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Agriculture in Odisha: Problems and challenges

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Abstract
Odisha is agriculture based state of India. More than two-thirds of the state's population is largely dependent on agriculture. Natural calamities such as drought, floods and cyclones are the major problems that affect agriculture almost every year. More than 80% of the state's districts were affected in some years, while only a few districts were affected in others. From 1990 to 2017, the state was hit by one of the calamities almost every year, with crop losses reaching 50% or more in some years. Furthermore, as a result of these disasters, the state is struggling with issues such as diminishing agricultural lands, agricultural labor migration and farmers' declining interest in agriculture. The aim of this paper is to provide a detailed review of the state of Odisha's major agricultural problems, so that readers can adjust their further research work.

Keywords: Drought, flood, cyclones, crop losses, environmental impact on agriculture

1. Introduction
Odisha is India's ninth largest state by area. According to the 2011 census, it has a geographical area of 1, 55,707 km^2 and a population of 4.19 crores. It is one of India's poorest states with 83%of the population living in rural areas [1]. Furthermore, rural poverty accounts for 91% of poverty in state, with 36% of the rural population living in poverty [1]. Agriculture employs more than 60% of the population, and rice is the state's primary crop [2]. The Odisha's agriculture is characterized by low productivity due to a variety of factors. Problematic soil (acidic, alkaline and waterlogged), lack of irrigation facilities, low seed replacement rate, low fertilizer use (53 kg/ha vs national average of 113 kg/ha) and lack of mechanization are factors leading to reduced productivity. The Odisha's agriculture has been stagnant for the past four decades. The state's agricultural growth rate was lower than India's from 1991 to 2008 [3].The majority of farmers are small and marginal, with minimal capital. Approximately 83% of the agricultural population is made up of small and marginal farmers with the average holding size is 1.25 ha. In rural Odisha, small farmers (those with less than 2 ha of land) account for about 57% of total households, while landless laborers account for about 36%, respectively [3].The crop wise cultivated area, irrigated and non-irrigated, district wise crop losses and rainfall data for the state of Odisha for 28 years, i.e., from 1990-91 to 2017-18 (obtained from Department of Agriculture Statistics, Krushi Bhavan, Bhubaneswar, Odisha) have been used for this study. This study represents the major problems associated with agriculture in Odisha.

2. Problems associated with agriculture
(a) Natural Calamities
Odisha is one of the most vulnerable states in India to natural disasters. Drought, flood, and cyclone are the most common natural disasters that hit the state. Odisha is divided into 30 districts, 13 of which are coastal [4]. Coastal districts are especially vulnerable to cyclones and storm surges [5]. More than 70% of the state's districts were submerged in the floods of 2001, 2003, 2006 and 2008 [1]. These disasters have had a major impact on the state's economy, especially agriculture [6]. Furthermore, the frequency and severity of these disasters have increased dramatically in recent years, and new areas are being affected every year. Droughts and floods have become a yearly occurrence in the state, and cyclones have become more or less common.
Extreme droughts struck the state in 1996-97, 1998-99, 2000-01, and 2002-03, as well as a super cyclone in 1999-00 and a severe flood in 2003. The year 1996 was the state's worst year because rice, other cereals, pulses, and oilseeds production decreased by 33, 30, 49 and 42%, respectively during this year. Furthermore, the gross sown area was reduced from 97 lakh ha to

82 lakh ha, and the net sown area was reduced from 63 lakh ha to 60 lakh ha in 1993-94. In October 1999, the coastal regions and some nearby districts were ravaged by two super cyclones, in whichCuttack, Puri, Jagatsinghpur and Kendrapada were the most affected districts. As a result of the cyclone, the crop was seriously harmed. In the aftermath of the cyclone, strong winds and torrential rains destroyed around 16 lakh ha, of which 13.5 lakh ha were rice fields. Rice production was down by 20 lakh tonnes, with losses in pulses, oilseeds, and vegetables totaling about 1 lakh tonnes. The monetary value of crop production losses was 1318 crores.

