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IMPACT OF IRRIGATION ON CROPPING PATTERN AND AGRICULTURAL PRODUCTION IN TELANGANA STATE.

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Abstract:

Cropping pattern simply means the proportion of area under different crops at a point of time, whereas change in cropping pattern refers to change in proportion of area under different crops at two different points of time. This Paper focuses on research concepts and methods that are relevant to study on **"Impact of Irrigation on Cropping Pattern and Agricultural Production in Telangana State."** To study the impact of irrigation on cropping pattern and agricultural production in the study area descriptive statistics was employed to describe the impact of irrigation in cropping pattern which includes, mean, standard deviation, CV: Coefficient of variation and CAGR: Compound Annual Growth Rate. For this, various research methodological concerns has been dealt in order to identify a research method that is most appropriate for the study. In order to do this, a distinction is made, research paradigms coupled with discussion on data collecting instruments. Increasing the agricultural production and raising the productivity of land, are among the central aims of the plan. Due to various development plans implemented by the government, tremendous changes have taken place in the village economy. Agriculture is slowly becoming a commercial profession rather than a way of life for agriculturalists. India has a diverse cropping pattern with considerable variation from region to region. The existing cropping pattern of the region is often the result of a number of ecological adjustments. In this paper an attempt has been made to examine the impact of irrigation on area, production and agricultural yield. It is interesting to know the general areas where differentcrops dominate and their contribution in agricultural yield for the purpose of important crops (Paddy, Maize, Jowar, Bajra, Green Gram, Red Gram, Bengalgram, Groundnut, Cotton, Soyabean) have been considered. In order to analyse the trend,the impact of irrigation on area under cultivation, production and productivity in the sample area of Telangana has been evaluated.

Key words: Irrigation, Cropping Pattern, Agricultural Production and Major Important Crops.

Introduction:

Water is needed in almost every sphere of human activity. Irrigation through major and medium canal systems was a key component of green revolution that transformed India and made the specter of famines in India history. Irrigated agriculture is thus responsible for the rapid improvement in the agriculture productivity in the 1960's, 70s, and 80's. There is a marked difference in the levels of contribution from agriculture in the rain-fed and the irrigated areas.

The cropping pattern differs from macro to micro region, both in space and time, governed largely by physical and non-physical factors. The term cropping pattern should not be confused with cropping systems. The cropping pattern includes yearly sequence and spatial arrangements of crops and fallow lands on a given area, while the cropping system takes into account the interaction of farmland with farm resources and management, other farm enterprises and available technology which determine their make-up (Sidhu and Sankhayan, 1973).

The cropping pattern of a particular area emerges through the interaction of physical, social, economic, technological and infrastructural factors. The impact of each of these factors would differ depending upon prevailing situation of a region. The farmer's behaviour also determines the cropping pattern which decides types of crops to be grown. The farmer would like to choose that crop or crop combination which will be best suited for his field under the given conditions of temperature and moisture. Except the physical factors which take comparatively longer time to change, availability of irrigation facilities change cropping pattern very rapidly.

Impact of Irrigation on Cropping Pattern

Irrigation plays a very vital role in increasing agricultural production and changes in cropping pattern of any area. Cropping pattern in a particular agricultural area is generally the outcome of trials and adjustments made by farm enterprises and various farming practices. The Indian farmer is used to practice traditional agriculture and this means it could take a while to adjust to the new resources and products of the changing agricultural economy. More innovations are now available to Indian agriculture in the form of improved seeds, fertilizers, enhanced irrigation facilities, etc. However, there seems to be time lag in adaptation of improved agricultural practices and the use of science and technology because a large mass of farmers are yet to turn away from experience and traditions. As a result existing, cropping patterns in many parts of the country are outdated and need to be rationalized.

