

# GOVERNMENT AND ITS ROLE IN SUSTAINABILITY OF IRRIGATION IN INDIAN AGRICULTURE

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**Abstract:** India has population as much as 15 per cent of the world's population but has only about 4 per cent of the world's fresh water resources. Much of these are unevenly distributed. Being an agriculture dependent country, irrigation is the backbone of India. India's irrigation covered crop area was increased to a potential of 90 m ha at the end of 1995 and according to recent estimation the total net sown area is 185 million hectares. At present about 172 million hectares are under cultivation. Sixty percent of India's vast population depends upon agriculture directly for their living, and therefore agriculture has always been and promises to remain the main industry of India in foreseeable future also. India has large water resources, great rivers systems and vast thirsty tracts of land. So, its inadequate supply of water for irrigation has been the severe problem for the most of the farmers in the country. In most parts of the country, supply of water for crop cultivation has become a constant concern as the canal irrigation is unequally distributed across. Creation of irrigation infrastructure has been the central in strategies for agricultural development for the State and Central Governments for the past six decades. However, the present study focused mainly on the role of government in the creation of irrigation infrastructure and the area covered under the irrigation as well as total agricultural production in India.

**IndexTerms - irrigation,potential,farmers,government.**

## I. INTRODUCTION

In India the irrigated area consists of about 36 per cent of the net sown area. Presently, the agriculture sector accounts for about 83 per cent of all water uses. There are various types of irrigation practices in different parts of India. Various types of irrigation techniques differ in how the water obtained from the source is distributed within the field. In general, the goal is to supply the entire field uniformly with water, so that each plant has the amount of water it needs, neither too much nor too little. Irrigation in India is carried on through wells, tanks, canals, perennial canal, multi-purpose river valley projects, etc.,. These sources of water have been using to create a potentiality of foodgrain production in India. Therefore the government plays an important role in providing irrigation facilities in order to sustain the agriculture sector and its production for long time. Along with this the government spending lots of money on agriculture to provide various input facilities at subsidized prices to the farmers and create the sustainability in agriculture sector. The irrigation is one of the major inputs to agriculture which needs the support of government in the way of sustaining agriculture sector through providing it.

## II. REVIEWS OF LITERATURE

Since the major emphasis of the present study is to analyse the behaviour of agriculture through government spending on irrigation at macro-level, therefore, the studies that examined the behaviour and determinants of government spending in irrigation and its impact on agricultural growth and development in the country, have been reviewed and presented in the following:

The brunt of a cut down in public expenditure following the economic reforms from 1991 was largely borne by the agriculture, irrigation and rural development sectors. This relative 'neglect of agriculture' in India's fiscal policy slowed down the increasing trend in area irrigated by public canals (Gulati and Bathla 2002; Chandrasekhar and Ghosh 2002). The net area irrigated by private sources of irrigation did not increase significantly. A near stagnancy in irrigation intensity coupled with recurrent droughts and high cost of inputs led to a situation of agrarian distress (Haque 2016). To arrest the situation, almost all the states in the country increased budgetary outlays towards agriculture from early 2000s along with the drought relief measures and rural employment generation programmes. Hike in minimum support price of key crops and an increased flow of institutional credit were other policy measures, primarily taken to incentivize farmers (Chand and Parappurathu 2012). A high public expenditure priority enabled public capital formation in agriculture and input subsidies to grow at an annual rate of 6% during 2000–2013. It also led to a much higher rate of growth in private investment in agriculture at almost 9% per annum in real terms (at 2004–05 prices). The irrigation intensity rose from 30 to about 50%, and agriculture was able to attain an all time high growth at 3.8% annually during this period. The most striking feature was a phenomenal rate of growth of agriculture in many laggard states between 5 and 8%.

While the significance of public investments cannot be undermined, input subsidies are widely used to support agricultural production all over the world. Empirical evidence on the issue of allocation of public resources towards farm investments vs. subsidies is somewhat mixed. For example, in the Indonesian case, Armas et al. (2012) found a positive impact of

public spending on agriculture and irrigation, while spending on fertilizer subsidies had an opposite effect on growth during the period 1976–2006. In India, recognizing the imbalance between subsidies and public agricultural expenditure, several studies posit that this phenomenal increase in subsidies has adversely affected public investment in agriculture and hence should be streamlined<sup>2</sup> (Gulati and Narayanan 2003; Moguees et al. 2012).

