbers of rice production in each district have been studied for nine years between 1959-60 to 1978-79.

38) Several graphs have been drawn to study the trend in production, yield, agricultural efficiency etc.

39) Trend in productivity (of rice) has been studied during the 30 years by selecting some convenient years.

40) "Rice region" has been delineated by taking taluka-wise area under rice cultivation. The regions appear distinctly. "The rice bowl" of Karnataka covers the districts of Uttara Kannada, Dakshina Kannada and the Western part of Shimoga district (Fig.6.1).
"RICE BOWL" OF KARNATAKA

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RICE BOWL
FRINGE OF THE RICE BOWL

Fig. 6.1 "Rice Bowl" of Karnataka
41) Karnataka is in the early stage of development as 67 per cent of people are engaged in agriculture.

42) Rice occupies 1.2 million hectares of land which is 12 per cent of the cultivated land. But the value of annual production of rice is 50 per cent of that of the net food grains.

43) Rice is used as main food by greater majority of the people in Karnataka especially in the western and the southern parts.

44) Annual production of rice is about 2.3 million tons (1978-79). The production was only 1.2 million tons in 1965-66.

45) Karnataka shares 3.16 per cent of rice growing area in India. Majority of the rice farmers in Karnataka are "subsistent farmers" who grow rice mainly for their domestic consumption. Only some farmers who have large size land holdings and grow surplus (even bumper crop) rice under irrigation and with modern methods of cultivation. Out of the total production they sell about 55 per cent of rice in the open market
(including levy) and 35 per cent for domestic consumption, 8 per cent for wages and 2 per cent for seeds.

Though there are traditional methods of rice cultivation in Karnataka, modernization is being adapted increasingly. As a result there is increase in rice production.

46) The rice growing farmers in Karnataka are able to afford only about 50 per cent of the required quantity of fertilizer for paddy cultivation. Management of rice fields is not much satisfactory, because of lagging economic capacity, disinterest, laziness, illiteracy etc. This causes poor yields of paddy.

47) Labour force is not available enough at the time of transplanting or harvesting of paddy. Labourers are invited from the neighbouring villages if available.

48) Improved varieties of paddy yield better than the local varieties of rice and fetch about 80 per cent greater out-turn to the farmer.
49) Soils are not managed properly. Soil is not tested in majority of the fields. As such, there is not significant increase in yield of rice in many fields.

50) Majority of the land holdings (56%) are of small size. This causes low yield and less production of paddy.

51) Marketing is done at the A.P.M.C. in the nearby town; which provides many facilities to the farmer to sell his commodity at a reasonable price.

52) Per capita availability of rice in the state has been decreased from 1961 (72.3 Kg.) to 1971 (72 Kg.) and to 1981 (59.4 Kg.), due to faster growth of population than that of the production of rice in the state.

By considering the per capita requirement of rice (300 to 400 gms. daily or 2500 calories per day) 3.7 million tons of rice is required to feed the population of Karnataka in 1985. Thus there is shortage of 1.2 million tons of paddy. By the end of 20th century at least 5 million tons of paddy will be required to feed the people.
53) The Government of Karnataka has been encouraging rice cultivation by providing several facilities such as improved high yielding seeds, training the farmers in modern methods of cultivation, irrigation, fertilizers, manures, pesticides, financial help etc.

54) The Government has organized exhibitions, training institutions, fairs, demonstrations, radio programmes etc., to inform the rice farmers, about the modern methods of rice cultivation, and remedies to control the diseases, etc.

55) Farmers are becoming more and more aware of use of fertilizers and manures, pesticides etc.

56) There is considerable progress in rice production in Karnataka by the financial assistance extended by various banks, societies etc.

57) The sample survey of villages has helped to understand the problems and attitude of farmers towards rice cultivation.
58) Social and cultural conditions of the farmers have affected rice cultivation in some areas (on account of illiteracy of the people).

59) There are about 1,515 rice mills in Karnataka. Milling and polishing reduces vitamin contents of the grain considerably. But modern culture prefers milling. Pounding or grinding paddy for dehusing is disappearing recently.

60) Fifty per cent levy on rice is charged by the Government of Karnataka, through the mills at the time of milling. Formerly (1966) levy was collected from the farmers. The mill owners demand for reduction in levy (15%). There is some controversy on levy between the rice mill owners and the Government of Karnataka.

