

Water Resources and Cropping Pattern with Reference to North-Karnataka, India

Vishwanath A. Khot¹, Talwar Sabanna²,

¹Research Scholar, Department of Studies in Economics, Rani Channamma University, Bhootaramanahatti, Belagavi-Karnataka State, India.

²Professor, Department of Studies in Economics, Rani Channamma University, Bhootaramanahatti, Belagavi, Karnataka State, India.

Email - vishu.k740@gmail.com, sabannatalwars@rediffmail.com

Abstract: *Irrigation is an important source of raising productivity in agricultural sector. Expansion of both groundwater and surface water resources has helped to increase the cultivated area under irrigation in the state over time. So land and water are the two most important natural resources in the development of agriculture. The success of the agriculture mainly depends on proper and scientific utilisation of these resources. Crop productivity can be best optimised on watershed basis when these resources interact in a synergetic manner. In this paper, we discuss the about river system in Karnataka, to know the utilization of water resources in North-Karnataka area and to analyses the area under different cropping pattern in North-Karnataka area. Study analysis based on secondary data.*

Key Words: *Water, Water resources, Cropping pattern and Irrigation.*

1. INTRODUCTION:

Water resources of a country constitute one of its vital assets. India with 2.4 per cent of the world's total area has 16 per cent of the world's population; but has only 4 per cent of the total available fresh water (Planning Commission, GOI, 2008). It has the largest irrigated area in the world, accounting for 22 per cent global irrigated area. Increasing population, growing urbanization, and rapid industrialization combined with the need for raising agricultural production generates competing claims for water. India is currently facing a daunting set of water-related challenges. Urban and industrial demand for water is going up rapidly, without commensurate augmentation of supply. There is a growing perception of a sense of an impending water crises in the country. The Standing Sub Committee Report (CWC 2000) estimated that the total demand for water by all sectors would surpass the total utilizable water resources by the year 2050, posing a big challenge to the country. The water challenges for the country and particularly for its states are manifold: a) improving and safeguarding existing drinking water supplies, b) managing water demand across competing sectors, and c) determining environmental requirements and prevention of pollutions (Raju, 2010). This clearly indicates the need for water resource development, conservation, and optimum use.

Irrigation constitutes the main use of water and its thus the focal issue in water resources development. About 83 per cent of the total fresh water available in the country is used for irrigation. Irrigation sector has been fundamental to India's economic development and poverty alleviation. In agriculture, irrigation water is always considered to be an engine of agricultural growth. Irrigation expansion has been one of the three input-related driving factors (the other two being seeds of modern HYVs and fertilizer) in the green Revolution process. Irrigation development increase the cropping intensity, alters the cropping pattern in favour of high value crops, encourages the adaption of technological inputs (HYV seeds, fertilisers, pesticides, etc) as well as machineries, all of which one way or the other help to augment the crop output. Besides providing direct benefits to the farming community, it also indirectly benefits the non-farming community substantially (Narayanamoorthy and Kalamkar, 2011). In this paper analyses the water resources and cropping pattern of North-Karnataka in Karnataka state.

2. KARNATAKA'S WATER SITUATION:

Karnataka's water resources are fast dwindling due to population explosion and increased utilization of water for the rapidly growing economic activities. Water demand on the one hand consumptive (drinking, health and sanitation needs) and productive uses (agriculture, industrial production, power generation, mining operations and navigation, and recreational activities) has increased tremendously, and on the other hand, water supply has declined with depletion and degradation of water resources causing water distress or scarcity in the state. Depletion of quantity and degradation of quality of water has restricted the availability of water for consumptive and productive uses and has consequently caused "negative externality" which impose economic and social cost on society. The declining trend in the economic contribution of water resources has occurred due to physical and economic water scarcity which results in insufficient use, poor management, declining water productivity, and increasing environmental and economic costs. Obviously, the outcome is growing imbalance between water needs and supply

augmentation capability of the state (Murgesha K.M. and Veerbhadrappa B.P. 2013). Irrigation has become an important aspect of agriculture. Recently irrigation becomes most essential and without it most crops cannot be grown. It becomes essential part due to variation of rainfall monsoon and uneven distribution of rainfall throughout year. Even those crops, which are grown during rainy season, also depend upon irrigation because farmers try to irrigate the crops in time so that crops might be ready in time and give higher yield. In case of failure of rainfall use of irrigation becomes much more essential areas growing multiple crops need intensive irrigation facilities. Although the modernization in the irrigation practices cannot abide the rainwater availability (Pandit. A et al., 2012).

Cropping systems of a region are decided by and large, by a number of soil and climatic parameters which determine overall agro-ecological setting for nourishment and appropriateness of a crop or set of crops for cultivation. Nevertheless, at farmers' level, potential productivity and monetary benefits act as guiding principles while opting for a particular crop/cropping system. These decisions with respect to choice of crops and cropping system are further narrowed down under influence of several other forces related to infrastructure facilities, socio-economic factors and technological developments, all operating interactively at micro-level.