Furthermore, the input subsidies which were considered crucial at the initial stage of Green Revolution in the 1960s and 1970s in adoption of new technologies in India showed diminishing marginal returns during the eighties and up to mid-nineties (Fan et al. 2008). The analysis for the recent period carried out by Bathla et al. (2017) from 1981–2013, however, finds fertilizer subsidy, which seems to have again assumed importance although higher marginal returns continue to be from investments in agricultural R&D, education, health, and energy.

Number of studies reviewed and brought out some potential results and interrelated issues pertaining to the government spending on irrigation facility in agriculture sector, while few studies focused the national level but not in detailed study on this concept, certain studies dealt with state level and some of them are related to particularly specified areas of agriculture and allied sectors. On the basis of these reviews, following objectives will be fulfilled the research gap.

### III. OBJECTIVES OF THE STUDY

- To study the trend of government spending on irrigation during planning period in Indian agriculture sector
- To the state-wise allotment of fund for the irrigation purpose in agriculture sector in India
- To analyse the net area irrigated by sources due to the government spending

### IV. HYPOTHESES OF THE STUDY

- Government spending on irrigation has a positive impact on agricultural production during planning period in India.
- There is a significant increase in the net area irrigated by sources due to the government spending in India

### V. METHODOLOGY AND DATA BASE

The data for the study has been collected from only secondary sources to reveal the research paper. Content Analysis Method, which is commonly known as the review of the previous literature, has been followed in the preparation of this article. These secondary types of data were collected from various published sources such as published articles, books, journals, websites, government reports, economic survey and NABARD report. Though the present study concentrates on the state as a whole, the focus will be on government spending on irrigation in agriculture sector. Full use of relevant books, journals and internet sources is made in order to make this study informative and meaningful.

**Analytical Tools:** The present study has used various types of statistical and mathematical tools for analysis of the collected data; such tools are averages, standard deviation, and coefficient of variation, correlation and regression analysis. Descriptive statistical techniques like tables, graphs and charts are made use of in order to analyze the information collected from different sources to present the study in a systematic manner. However, the collected sources have helped to give a good insight on the government spending on irrigation development as well as agriculture production in India.

**Regression Model:** The study assumed that total output of agriculture sector is mainly dependent on the government spending on irrigation (irrigation as a main input and other inputs are fertilizer, pesticides, seeds, labour supply and technical assistance). On the basis of that the following model to explain the variation in the agriculture output is proposed. It has to be assumed that there is linear relationship among explanatory variables. The equation can be written as:  $AQ = f(Irri)$

Simple regression model can be formed as:  $AQ = \beta_0 + \beta_1 Irri$

### VI. GOVERNMENT SPENDING ON IRRIGATION

India's irrigation covered crop area was about 22.6 million hectares in 1951, and it increased to a potential of 90 m ha at the end of 1995 and according to recent estimation the total net sown area is 140 m ha (46% of total geographical area), inclusive of canals and groundwater wells. However, the potential irrigation relies on reliable supply of electricity for water pumps and maintenance, and the net irrigated land has been considerably short. According to 2001-02 Agriculture census only 58.1 million hectares of land was actually irrigated in India. The total arable land in India is 160 million hectares (395 million acres). According to the World Bank, only about 35 per cent of total agricultural land in India was reliably irrigated in 2010.

The government is spending lots of money on irrigation purposes to increase the production and productivity of agriculture since independence. Government of India has spent ₹ 16,590 crore on irrigation development between 1950 and 1985. India proposed to spend a sum of ₹ 1,03,315 crore and 2,10,326 crore on irrigation and flood control in India between 2000-2005 and 2005-2010.