Cropping pattern indicates the extent to which the usable land under different agricultural activities can be put to use. This largely depends upon the socio-economic influences, which determine the possibilities of the enterprise. Moreover, social and cultural values strongly influence the cropping pattern especially in countries where agriculture is a way of life. The farming communities have developed their own rights and traditions, which affect the growing of crops. These crops are not always grown where they are not best adapted to nor are they grown in the most economical way. Ownership of land, which undergoes multiple changes, is also a limiting variable in the rational distribution and development of crops. The recognition of crop combination that can be grown in a region is fundamental in deciding the agricultural system of an area. The spatial distribution of crops tends to reflect the physical, cultural and environmental variables of an area. “The crops are generally grown in combination and it is rare that a particular crop occupies a portion of a total isolations from other crops in a given area unit of a given point of time”. Similarly, the absence of crops from a combination does not mean that it is not grown in that district but merely that crop is not important enough to include in the combination. For a comprehensive and better understanding of the agricultural mosaic, the study of crop combination is of great importance. Such combination is essential and they must be made available if one wishes to build the still more complex structure of agricultural region.

Importance of Irrigation in the Development of Agriculture

Large scale agriculture was practiced and an extensive network of canal was used for the purpose of irrigation. After Independence (1951) total 22.56 million hectares land was irrigated and it become to 64.7 million hectares in 2016 from 160 million hectares arable land. 54% land is irrigated by irrigated by surface water and remaining from ground water (Yojna, July, 2016). Irrigation potential is high in India but we can utilize only 64% of it. At present only 40% land is dependent on monsoonal rainfall. The crops production is not increased enough due to uncertainty of rainfall. Another reason for low agricultural productivity is illiteracy of farmers or lack of knowledge. They do not know about the requirement of water of a particular crop because the requirement of water is different in different crops.

Objectives of the Study

1. To study the impact of irrigation on cropping pattern
2. To study the impact of irrigation on agricultural production.

Hypothesis of the Study

1. There is no significant impact of irrigation on cropping pattern.
2. There is no significant impact of irrigation on agricultural production

Methodology of the Study

The adoption of appropriate methodology in any investigation is essential for achieving meaningful results. The sample design, the data base and the analytical frame work of the study are presented below:

Sources of Data

For the purpose of analysis, both secondary and primary data have been used. The secondary sources have been basically the books published by various institutions and academicians, Journal articles, various reports of the government, semi government agencies, private institutions, etc. In addition to these the statistical data has been collected from the Telangana at a Glance, Telangana socio economic outlook, Economic Surveys and Statistical Abstracts - these documents have been published by both the state and central governments through their Bureau of Economics and Statistics. In addition to these, the Central Statistical Reports of the Government of India have also been considered. The primary data has been collected basically from the households who are residing in the respective study areas.

Period of the study

The purpose of the present study, with regard to secondary sources, the data have been collected for 7 years period indicating the time frame from 2014-2015 to 2020-21, and Primary data collected for the 2021-22.The primary data has been collected basically from the three districts viz., Medak , Nizamabad and Mahabubnagar districts where the Irrigation projects have implemented. In these three districts six mandals and twelve villages and from these twelve villages 360 respondents of various categories have been interviewed.

Sampling technique

Sample respondents have been selected by using multistage random sampling method through pre-designed schedule among the farmers. At the first stage, three districts i.e Medak , Nizamabad and Mahabubnagar districts; at the second stage six Mandals from three districts; at the third stage two villages from each Mandal; and at the fourth stage 30 farmers from each village have been taken into consideration. Total 360 farmers have been selected randomly.

Tools and Techniques of Analysis

To study the impact of irrigation on cropping pattern and agricultural production in the study area descriptive statistics was employed to describe the impact of irrigation in cropping pattern which includes, mean, standard deviation, CV: Coefficient of variation and CAGR: Compound Annual Growth Rate.

Analysis and interpretation of data

Table 1A: Gross Sown Area Under Crops% in VanakaalamBetween 2014-15 to 2020-21

Year	Paddy	Cotton	Maize	Redgram	Soyabean	Total share of crops (%)
2014-15	22.0	40.6	12.5	5.3	5.8	86.2
2015-16	18.3	43.4	11.1	6.1	5.9	84.8
2016-17	20.3	32.1	14.5	8.8	6.3	82.1
2017-18	23.2	42.0	10.3	7.3	3.4	86.1
2018-19	26.4	40.9	9.5	6.6	3.3	86.7
2019-20	31.2	40.7	7.5	5.6	3.3	88.3
2020-21	37.1	41.2	1.5	7.5	2.8	90.1
Mean	25.5	40.12	9.55	6.74	4.4	86.32
SD	6.63	3.67	4.18	1.22	1.51	2.53
CV	0.26	0.09	0.43	0.18	0.34	0.02
CAGR	7.75	0.21	-26.13	4.93	-9.43	0.65

Source: Researcher estimated is based on Directorate of Economics and Statistics, Govt. of Telangana, Telangana atlas, Telangana socio economic outlook and Telangana at glance 2022.