Thousands of hectares of rice land were left fallow in Bolangir (20000 ha), Bargarh (12000 ha), Sundargarh (18000 ha), Sambalpur (11000 ha), Jajpur (6000 ha), Kendrapada (25000 ha) and other districts (12000 ha) during the extreme drought of 2000-01. There are regions that are being transplanted. Due to long dry spells and a lack of rainfall in July and August, the seedlings produced in the aftermath of the monsoon were unable to be transplanted. In several places, seedlings that were already old were transplanted. Weeding, gap filling and other intercultural operations could not be carried out in 3 lakh ha of Bolangir, Jharsuguda, Bargarh, Jajpur, Sambalpur and Sundargarh due to a lack of rainfall. As a result, there was a major reduction in food grain production. In contrast to 1993-94, the overall reduction in kharif rice was projected to be about 19 lakh tonnes. Similarly, the state was flooded in 2001-02, affecting 6.21 lakh ha of rice and 0.52 lakh ha of non-rice crops. Furthermore, out of the 6.21 lakh ha ofrice affected, about 2 lakh ha were replanted. The total predicted crop loss was estimated to be around 430 crores.

Due to another extreme drought in 2002-03, rice production was reduced to 28 lakh tonnes, down from 66 lakh tonnes in previous years. Furthermore, rice production was 6.90 qtls/ha (56%) compared to 15.50 qtls/ha during the previous kharif season. During kharif 2003-04, the state was hit by heavy flooding in 23 districts, resulting in a decrease in rice production to 62 lakh tonnes from 66 lakh tonnes in kharif 2001. Rice yields fell 14.59 qtls/ha in kharif 2001, compared to 15.54 qtls/ha the previous year. In addition, total food grain production has decreased to 68 lakh tonnes from 72 lakh tonnes in 2001. In the year 2004-05, ten districts in the state encountered drought-like conditions. Rice production decreased by 58.84 lakh tonnes (14.01 qtls/ha) this year, compared to 66 lakh tonnes (15.54 qtls/ha) in 2001.

Due to dry spells and moisture stress, rice production dropped to 62.49 lakh tonnes (15.04 qtls/ha) in kharif 2005-06, compared to 66 lakh tonnes (15.54 qtls/ha) in kharif 2001. Floods reached 26 districts five times in the kharif 2006. A total of 2.88 lakh ha of rice land was impacted by 50% or more. Due to the incidence of floods and moisture stress in the state, rice production dropped to 60.92 lakh tonnes in kharif 2008, compared to 68.26 lakh tonnes in kharif2007. Sowing and transplanting were successful in 2017-18, but a flash flood in Southern Odisha damaged 22,356 ha of crop land. Furthermore, about 50,000 ha of cropland in the Northern and coastal regions were affected. The drought affected about 15 districts covering 3.35 lakh ha. Over the 45 years from 1965 to 2009, Samal and Patra [6] estimated the rice production losses in Odisha due to three major natural calamities: drought, flood, and cyclones. The findings revealed that during the natural disaster years, a large amount of rice production was lost.

In 1992, 1996, 1998, 2000, 2002, 2010, 2011, 2012 and 2015, drought struck the Odisha. During the non-monsoon months, the state's river flow has been diminished by drought and prolonged dry spells. Around two-thirds of the years, the bulk of rivers are dry [7]. Drought affects approximately 70% of the state's total cultivated land [8]. Drought struck Odisha 39 times between 1900 and 2007 [9]. Drought years are those in which the state receives less rainfall than average, while flood years are those in which the state receives more rainfall than normal (Fig.1). Droughts occur far more often than floods (Fig.1) and cyclones, and drought-related output losses are far greater than those caused by other natural disasters. Droughts have had varying degrees of effects on the state over the years. The entire state has been affected in several years, although only a few areas have been affected in others years. These patterns are extremely alarming for a state like Odisha, where agriculture is the main source of employment. Rice is Odisha's main food crop, with significant year-to-year variations due to natural disasters and irregular rainfall. These natural disasters result in crop losses of 50% or more, as shown in Table 1.