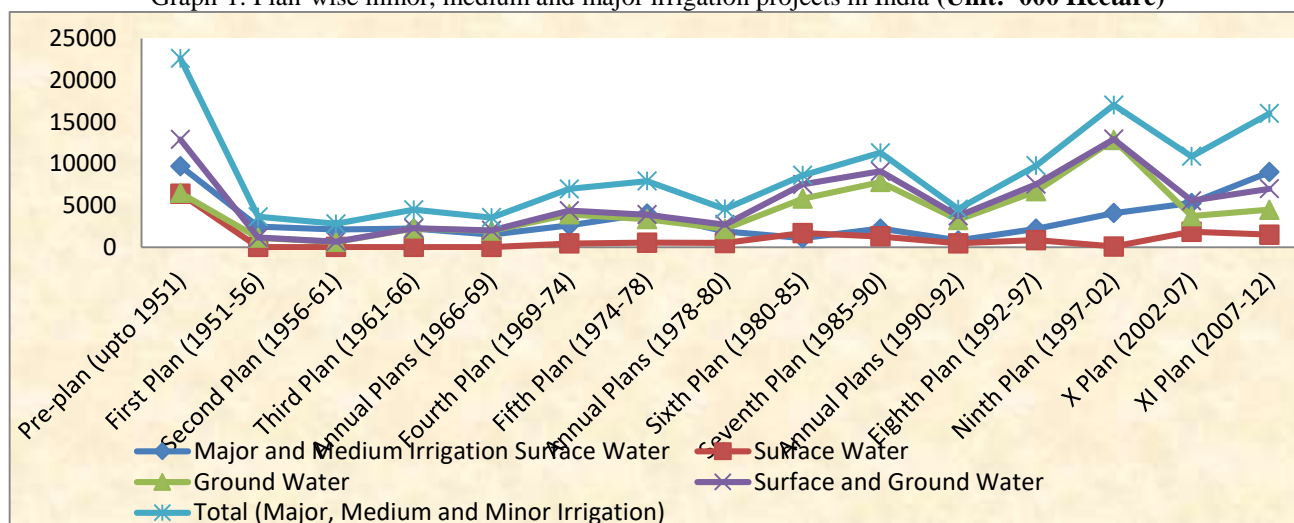
Table-1: Plan-wise minor, medium and major irrigation projects in India (Unit: '000 Hectare)

Period	Major and Medium Irrigation Surface Water	Minor Irrigation			Total (Major, Medium and Minor Irrigation)	Total Production of Foodgrains (MT)
		Surface Water	Ground Water	Surface and Ground Water		
<b>Irrigation Potential Created (IPC)</b>						
Pre-plan (upto 1951)	9705	6401	6500	12901	22606	63.00
First Plan (1951-56)	2486	29	1130	1159	3645	74.00

Second Plan (1956-61)	2143	24	647	671	2814	81.00
Third Plan (1961-66)	2231	26	2243	2269	4500	87.80
Annual Plans (1966-69)	1530	32	1988	2020	3550	103.00
Fourth Plan (1969-74)	2608	450	3930	4380	6988	118.10
Fifth Plan (1974-78)	4014	538	3362	3900	7914	124.40
Annual Plans (1978-80)	1895	500	2200	2700	4595	138.10
Sixth Plan (1980-85)	1083	1698	5823	7521	8604	155.00
Seventh Plan (1985-90)	2225	1289	7797	9086	11311	165.70
Annual Plans (1990-92)	821	470	3273	3743	4564	189.00
Eighth Plan (1992-97)	2216	843	6702	7545	9761	202.90
Ninth Plan (1997-02)	4097	80	12855	12935	17032	202.20
X Plan (2002-07)	5296	1847	3725	5572	10867	218.20
XI Plan (2007-12)	9000	1500	4500	7000	16000	252.00

Source: Central Water Commission, Govt. of India- 2015

Graph-1: Plan-wise minor, medium and major irrigation projects in India (Unit: '000 Hectare)



According to the data shown in the table-1 and the graph-1, irrigation potentiality has been created in every five year plan in India. Actually the government could fix certain target to reach within a given period of time, on the basis of that before independence land had been undergone only less proportion in order to attain the problem of foodgrain production, the government spent lots of money on irrigation purposes. As per the data, total irrigated land has been increasing continuously from plan to plan like 3645000 ha of land was incurred under irrigation in the first five year plan but in end of the eleventh five year plan the area has expanded to 16000000 ha of land created under irrigation through large amount of investment on agriculture purpose by the government of India. These results in expansion of irrigated land every five year plans as mentioned above. On the other hand total foodgrain production has increased from 63 million tonne during pre- plan to 252 million tonne in the twelfth five year plan.