Table 1B: Gross Sown Area Under Crops% in Yasangi Between 2014-15 to 2020-21

Year	Paddy	Maize	Groundnut	Bengalgram	Sesamum	Total share of crops (%)
2014-15	43.4	14.9	12.5	5.2	1.6	77.6
2015-16	36.9	14.7	14.2	8.7	1.2	75.7
2016-17	59.2	10.4	8.9	6.4	1.1	86.0
2017-18	59.4	10.9	9.5	6.3	1.3	87.0
2018-19	58.3	9.2	8.9	8.2	1.0	85.8
2019-20	70.4	11.2	4.4	5.8	0.9	92.7
2020-21	76.0	6.3	4.1	5.2	0.8	92.3
Mean	57.65	11.9	9.0	6.6	1.2	85.3
SD	13.8	3.01	3.75	1.4	0.26	6.6
CV	0.23	0.25	0.41	0.21	0.21	0.07
CAGR	8.48	-12.27	-14.52	0.00	-8.23	2.58

Source: Researcher estimated is based on Directorate of Economics and Statistics, Govt. of Telangana, Telangana atlas, Telangana socio economic outlook and Telangana at glance 2022.

As a result of, the overall cropping area and irrigated area have increased significantly, the Gross Sown Area (GSA) has significantly increased from 131 lakh acres in 2014-15 to 210 lakh acres in 2020-21. During this period, more than 79 lakh acres were brought under cultivation. This increase can be attributed to the sustained investment in irrigation projects and paddy procurement by the Government, which has made it possible for farmers to cultivate paddy in both seasons of the year. Paddy, Cotton, Maize and Red Gram are the major crops grown in Telangana. Cumulatively, the area under these crops constitutes nearly 85% of the total area under cultivation. Currently, cultivated area under Paddy (50%) and Cotton (28%) constitutes 78% of the total. In 2014-15, total area cultivated under Paddy was around 35 lakh acres and by the end of 2020-21, it increased nearly 197% to 104 lakh acres. The total area under cotton cultivation increased by 38% from 42 lakh acres to 58 lakh acres

There was a significant decline in the coverage of Maize from 12.5% of overall gross area sown in Vanakalam 2014-15 to 1.5% of the gross area sown in 2020-21 Vanakalam. The coverage of Red gram and Soyabean did not vary significantly in this time span. Table depicts the trends in % area coverage of the top 5 crops out of gross sown area in Vanakalam between 2014-15 and 2020-21. Fig 4.7B reflects the year-on-year percentage of area for the top 5 crops out of gross sown area in Yasangi season.

While the % sown area for the top-ranking crop paddy-increased from 43.42% in Yasangi 2014-15, to 76.0% in Yasangi 2020-21, the percentage sown area for all the other 4 crops declined between 2018- 19 and 2020-21. The most drastic decrease in sown area was for groundnut, where the percentage sown area declined from 12.5% 2014-15 to 4.1% in 2020- 21. It is pertinent to note that area % under top 5 crops out of sown area in Yasangi has increased from 77.6% in 2014-15 to 92.3% in 2020-21.

Table 2: Mandal wise Total Cultivated land, yield and production

Sample Area		Total Sample House Holds	Total Cultivabl eLand Area (in Acres)	%	Average Yield(kgs/ Acre)	Total Production (in quintals)	%
High Irrigated Area	Ramayampet	60	458	30.41	2154	9865	27.9
	Bodhan	60	682	45.28	2658	18127	51.4
	Devarkadra	60	366	24.30	1986	7268	20.61
	Sub-total	**180**	**1506**	**100**	**2266**	**35260**	**100**
Low Irrigated Area	**Tekmal**	60	426	34.63	1838	7829	35.87
	Balkonda	60	398	32.35	1732	6893	31.6
	Koilkonda	60	406	33.01	1749	7100	32.53
	Sub-total	**180**	**1230**	**100**	**1773**	**21822**	**100**
	Total	**360**	**2736**	**100**	**2019**	**57082**	**100**