These are:

Infrastructure facilities: Irrigation, transport, storage, trade and marketing, post-harvest handling and processing etc.

Socio-economic factors: Financial resources base, land ownership, size and type of land holding, household needs of food, fodder, fuel, fibre and finance, labour availability etc.

Technological factors: Improved varieties, cultural requirements, mechanization, plant protection, access to information, etc (Das. P).

3. OBJECTIVES:

1. To find out river systems in Karnataka
2. To know the utilization of water resources in North-Karnataka.
3. To analyses the area under different cropping pattern in North-Karnataka.

4. METHODOLOGY:

The secondary data have been collected from district at a glance report of Karnataka state, books, journals, magazines, publications research papers and reports.

5. RIVER SYSTEMS OF KARNATAKA:

There are seven river systems in Karnataka which with their tributaries, drain the state. The names of these river systems and area drained by them are given below Table 1. The river Krishna is an Inter-State river in Southern India. It is the second largest river in Peninsular India, rises in the Western Ghats at an Altitude of 1337m, near Mahabaleshwar in Maharashtra State. It flows across the whole width of the peninsula, from west to east, for a length of about 1400 km, through Maharashtra, Karnataka and Andhra Pradesh. Karnataka state primarily enjoys a tropical climate that is largely dependent on its physic-graphic and geographic location with respect to the Arabian Sea and the monsoons. The state receives the benefit of two monsoons: the North-East monsoon and South-West monsoon. Karnataka receives mean annual rainfall of around 1.335 milimeters. More than 73 per cent of this rainfall is received due to the South-West monsoon.

Table No.1 River Systems of Karnataka

Sl. No.	River System	Drainage area	
		1000 Sq,km	Percentage
1	Godavari	4.41	2.31
2	Krishna	113.29	59.48
3	Cauvery	34.27	17.99
4	North Pennar	6.94	3.64
5	South Pennar	4.94	2.29
6	Palar	2.97	1.56
7	West Flowing Rivers	24.25	12.73
	Total	190.50	100

Source: Department of Water Resources, Karnataka.

Karnataka has groundwater resources estimated to be around 485 TMC. Ground water resources have not been exploited evenly across the state. In areas where adequate surface water is available, exploitation of ground water resources is minimum. Exploitation of ground water in the dry taluks of North-Karnataka is higher as compared to Costal, Malnad and Irrigation command areas of the Karnataka state. The entire catchment area of Krishna basin is 2, 58,948 sq km. it is the North-Karnataka main important river system and Krishna river system have four principal tributaries Ghataprbha, Malaprabha, Bhima and Tungabhadra and these tributaries have some sub-tributaries (Table-

2). North-Karnataka agriculture depends on this Krishna river of Principal tributaries and sub-tributaries. However, rainfall is playing very important role in North-Karnataka to irrigate the land. All tributaries become dry due to poor rainfall in the region.

Table No: 2 Principal Tributaries of Krishna River

Sl.No.	Name of the tributary	Catchment area in Sq.kms	Origin, Altitude & Length	Su-Tributaries	Name of the States
1	Ghataprabha	8829	Western ghats, 884m, 283 Kms	Hiranyakeshi, Markandeya	Maharashtra, Karnataka
2	Malaprabha	11549	Western ghats, 792.48m, 306 kms	Bennihalla, Hirechalla, Tas nadi	Karnataka
3	Bhima	70,614	Western ghats, 945m, 861kms	Combined waters of Mula & Mutha Ghod, Nira, Sina	Maharashtra, Karnataka
4	Tungabhadra	47,866	Western ghats at Ganagamula, 1198m, 531 kms	Combined waters of Tunga & Bhadra, Varada, Hagari(Vedavathy)	Karnataka & Andhra Pradesh

Source: Department of Water Resources, Karnataka.

6. IRRIGATED AREA VARIOUS WATER RESOURCES:

India is not a water poor country, due to growing human population, severe neglect and over-exploitation of this resource, water is becoming a scarce commodity. India is more vulnerable because of the growing population and in-disciplined lifestyle. This calls for immediate attention by the stakeholders to make sustainable use of the available water resources. 70% of the earth surface is covered with water, which amounts to 1400 million cubic kilometers ($m\ km^3$). However, 97.5% of this water being sea water, it is salty. Fresh water availability is only $35\ m\ km^3$ and only 40% of this can be used by human beings. Out of the total fresh water, 68.7% is frozen in ice caps, 30% is stored underground and only 0.3% water is available on the surface of the earth. Out of the surface water, 87% is stored in lakes, 11% in swamp and 2% in rivers. Long before, when the population was low and lifestyle was simple, water was available in plenty and was considered as a free resource. However, with growing demand for water and depletion of the available water, assured supply of good quality water is becoming a growing concern. As the water resources are not evenly distributed, across different continents, some countries have surplus water while many other countries are already facing scarcity of water (Hegde Narayan G.). In this background Table 3 presents the information about Gross and Net Irrigated area in North-Karnataka region during 2012-13.