Table-2: State-wise amount allocation, released and expenditure under micro irrigation scheme in India (Rs. In Crore)

States	2013-2014			2014-2015			2015-2016		
	Allocation	Released	Expenditure	Allocation	Released	Utilized#	Allocation	Released	Expenditure
Andhra Prad.	295.00	265.56	265.56	121.48	121.48	351.10	131.75	177.68	197.83
Bihar	70.00	57.50	42.00	49.70	35.00	2.98	20.00	10.00	6.01
Chhattisgarh	40.00	30.00	22.50	28.40	10.00	6.62	7.50	7.50	8.01
Gujarat	200.0	220.00	203.1	142.00	140.7	137.1	146.75	204.10	208.41
Haryana	40.00	33.00	32.16	28.40	23.00	16.31	34.50	16.94	10.12
Jharkhand	30.00	15.00	0.00	21.30	15.00	0.28	15.00	0.00	14.65
<b>Karnataka</b>	<b>175.0</b>	<b>173.30</b>	<b>186.2</b>	<b>124.25</b>	<b>124.2</b>	<b>117.4</b>	<b>111.75</b>	<b>111.75</b>	<b>110.51</b>
Kerala	7.50	5.62	0.00	5.33	3.75	3.75	5.00	0.86	0.86
Madhya Prad.	110.0	106.52	96.82	78.10	66.50	67.14	82.75	134.33	92.67
Maharashtra	250.0	141.01	124.7	177.50	177.5	177.5	176.75	88.38	70.00
Odisha	15.00	25.86	28.81	10.65	10.14	10.57	12.00	8.35	3.79
Punjab	20.00	5.00	5.91	14.20	0.00	0.88	10.00	0.00	2.37
Rajasthan	150.0	80.00	79.29	106.50	75.00	95.16	104.75	52.37	39.85
Tamil Nadu	90.00	86.90	167.92	63.90	56.63	87.57	72.75	72.75	59.91

Telangana	NA	NA	NA	87.97	77.57	66.02	92.75	95.15	100.13
Uttar Pradesh	15.61	2.00	3.04	11.08	3.00	3.22	15.00	7.50	1.79
Uttarakhand	-	5.40	6.40	-	6.98	3.44	7.00	3.50	4.24
<b>India</b>	<b>1559.24</b>	<b>1271.48</b>	<b>1267.88</b>	<b>1111.82</b>	<b>715.12</b>	<b>1156.5</b>	<b>1073.13</b>	<b>1000.28</b>	<b>937.93</b>

Source: Central Water Commission, Govt. of India- 2017

**Note:** # - Utilized amount includes unspent balances of previous year.

NA - Not Applicable since Telangana came into existence in June 2014.

The table-2 says about the state-wise amount allocation, released and expenditure under micro irrigation scheme in India (Rs. in Crore). Only few states are spending huge amount of money on irrigation purpose like Gujarat, Andhra Pradesh, Telangana, Karnataka and Madhya Pradesh. On the other hand many states are not focusing on the irrigation facilities provided to the agriculture sector. There is a fluctuation in overall allocation of resource on irrigation facility at national level.

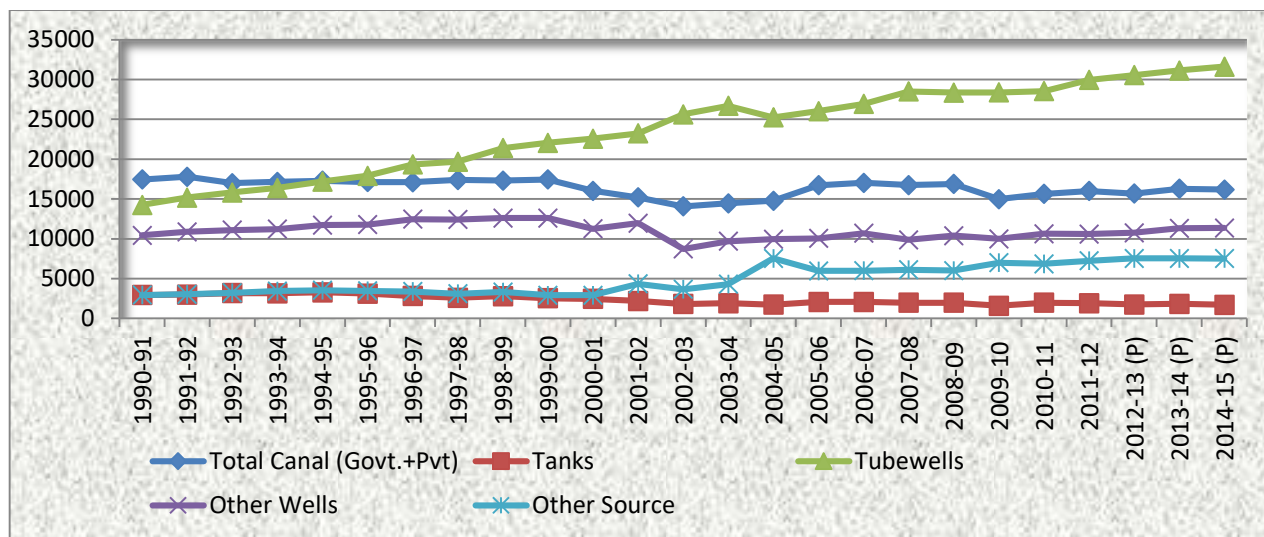
Table-3: Net Area Irrigated by Source in India (In '000 Hectare)