(b) Dependency on Rainfall

The speed of agricultural activities is affected by inadequate and irregular rainfall. Since agriculture is so dependent on rainfall, even small variations in rainfall render drought a constant danger [5]. The state's total cultivated area is 61.80 lakh ha (40% of its geographical area), of which 29.14 lakh ha (47%), 17.55 lakh ha (28%), and 15.11 lakh ha (25%) are high land, medium land and low land, respectively. Around 33% of the total cultivated area is irrigated, while the remaining 67% is rainfed and subject to the monsoon's whims. Some of its districts like Bolangir, Kalahandi, Rayagada, Koraput, Malkangiri, Gajapati, Kandhamal and Dhenkanal, respectively represents the irony typical of rainfed areas. As a result, agricultural crop production is more dependent on a good monsoon. However, the state is blesses with plenty of rainfall during monsoon season. The state's average annual rainfall is 1452 mm, with about 80% of that falling between June and September during the monsoon season. Although this amount of rainfall is significant, its distribution is highly uneven and erratic.

The state experiences droughts, with more than 20% of rainfall deficient. During both kharif and rabi, there is a significant loss of rice, pulses, and oilseeds production in drought years. Rice is main crop of the state that covers about 67% of total cultivated area(Fig. 2) andis grown on all types of lands irrespective of its suitability. Rice is grown by almost all farmers in the state because of its subsistence nature and traditional agro-climatic conditions (Fig. 3) [6]. The yield of kharif rice fluctuated widely due to the instability and unpredictable nature of rainfall. Rice grown in highland rainfed conditions is particularly susceptible to moisture stress, resulting in dramatic productivity reductions during years of low rainfall [3]. Despite facing of natural calamities frequently like drought (Fig. 1), the farmers are still preferring the rice crop in kharif season is still high (Fig. 2). The area under total pulses are showing increasing trend shows thatsome farmers substituting pulses crop to rice crop which is showing decreasing trend (Fig. 3).The difference between the area covered by rice and other crops is still wide, which is the major problem of the state.

After facing the several natural calamities, some farmers still prefer rice crop in rabi season due to availability of irrigation

facilities (Fig. 4 and Fig. 5). During 1996 to 2005, the area covered under rabi crops was highly fluctuated as compared to other years because during these period state faced severe drought and super cyclones. During drought years the irrigated area was highly fluctuated as shown in Fig. 5.

(c) Lack of Irrigation facilities

Irrigation is an important factor in raising the yield of the crop. In order to achieve higher productivity and stability in farming, timely access to sufficient water for irrigation has become a severe constraint. As a result, reliable irrigation is important. Though the state receives sufficient rainfall, the distribution of that rainfall over time and space is extremely unequal. It has been estimated that even a 10% improvement in current water use efficiency in irrigation projects will help provide lifesaving irrigation to vast areas of crops.

Despite the fact that Odisha's economy is dependent on agriculture, these areas lack irrigation facilities; only 14% of the state has irrigation [10-11]. Coverage during rabi is largely determined by irrigation availability and residual moisture in the soil caused by post-monsoon rainfall. The state's worst year was 2010, when it experienced extreme drought in kharif, affecting 734.11 thousand ha and then unseasonal rainfall in rabi, affecting 1035.58 thousand ha of rice and 156.68 thousand ha of non-rice. The net irrigated area for the year 2017-18 is 2.20 Mha, accounting for 35% of net cropped land (Fig. 6). Owing to a lack of irrigation facilities and a lack of knowledge of the soil moisture of the harvested rice region, the majority of cultivable lands are left fallow after the kharif rice harvest. Lack of proper irrigation facilities threating the huge area under on cultivation in Odisha after kharif season, which is just equal or 1.5 times amount of the land in rabi season (Fig. 7).

Prior to 1990, there was less irrigated land, and agriculture was primarily dependent on rainfall. However, after 1990, the irrigated area increased due to the repair of existing irrigation networks, the installation of new irrigation networks, and the adoption of various irrigation lifting devices such as tube wells. Despite rising irrigated area year after year, much of the land remains uncultivated after kharif crops is the major problem of Odisha.