6.3.0 Suggestions

1) Rice is the most important crop giving very high yields to feed the dense population of the Orient, it needs all the co-operation among the rice growing countries to improve the methods of cultivation under the scientific technology.
2) In the International rice research centre a few geographers may be associated with agricultural scientists, botanists etc. So that they can contribute geographic research by analysing and correlating geographical conditions and rice cultivation in different regions. They should be given adequate funds for research.

3) The existing international Rice Research Centres are only a few in number. Therefore it is necessary to increase the number of such Research Stations in all the important rice growing countries.

4) A team of scientists consisting of a historian (ancient), a geologist (Paleontology), a geographer, a botanist and a few agricultural scientists may be appointed and entrusted to do research about the age, origin, ancient methods of cultivation and environmental conditions of rice cultivation in the southern and the south-eastern and the other Asian countries.

5) While doing research in order to improve the quality of rice varieties, different geographic conditions in different countries may be given more
attention, so that it would be possible to do better research in improving the varieties suitable for particular regions.

6) As rice has been grown in Karnataka since ancient time, there are numerous varieties of rice. The geographic conditions such as temperature, rainfall (irrigation), soil, relief etc., are quite favourable for rice cultivation in Karnataka. Therefore, it is suggested that rice cultivation on modern lines with improved varieties and irrigation, fertilizers, pesticides etc., should be given top priority to increase the yield and out-turn of paddy in Karnataka, so that it would be possible to meet the growing demand for food.

7) More and more "japonica" and "javanica" varieties of paddy should be cultivated instead of "indica" varieties so that the yield and the production would increase. The first two varieties viz., Japonica and Jovanica are short in height and do not lodge and respond better to fertilizers and irrigation. Hybrid varieties with these 3 varieties may be generated.
8) More research work is needed regarding suitability of duration of paddy crop to the geographic regions, the malnad, the maidan and the coastal belt. Both an agricultural scientist and an agricultural geographer should be appointed in each rice research station, to do research work about the relationship between the geographic conditions and rice cultivation and varieties.

9) It is appreciable that the Government of Karnataka has encouraged rice cultivation on top priority comparing to the other cereal crops. But, considering the demand and the need for more food by the ever growing population and by considering the highest per hectare yielding of rice comparing with other cereal crops it is suggested that still more emphasis and encouragement should be given for rice cultivation.

10) Many farmers do not show interest in growing new varieties of rice. It is suggested to educate the farmers through demonstration, exhibition, short-training, etc., and convince them to grow new varieties under modern methods.
11) The University of Agricultural Sciences, Bangalore has done commendable work regarding extension of rice cultivation on modern line. But considering the vast and growing population still more efforts are necessary in this direction. Therefore, it is suggested that the Government of Karnataka should sanction a special additional grant to expand research on rice breeding at different tracts and extension programmes to educate or train the farmers about modern methods of rice cultivation.

12) Methods of rice cultivation should be improved according to the tracts or geographic regions i.e., the coastal belt, the malnad and the maiden, so that the best adaptation to the environment and maximum out-turn of paddy would become possible.

13) Japanese method of rice cultivation should be extended in all the areas of irrigated rice cultivation, so that production of rice would increase. Labour problem (shortage) can be overcome by mechanizing rice cultivation.
14) More area has to be brought under rice cultivation in all the three geographical regions of Karnataka (now the area is 1.1 million hectares) viz., (i) the coastal plain, (ii) the malnad and (iii) the maidan (average yield 2,000 Kg/ha.) and production (2.2 million tons) of rice is more than that of any other cereal crop. This quality of higher yields of rice would help to solve the food problem of Karnataka. Irrigation facility must be provided in the maidan area because the annual rainfall is only 50 cm.

15) Water resource is limited and hence minimum quantity of water should be used for rice cultivation. Forty per cent of the available water resource is spent in rice cultivation. We use 8000 litres of water to produce half a kilogramme of rice. Japan uses only 2700 litres. The Indian Agricultural Research Institute has evolved varieties which would give the present yield with 2,250 litres. Farmers must be trained and instructed to use minimum quantity of water. This would enable not only to grow more rice but also to extend irrigation 3.5 times more area. (Based on the Illustrated Weekly of India, 24th January, 1971, p.12).
16) Efforts should be made to bring more area from sugar-cane to rice cultivation. Because rice is more essential to feed the people than sugar. Sugar-cane is grown in 1.5 lakh hectares. At least efforts should be made to rotate sugar-cane crop with rice, instead of continuous cultivation of sugar-cane which would decrease soil productivity.