Year	Canals			Tanks	Wells		Other Source	Total
	Govt.	Pvt.	Total		Tubewells	Other Wells		
1990-91	16973	481	17453	2944	14257	10438	2932	48023
1991-92	17327	464	17791	2991	15168	10869	3048	49867
1992-93	16503	483	16986	3179	15815	11105	3211	50296
1993-94	16653	485	17138	3170	16376	11220	3435	51339
1994-95	16799	480	17279	3276	17189	11722	3533	52999
1995-96	16561	559	17120	3118	17910	11787	3467	53402
1996-97	16889	220	17109	2821	19338	12457	3388	55112
1997-98	17186	211	17397	2597	19680	12431	3106	55210
1998-99	17099	212	17311	2795	21394	12606	3329	57436
1999-00	17247	194	17440	2539	22042	12597	2912	57531
2000-01	15809	203	16012	2466	22566	11252	2909	55205
2001-02	14993	209	15202	2196	23245	11952	4342	56936
2002-03	13867	206	14073	1811	25627	8727	3658	53897
2003-04	14251	206	14458	1916	26691	9693	4299	57057
2004-05	14553	214	14766	1734	25235	9956	7538	59229
2005-06	16490	227	16718	2083	26026	10044	5966	60837
2006-07	16802	224	17027	2078	26942	10698	5999	62744
2007-08	16531	217	16748	1973	28497	9864	6107	63189
2008-09	16686	195	16881	1981	28367	10389	6020	63638
2009-10	14789	188	14978	1587	28371	9992	7008	61936
2010-11	15472	171	15643	1980	28543	10629	6864	63659
2011-12	15833	172	16005	1919	29943	10595	7236	65697
2012-13	15506	165	15672	1753	30543	10763	7536	66266
2013-14	16115	163	16278	1842	31126	11312	7542	68100
2014-15	16020	163	16182	1723	31606	11354	7519	68383

Source: Ministry of Agriculture & Farmers welfare, Govt. of India. (ON1393) & Past Issues

Note: P- Included under "Other Wells" as separate figures were not collected during these years.

Graph-2: Net Area Irrigated by Source in India (In '000 Hectare)



The Table-3 and Graph-2 explain about the net irrigated area by different sources in India. There is a participation of both public and private sector in creation of irrigation facility where both are spending money on construction of canals for providing water. In order to that public sector source of irrigation through canal is high compared to private sector. Overall net irrigated area has been increasing from 48023000 hectare in 1990-91 to 68383000 hectare in 2014-15 which includes canals, tanks, tube-wells, other wells and other sources of irrigation.

**Hypothesis Testing:**

1. Government spending in irrigation has a positive impact on agricultural production during planning period in India.

Table-4: Result of Regression Model

Variables	Coefficient	Std. Error	t Value	Prob. Value
Govt. Spending	71.243	19.037	3.742	.003
<b>R</b>			0.809	
<b>R<sup>2</sup> Value</b>			0.655	
<b>Adjusted R<sup>2</sup> Value</b>			0.626	
<b>F Value</b>			22.734	
<b>Degree of Freedom</b>			12	

On the basis of the above result, it has been found that government spending in irrigation has a positive impact on agriculture production during planning period in India. When the government increases its investment on irrigation during the five year plan period the agricultural production has increased continuously. The statistical result has shown that the coefficient value of government spending is 71.243 and t value is 3.742. The probability value is 0.003 namely it is significant at 1 percent level which means that there is a significant impact of government spending on agricultural production.