(d) Declining of net sown area

Farmers are losing confidence in agriculture as a result of the regular occurrence of natural disasters. As a result, the area under cultivation is gradually shrinking (Fig. 8). The area under rice cultivation is also shrinking (Fig. 3). In 1991-92, the state's net sown area for all crops was 65.75 lakh ha, which fell to 60.81 lakh ha in 2001-02, 57.92 lakh ha in 2011-12, and 54.28 lakh ha in 2017-18 (Fig. 8). As a result, a total of 11.47 lakh ha of land has been lost in Odisha over the last three decades, which is a serious concern.

3. Recommended Solutions

According to Samal and Patra [6], increasing funding for rice research in order to grow new rice varieties that are resistant to natural disasters would make farmers feel less stressed. Another approach is the introduction of new high-yielding varieties and better management practices. To reduce food grain yield variability, Sharma *et al*. [12] recommended increasing irrigation facilities, developing crop varieties that are less susceptible to the vagaries of weather, reforming institutions in lagging regions, and increasing investment in agricultural research institutions. To bring stability in production, short-term, medium-term and long-term policy measures are suggested. In the short term, the varieties grown by the Central Rice Research Institute in Cuttack and the Odisha University of Agriculture and Technology in Bhubaneswar should be utilized by extension agencies working in the state to bring production stability, as the varieties are environment and location-specific.

Drought stress can be alleviated to a degree by providing supplemental irrigation during critical growth stages of the crops. Tube well irrigation has also proven to be the most cost-effective and timely of all forms of irrigation. As a result, the government should promote the expansion of tube well irrigation in Odisha in the medium to long term policy measures, wherever possible. This will bring stability in rice production in Odisha. Moreover, this form of irrigation will also aid in the production of a second crop, such as black gram/ green gram, which uses very little water and will not only increase farmers' income but also maintain soil fertility. In the long term policies, more research funds should be directed toward developing rice varieties that are resistant to abiotic stresses such as drought, submergence and salinity, and that have at least one month of seed dormancy. Crop insurance is also a practice that isn't commonly practiced. As a result, the government should take the requisite measures to promote crop insurance in all of the rainfed regions of the state. Since most small farmers in the highlands tend to grow rice for food security purposes, partial replacement of rice with alley cropping (mixed cropping) is thought to be a better way to achieve crop diversification [3]. Rice covers about two-third of total cultivated area, therefore, diversification of this rice area are also needed.

Table 1: Crop loss of 50% or more during the kharif due to natural calamities

Year	Affected District	Affected blocks
1999	18	142
2000	29	216
2001	12	43
2002	29	287
2003	9	65
2004	10	40
2005	6	33
2006	26	224
2007	19	121
2008	14	98
2009	13	67
2010	17	112
2011	21	136
2012	19	260
2013	19	259
2014	6	70
2015	30	233
2016	4	10
2017	15	70