Table No: 3 Gross and Net area Irrigated under Various Water Resources: 2012-13

Gross and Net area Irrigated under Different Water Sources (in Hectares)						
Sources	Length in Kms		Gross Irrigated Area		Net Irrigated Area	
	Area (Hectares)	Area (%)	Area (Hectares)	Area (%)	Area (Hectares)	Area (%)
Canals	2317	0.47	901090	35.83	753464	35.28
Tanks	8091	1.68	22608	0.89	21623	1.01
Wells	198477	40.87	358939	14.27	315464	14.77
Tube wells	251033	51.69	843542	33.54	695853	32.60
Lift Irrigation	25695	5.26	89997	3.59	80338	3.77
Other sources	-----	-----	298482	11.88	268563	12.57
Total	485613	100.00	2514657	100.00	2135305	100.00

Source: Karnataka at A Glance 2012-13, DES Bangalore

Of the total irrigated area, Canals share constitute 35.28 percent followed by Tube wells (32.60 percent) and Wells (14.77). This shows that most of sources of Irrigation in North-Karnataka depends on rainfall and are able to irrigate one crop in a year.

7. CROPPING PATTERN:

Farmers need a genetically diverse portfolio of improved crop seeds varieties suited to a range of agro-ecosystems, farming practices, to improve their resilience to climatic change. Crop improvement and seed improvement are like two wheels of the same cart, having to co-exist with uninterrupted complimentary, playing

supplementary roles and having to move with the same force and speed (Pattanaik, 2013). However, timely delivery to farmers of the seed of high-yielding varieties (HYVs) or hybrids requires big improvements in the system that connects plant germplasm collections, plant breeding and seed production and delivery (Ghosh, 2013). Regarding this Table 4 indicates information about cropping pattern in North-Karnataka during 2012-13. Data on area under cereals shows that Jowar (39.30 percent) is the predominant crop followed by Maize (23.10 percent) and Paddy (20.85 percent). On the other hand, Tur (34.00) is important crop among pulses grown in North-Karnataka region. Against this, Sun-flower (42.04 percent) and Ground nut (33.87 percent) are the important oil seeds grown. Therefore, North-Karnataka have good water resources but farmers are still followed traditional irrigation system water used inefficiency, so in summer season farmer they have to grown pulses, cereals and oil seeds. For this, lack knowledge is reduced farmers efficiency to grow cash crops in yearly. Commercial crops also grow by farmers in North-Karnataka it's in very percentages of farmers in the study area.

Table No: 4 Total Area Covered Under Different Cropping Pattern in North-Karnataka (In Hectares): 2012-13

Area under principal crops (in Hect)											
Area under Cereals			Area under Pulses			Area Under Important Oil Seeds			Area Under Commercial Crops		
Crops	Area in Hectares	Area (%)	Crops	Area in Hectares	Area (%)	Crops	Area in Hectares	Area (%)	Crops	Area in Hectares	Area (%)
Paddy	625322	20.85	Tur	608978	34.00	Ground Nut	345095	33.87	Cotton	407884	41.79
Jowar	1178468	39.30	Horse Gram	28689	1.61	Sun Flower	428346	42.04	Sugar cane	552305	56.59
Bajra	271604	9.06	Black Gram	79205	4.44	Safflower	48033	4.75	Tobaco	15718	1.61
Maize	692936	23.10	Green Gram	126481	7.10	Caster	1763	0.17	-----	-----	-----
Ragi	5467	0.19	Avare	2562	0.34	Sesamum	14637	1.43	-	-----	-----
Wheat	224753	7.49	Cowpea	10738	0.63	Niger Seed	4449	0.43	-----	-----	-----
Other cereals & Millet	336	0.01	Brngal Gram	924144	51.89	Soyabean	169564	16.64	-----	-----	-----
-----	-----	-----	-----	-----	-----	Linsed	6857	0.67	-----	-----	-----
Total	2998886	100.00	Total	1780797	100.00	Total	1018744	100.00	Total	975907	100.00

Source: Karnataka at A Glance 2012-13, DES Bangalore.

However, Sugarcane (56.59 percent) and Cotton (41.79 percent) are Commercial crops grown in irrigated and drought-prone areas, respectively. This shows that North-Karnataka region is dominated by cereals, pulses and oil seeds which are generally grown in drought prone areas.

8. CONCLUSION:

This study highlights that through Krishna basin is spread in most part of the North-Karnataka region, but irrigation point of view the region is lagging behind. Further, because of scarcity of water, staple crops like cereals, pulses and oil seeds are grown in North-Karnataka indicating the dependence of cropping pattern of North-Karnataka on rainfall. This shows the need for policy measures to utilize available water resources and diversification of cropping pattern in the region.

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