The R<sup>2</sup> shows goodness of fit, it indicates 65.5 per cent change in agricultural production is explained by the government spending. The F value is 22.734 which indicates the model is very significant at one per cent level of significant. Therefore, the null hypothesis is rejected and accepted the alternative hypothesis; the rate of total agricultural production is mainly depending on government spending. Based on these results, it has been concluded that the government spending in irrigation has a positive impact on development of agriculture in India.

2. There is a significant increase in the net area irrigated by sources due to the government spending in India

Table-5: Result of One Sample t Test

Variable	N	Mean	Std. Deviation	Std. Error Mean
Net Irrigate Area	25	58319.52	5887.903	1177.581

Variable	t Value	Degrees of Freedom	Sig. Value	Mean Difference
Net Irrigated Area	49.525	24	.001	58319.520

The above table reveals about the result of one sample t test regarding change of net irrigated area by sources in India. It observed that, due to government spending in irrigation the net irrigated area by sources has been increased since 1990-91 in India. The statistical result has showed that the mean value is 28319.52 and std. deviation is 5887.903 and t value is 49.525. The probability value is 0.001 namely it is significant at 1 percent level therefore, the null hypothesis is rejected and accepted the alternative hypothesis; which means that there is a significant increase in the net irrigated area due to government spending.

## VII. FINDINGS OF THE STUDY

- The government is spending lots of money on irrigation purposes to increase the production and productivity of agriculture since independence. Government of India has spent ₹ 16,590 crore on irrigation development between 1950 and 1985. India proposed to spend a sum of ₹ 1,03,315 crore and 2,10,326 crore on irrigation in India between 2000-2005 and 2005-2010.
- Total irrigated land has been increasing continuously from plan to plan like 3645000 ha of land was incurred under irrigation in the first five year plan but in end of the eleventh five year plan the area has expanded to 16000000 ha of land created under irrigation through large amount of investment on agriculture purpose.
- Only few states are spending huge amount of money on irrigation purpose like Gujarat, Andhra Pradesh, Telangana, Karnataka and Madhya Pradesh. There is a fluctuation in overall allocation of resource on irrigation facility at national level.
- There is a participation of both public and private sector in creation of irrigation facility where both are spending money on construction of canals for providing water. In order to that public sector source of irrigation through canal is high compared to private sector.
- Overall net irrigated area has been increasing from 48023000 hectare in 1990-91 to 68383000 hectare in 2014-15 which includes canals, tanks, tube-wells, other wells and other sources of irrigation.

## VIII. POLICY RECOMMENDATIONS

- The irrigation source is very important in agriculture sector because the Indian agriculture is mainly depending on monsoon rain, so the permanent means of irrigation should be developed by the Government.
- There should be large number of tube wells and canals to be provided for irrigation purpose in the agriculture sector.
- The government spending in agriculture must be increased by providing the necessary support like credit, cheap power, tube-well subsidy, etc.
- Farmers should be advanced loans at reasonable rates of interest. Regional Rural Banks should be opened at rural level to provide loans at cheaper rate.
- All commercial banks should be directed to small and marginal farmers for obtaining loans on easy terms. Local moneylenders should be scrutinized to stop their malpractices in rural areas.

## IX. CONCLUSION

Explanation for this lies in farming, in the cruel fact that India may no longer be an agrarian economy but still has an agricultural policy. So with all fast-developing economies, the share of farming is declining in India's GDP as services and manufacturing rise. Agriculture's share in the economic GDP may be below 15 per cent. But in electoral and political equivalent of GDP, it is about 60 per cent. The decrease in the share of Agricultural and Allied Sectors in GDP of the country in comparison to other sectors is on account of structural changes due to a shift from a traditional agrarian economy to industry and service dominated one. In a separate query, the result of study despite a positive trend in government spending on irrigation during five year plan and increase of net irrigated area due and total production of foodgrain in India. If the country wants to sustain the agriculture sector, there should be a formulation of new policies with the favour of agriculture for the long period in the way of providing necessary requirements at the reasonable price.

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