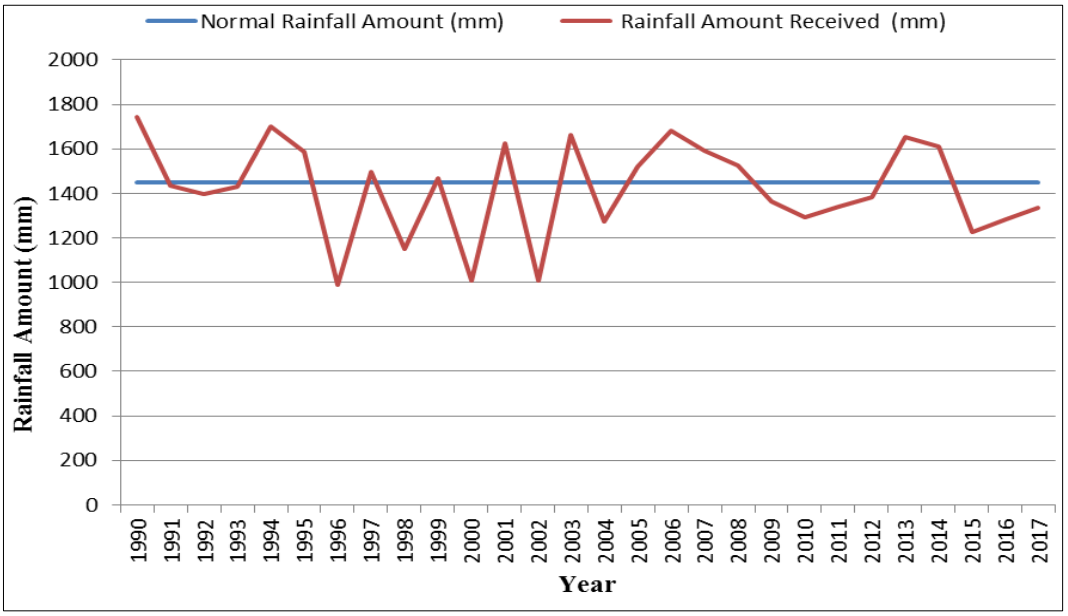

Fig 1: Year wise rainfall received by the Odisha

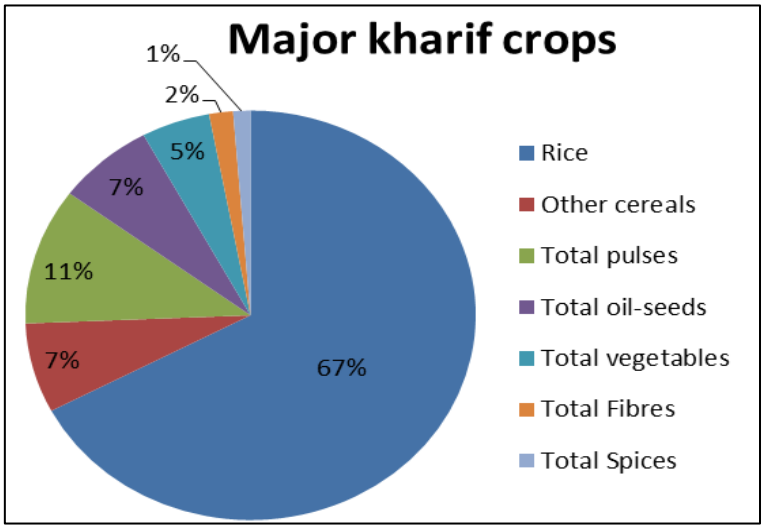

Fig 2: Average area covered under kharif crops

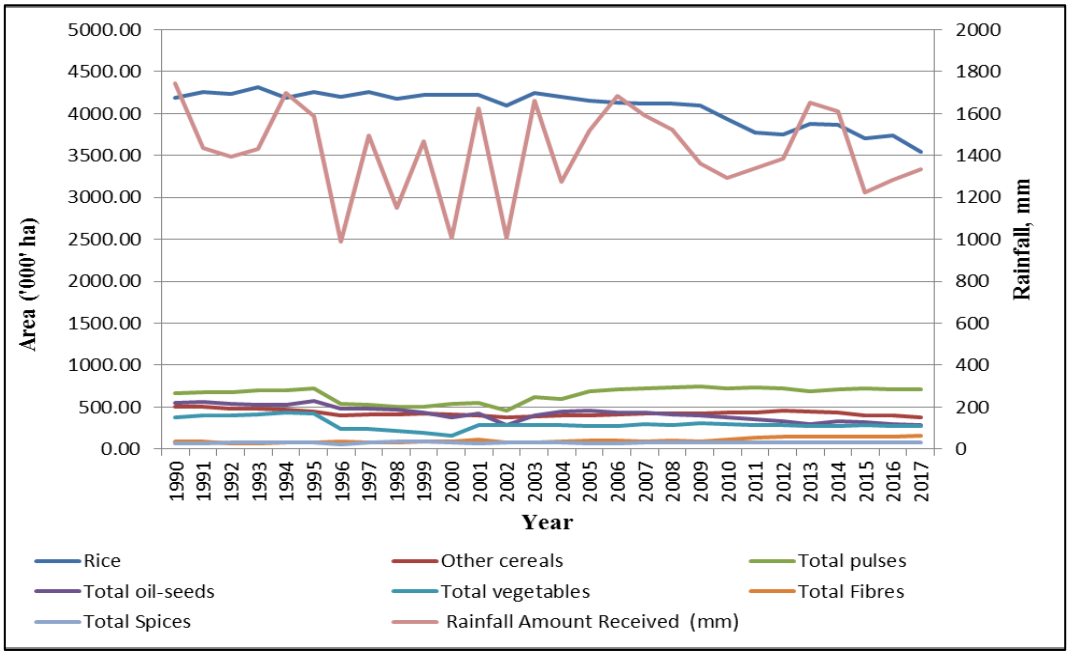

Fig 3: Year wise area covered under different kharif crops

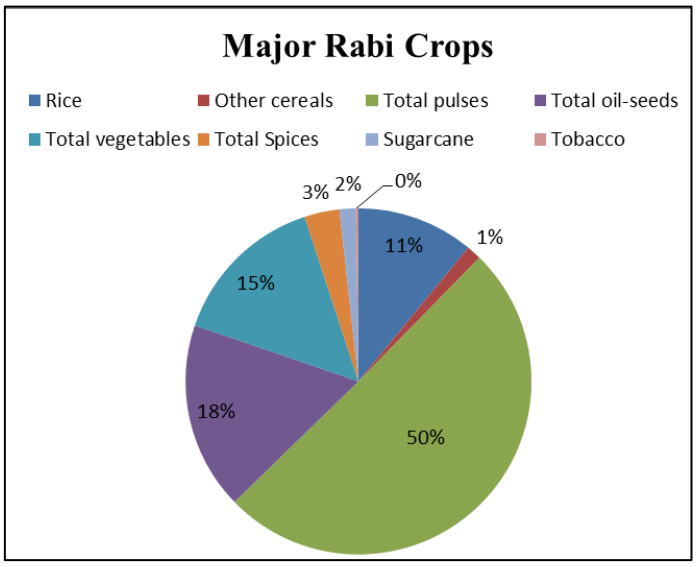

Fig 4: Average area covered under rabi crops

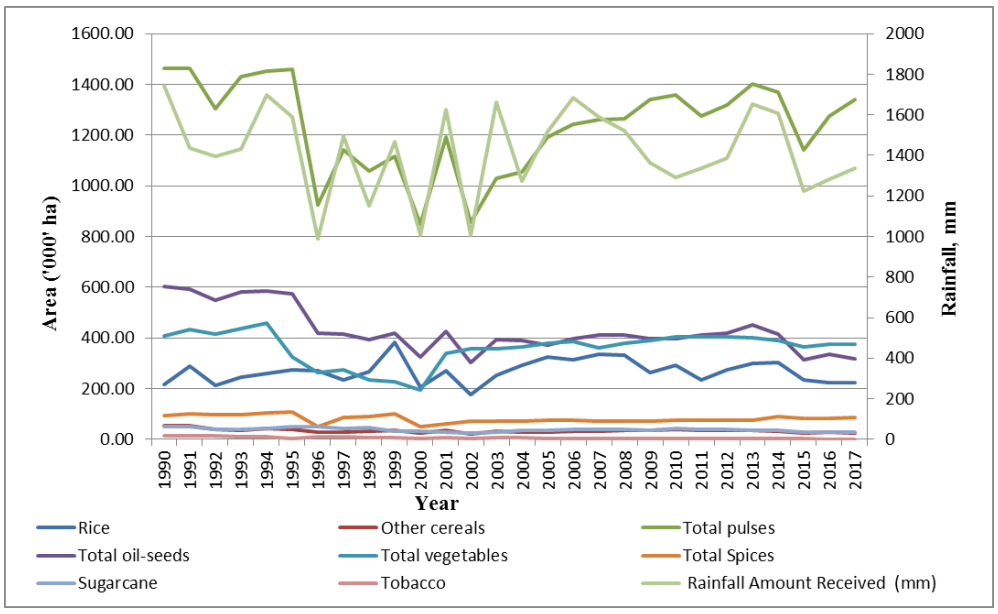

Fig 5: Year wise area covered under different rabi crops

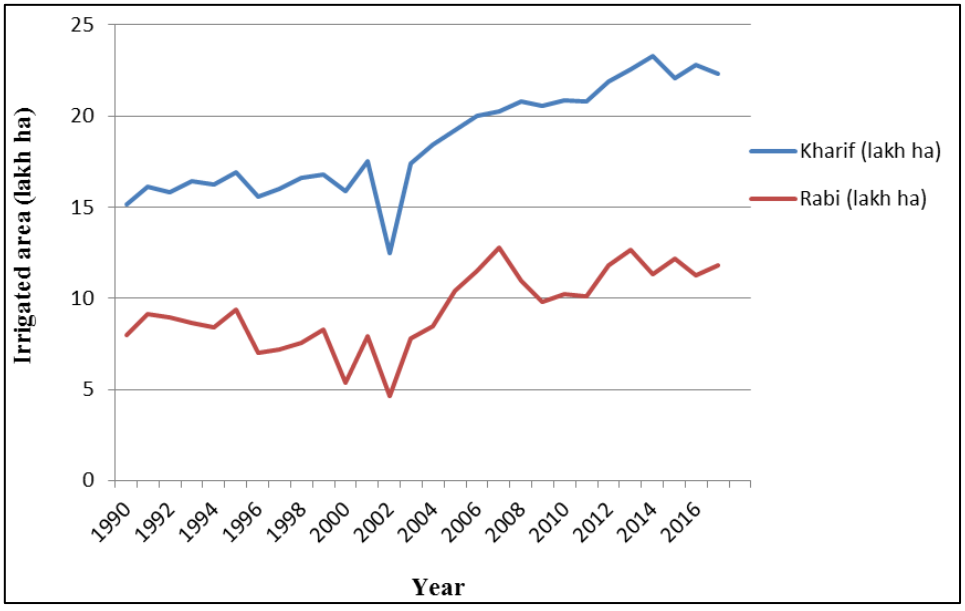

Fig 6: Year wise irrigated area

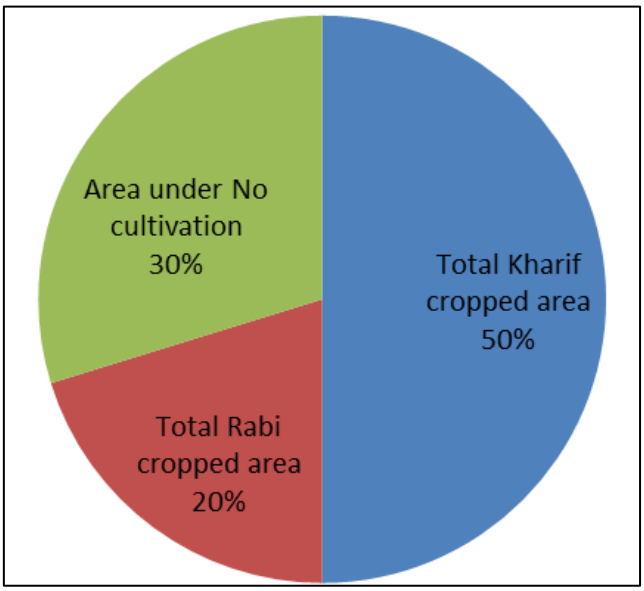

Fig 7: Average area covered under cultivation and no cultivation

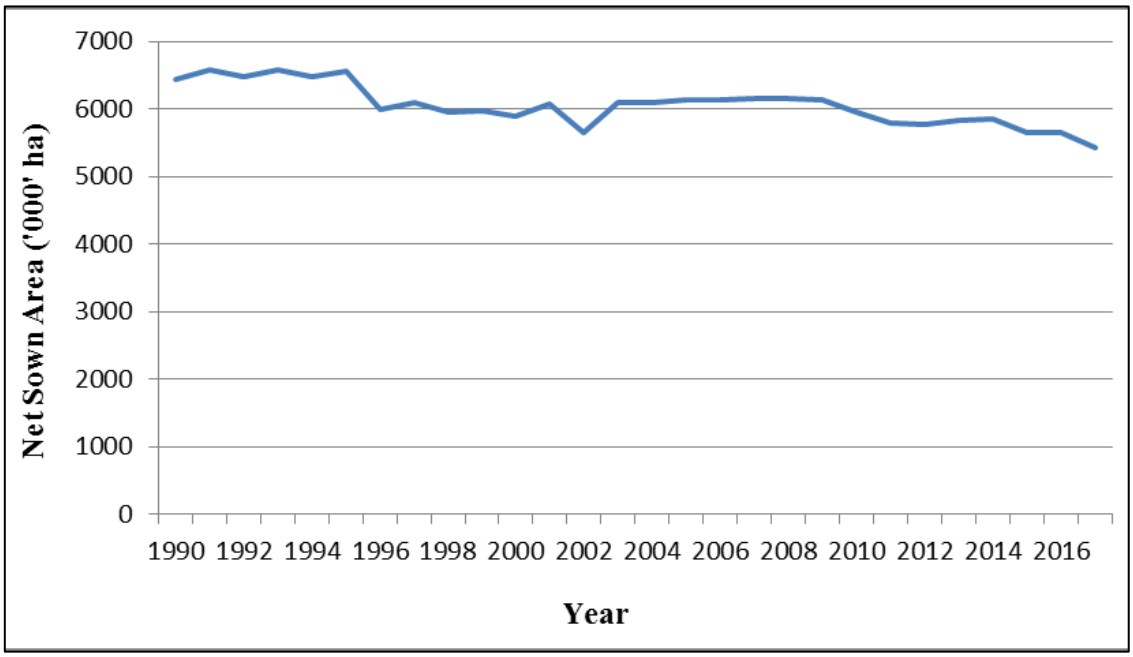

Fig 8: Year wise shrinkage of net sown area