Source: Primary data

Table 2 shows mandal wise total cultivated area, production and productivity for all crops in the sample area of Telangana. The study found that total cultivated area is 1506 acres, total production is 35260 quintals and the average Yield is 2266 kgs per acre in highly irrigated area. Similarly, the area under cultivation, total production and average Yield are 1230 acres, 21822 quintals and 1773 kg per acre respectively in low irrigated area. The data reveals that there is a direct relationship between total cultivated area and average productivity in both high and low irrigated areas. Interestingly, the average productivity in highly irrigated area is 2266 kgs per acre which is significantly higher than the average productivity in the low irrigated area. Hence, one can observe the importance of irrigation in the area under cultivation, production and average yield per acre in the sample area.

Table 3: Mandal wise Paddy Total cultivated Area, Yield and Production

Sample Area		Total Cultivable Land Area (in acres)	%	Average Yield(kgs/ Acre)	Total Production (in quintals)	%
High Irrigated Area	Ramayampet	251	32.51	2016	5060	31.20
	Bodhan	421	54.53	2258	9506	58.62
	Devarkadra	100	12.95	1649	1649	10.16
	Sub-total	**772**	**100**	**1974**	**16215**	**100**
Low Irrigated Area	Tekmal	212	39.55	1731	3669	41.44
	Balkonda	228	42.53	1597	3641	41.12
	Koilkonda	96	17.91	1608	1543	17.42
	Sub-total	**536**	**100**	**1645**	**8853**	**100**
	Total	**1308**	**100**	**1809**	**25068**	**100**

Source: Primary data.

Table 3 shows the total cultivated area, production and average yield for paddy sample area of Telangana State. The study found that total paddy cultivated area is 772 acres, total production is 16215 quintals, average Yield is1974 kgs per acre in a highly irrigated area. Similarly, the paddy area under cultivation, total production and average yield are 536 acre, 8853 quintals, and 1645 kgs per acre respectively in low irrigated area. The data reveals that there is a direct relationship between total paddy cultivated area and average productivity in both high and low irrigated areas. Interestingly the average yield in highly irrigated area is 1974 kgs per acre which is significantly higher than the average productivity in the low irrigated area. Hence, one can observe the importance of irrigation in areaunder cultivation, production and average yield per acre in the sample area. The data presented in table 5.12 indicates that the total paddy cultivated area by all Mandals together is 1308 acres, total production is 25068 quintals and average yield 1809 kgs per acre.

Table 4: Mandal wise Maize Total cultivated area, Yield and Production

Sample Area		Total Cultivable Land Area	%	Average Yield (kgs/ Acre)	Total Production (in quintals)	%
High Irrigated Area	Ramayampet	48	37.5	1425	684	35.27
	Bodhan	32	25	2385	763	39.35
	Devarkadra	48	37.5	1026	492	25.37
	Sub-total	**128**	**100**	**1612**	**1939**	**100**
Low Irrigated Area	Tekmal	48	34.78	1275	612	39.94
	Balkonda	26	18.84	1128	293	19.12
	Koilkonda	64	46.37	981	627	40.92
	Sub-total	**138**	**100**	**1128**	**1532**	**100**
	Total	**226**	**100**	**1370**	**3471**	**100**

Source: Primary data.

Table 4 shows Mandal wise total cultivated area, production and productivity Maize for in the sample area of Telangana. The study found that total cultivated area is 128 acres, total production is 1939 quintals and the average yield is 1612 kgs per acre in highly irrigated area. Similarly, the area under cultivation, total production and average yield are 138 acres, 1352 quintals and 1128 kg per acre respectively in low irrigated area.

The data reveals that there is a direct relationship between total cultivated area and average productivity in both high and low irrigated areas. Interestingly, the average yield in highly irrigated area is1612 kgs per acre which is significantly higher than the average yield in the low irrigated area. Hence, one can observe the importance of irrigation in area under cultivation, production and average yield per acre in the sample area.