17) More emphasis is to be given to increase the area under rice in the coastal land the malnad region where there is heavy rainfall. Shimoga, Dharwad, Dakshina Kannada, and Uttar Kannada districts cover about 50 per cent of the state's rice growing area. Mysore, Mandya, Belgaum, Hassan, Chikmagalur, Chitradurga, Kodagu, Bangalore, Raichur are the next important districts of rice growing areas. More area is to be brought under rice cultivation in these districts where geographic conditions are quite favourable for rice cultivation.

18) Improvement of soil conditions, soil conservation practice need emphasis in the rice growing areas. The slope factor must be given proper attention by bunding, terracing, wherever necessary especially in
in the malnad districts. This would help decrease in soil erosion and increase in rice production.

19) Modernization of agriculture and agricultural implements and use of tractors preferably of small size should be encouraged. Research by agricultural scientists, in this regard, needs more encouragement by the Government.

20) Production of manure and fertilizer should be doubled regarding rice cultivation in the state to meet the (adequate) requirements. Because India is one of the countries using very low quantities of fertilizers and manures.

21) Groups of villages should plan systematic and co-operative use of labour force at the time of peak periods, like transplanting and harvesting when there is shortage of labourers in some villages. Mechanization should be increased.

22) Too (marginal) small and small land holdings are responsible for low yield and less production of rice. It is better to merge all the marginal and
small size land holdings and convert them into medium or semi-medium (2-4 hectares) size holdings; so that it would help to increase rice production.

23) Improved varieties of rice should be extended to all the rice growing districts in order to increase the yield and the production. Research should be carried out by agricultural scientists to improve taste, nutritive and cooking quality of hybrid varieties of rice.

24) Now there is shortage of 1.2 million tons of paddy in the state. At the end of 20th Century about five million tons of rice would be required for the estimated population. Annual Plans (Five Year Plans, Annual Plans) should be made with a view to increase the production of rice to the required quantity by modernization, increasing fertilizers and manures and proper use of irrigation without wasting water (use of sprinkler etc.,), pesticides etc.

25) It is necessary to increase rice production so that the state could become self sufficient. Price of rice should be at such a level which can reach even a poor man because rice is the main food in Karnataka,
at the same time the farmer should get the reasonable returns.

26) Exhibitions, trainings, demonstrations, fairs, regarding rice cultivation should be extended still on larger scale because they are interesting, informative and educative to the rice farmers.

27) Educational institutions such as agricultural schools, colleges should be increased in number so that more farmers (children) get the benefit of the education and they can increase rice production. Geography must be a part of every curriculum.

28) Production of not only fertilizers but also manures—including green manures—is to be doubled to facilitate the farmers to increase rice production.

29) Money lending from banks and societies needs some improvements regarding recovery of loans. The government has given subsidiary, exemption of interest in certain conditions and exemption of capital at certain time. But this would put heavy burden on the Government and on the common man in turn. Exemption
of loans or part of loan or interest is not good from the state's economic point of view. The farmers should be given only further extension of time to pay off the loan and interest.

30) According to the sample surveys, there is difference in yield and production of paddy. Efforts should be made to increase rice productions, especially in areas of low yields, by providing the necessary help, guidance etc., to farmers.

31) Farmers must be educated to enable them to understand properly modern agriculture and to practice the same.

32) Rice mills need facilities like electricity, certain imported machines or spare parts etc., from the Government. The Rice Mill Owners Association has been established in Karnataka in 1983. But that should work with co-operation to solve the problems of the Rice Mills.

33) When the Governments, fix the price of rice they can purchase the quantum of paddy from the
chief marketing centres, through A.P.M.C. instead of taxing either the Rice Mills or the farmers.

34) Presently about 50 per cent of rice growing area is under irrigation and the rest is rainfed area. There is an urgent need to increase area under irrigated rice.

35) By bringing another 24 per cent of rice growing land under irrigation it is possible to increase production of rice over one lakh tons in Karnataka.

36) Paddy straw is mainly used as fodder for cattle in Karnataka. But ropes, mats, baskets etc., are produced with paddy straw in Japan. Paddy straw is a very good raw material for strawboards, paper-straw which is used for hat, mat etc., in Philippines, China and Japan. In the same manner the use of paddy straw may be developed in Karnataka and other parts of India. (Photo 6.1, 6.2).
Photo 6.1: Heaps of paddy straw at a 'Kan' (nigadi, dist. Dharwad).
Note: The straw is mainly used as fodder.

Photo 6.2: Handicrafts like rope, basket, hat, mat, etc., from paddy straw in Japan (Courtesy: Grist).
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