Table 5: Mandal wise Cotton Total cultivated area, Yield and Production

Sample Area		Total Cultivable Land Area	%	Average Yield(kgs/ Acre)	Total Production (inquintals)	%
High Irrigated Area	Ramayampet	75	39.68	512	384	37.9
	Bodhan	26	13.75	524	136	13.45
	Devarkadra	88	46.56	558	491	48.56
	Sub-total	**189**	**100**	**538**	**1011**	**100**
Low Irrigated Area	Tekmal	68	41.46	498	338	40.52
	Balkonda	12	7.3	493	59	7.07
	Koilkonda	84	51.21	521	437	52.39
	Sub-total	**164**	**100**	**504**	**834**	**100**
	Total	**353**	**100**	**521**	**1845**	**100**

Source: Primary data.

Table 5 shows total irrigated area, total production and average yield for Cotton under high irrigated area of Mandals and low irrigated area of Mandals. The study found that high irrigated area of the total cotton cultivated area is 189 acres, total production is 1011 quintals, and yield was 538 kgs per acres. Similarly, the area under cultivation, total production and average yield are 164 acres, 834 quintals and 504 kg per acres respectively in low irrigated area. The average yield is high in high irrigated area of Mandal as compared to Low irrigated area of the Mandals. The data presented in table 5.14 indicates that the total cultivated area by all farmers together is 353 acres, total production is 1845 quintals and yield is 521 kgs per acre.

Table 6: Mandal wise Red gram total cultivated area, Yield and Production

Sample Area		Total CultivableLand Area	%	Average Yield(kgs/ Acre)	Total Production (in quintals)	%
High Irrigated Area	Ramayampet	60	51.28	216	129	50
	Bodhan	12	10.25	296	36	13.95
	Devarkadra	45	38.46	208	93	36.04
	Sub-total	**117**	**100**	**240**	**258**	**100**
Low Irrigated Area	Tekmal	54	49.09	205	110	47.21
	Balkonda	18	16.36	263	47	20.17
	Koilkonda	38	34.54	201	76	32.61
	Sub-total	**110**	**100**	**223**	**233**	**100**
	Total	**286**	**100**	**231**	**491**	**100**

Source: Primary data.

Table 6 shows total cultivated area, total Yield and Production for red gram under high irrigated area of Mandals and low irrigated area of Mandals. The study found that high irrigated area of total red gram cultivated area is 117 acres, total production 258 quintals, average yield is 240 kgs per acre. Similarly, the area under cultivation, total production and average yield are 110 acres, 233 quintals and 223 kg per acre respectively in low irrigated area. The yield is more in high irrigated area of Mandals as compared to low irrigated area of Mandals. The data presented in table 5.15 indicates that the total cultivated area by all Mandals together is 227 acres, total production is 491 quintals and average yield is 231 kgs peracre, there is impact of irrigation on agriculture productivity.

Table 7: Mandal wise, Bengal gram total cultivated area, yield and production

Sample Area		Total Cultivabl eLand Area	%	Average Yield(kgs/ Acre)	Total Production (in quintals)	%
High Irrigated Area	Ramayampet	18	12.67	471	84	10.7
	Bodhan	116	81.69	568	658	83.8
	Devarkadra	08	5.63	546	43	5.47
	Sub-total	**142**	**100**	**528**	**785**	**100**
Low Irrigated Area	Tekmal	22	22.22	461	101	20.44
	Balkonda	65	65.65	511	332	67.20
	Koilkonda	12	12.12	514	61	12.34
	Sub-total	**99**	**100**	**517**	**494**	**100**
	Total	**241**	**100**	**495**	**1279**	**100**

Source: Primary data.

Table 7 shows total cultivated area, production and average productivity for Bengal gram under high irrigated area and low irrigated area. The study found that total Bengal gram high irrigated area is 142 acres, total production is 785 quintals and average productivity is 528 kgs per acre. Similarly, the area under cultivation, total production and average yield are 99 acres,494 quintals and 517 kg per acre respectively in low irrigated area. The high irrigated area and total production, productivity is more in high irrigated Mandals as compared to low irrigated Mandals, the data presented in table 5.16 indicates that the total cultivated area by all Mandals together is 241 acres, total production is 1279 quintals and average yield is 495 kgs per acre there is impact of irrigation on crop yield.

Table 8: Mandal wise, Groundnut total cultivated area, yield and production

Sample Area		Total Cultivabl eLand Area	%	Average Yield(kg s/ Acre)	Total Production (in quintals)	%
High Irrigated Area	Ramayampet	16	11.59	895	143	9.51
	Bodhan	15	10.86	898	134	8.91
	Devarkadra	107	77.53	1146	1226	81.30
	Sub-total	**138**	**100**	**979**	**1503**	**100**
Low Irrigated Area	Tekmal	6	5.76	872	52	5.04
	Balkonda	4	3.84	853	34	3.29
	Koilkonda	94	90.38	1006	945	91.65
	Sub-total	**104**	**100**	**910**	**1031**	**100**
	Total	**242**	**100**	**944**	**2534**	**100**

Source: Primary data.

Table 8 shows total cultivated area, production and average yield for Groundnut under high irrigated area and low irrigated area. The study found that total Groundnut high irrigated area is 138 acres, total production is 1503 quintals and average yield is 979 kgs per acre. Similarly, the area under cultivation, total production and average yield are 104 acres, 1031 quintals and 910 kg per acre respectively in low irrigated area. The high irrigated area and total production, productivity is more in high irrigated Mandals as compared to low irrigated Mandals, the data presented in table 5.17 indicates that the total cultivated area by all Mandals together is 242 acres, total production is 2534 quintals and average productivity is 944 kgs per acre there is impact of irrigation on crop productivity.

Conclusions:

The Gross Sown Area (GSA) in Telangana has increased significantly from 131 lakh acres in 2014-15 to 210 lakh acres in 2020-21, with over 79 lakh acres under cultivation. The major crops grown in Telangana are Paddy, Cotton, Maize, and Red Gram, which constitute nearly 85% of the total area under cultivation. However, maize coverage has declined from 12.5% to 1.5%, while Red Gram and Soyabean coverage remains consistent. The percentage sown area for the top-ranking crop, paddy, increased from 43.42% in 2014-15 to 76.0% in 2020-21, while the percentage sown area for all other crops declined between 2018-19 and 2020-21.

Compares cropping area, yield, and production in Telangana State and the study area from 2014-15 to 2020-21. The cultivation area of paddy shows an increase from 2014-15 to 2020-21, with higher annual compound growth rate in the study area. However, the study area experiences more fluctuation or variability in paddy crop areas, leading to more farmers relying on traditional crops. Paddy production and productivity also show increasing trends in the study area, with higher average productivity and compound annual growth rate. However, the study area has less variability.

The study reveals that high irrigated areas yield more groundnut, with a total cultivated area of 138 acres, total production of 1503 quintals, and average yield of 979 kgs per acre. In contrast, low irrigated areas yield less, with a total cultivated area of 242 acres and 2534 quintals.

Suggestions

The following suggestions are made for a better trickledown effects of benefits attributable to agriculture growth and development in the study area include

1. Location specific agriculture development function should be specified so as to enhance the one to one correspondence between the needs and expectations of the local people and also to augment factor productivity.

2. Skill development of the farmers should be accorded top priority among the inputs of agricultural development of farmers.

3. Crop diversification should be increased to reach both semi urban and urban markets.
4. Rythubandhu scheme must be properly utilized by the farmers which ensure their financial inclusion.

Areas of Further Research

In order to strengthen research and development in this arena, the following topics are useful and they include

1. This study focused only on the socio-economic conditions of the farmers, cropping patterns, agriculture production, and livelihood of the farmers, so future research could also consider factors such as water quality, soil health, and climate change impacts on water availability.
2. This study is limited to only 360 farmers from three districts in Telangana, so further research is needed to ensure the findings are representative of the entire farming population in the region. Additionally, expanding the sample size and including farmers from a wider geographical area could provide more comprehensive insights into agricultural practices and challenges in Telangana.
3. Furthermore, incorporating feedback from local farmers and water resource experts could offer additional perspectives on the challenges and opportunities associated with irrigation projects in the region
4. The study was done across the Telangana State. A similar study could be undertaken in other states using the same or different parameters
5. Case studies of farmer specific costs and returns in agriculture

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