4. Conclusions

After reviewing the data from 1990 to 2017, we have come to the conclusion that the irrigated area is increasing, but a large portion of land remains uncultivated throughout the rabi season. Furthermore, conventional agricultural practices, insufficient capital accumulation and low investment, insufficient irrigation facilities, low water use efficiency and uneconomical land holding sizes all contribute to Odisha's agriculture's low productivity. The state's cropland covers an average of 44.5 lakh ha, but this varies from year to year due to natural disasters. Rainfed conditions are used to produce two-thirds of kharif rice. Despite the fact that the state's average annual rainfall is 1452 mm, which is higher than India's average annual rainfall, the majority of agricultural lands are still rainfed. Drought, floods, cyclones, and unseasonal rainfall are also serious issues in the state, resulting in crop losses of 50% or more. As a result, more research is needed for proper agricultural planning in order to reduce crop losses due to natural disasters.

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7. References

1. Anwarul H, Pallavi R, Ashok G. Transforming agriculture in Odisha: Sources and drivers of agriculture growth, Working Paper, No. 337, Indian Council for Research on International Economic Relations (ICRIER), New Delhi, 2017.
2. Directorate of Horticulture, Govt. of Odisha, http://odihort.nic.in/
3. Reddy AA, Agricultural productivity growth in Odisha,

India: Crop diversification to pulses, oilseeds and other high value crops. African Journal of Agricultural Research, 2013;8(19):2272-2284.
4. Samal KC, Meher S, Panigrahi N. Beyond Relief Disaster Mitigation, Livelihood Rehabilitation and the Post-cyclone Recovery in Odisha: Village Level Studies in Three Most Cyclone Affected Districts in Odisha. NCDS, Bhubaneswar, 2003.
5. Ray-Bennett NS. Avoidable deaths in disaster. Springer Briefs in Environmental Science, 2018. DOI 10.1007/978-3-319-66951-9_1
6. Samal P, Patra R. Natural Calamities, Rice Production Loss and Risk Coping Strategies: Evidence from Odisha. The IUP Journal of Agricultural Economics. 2012;9(1):1-13.
7. Pati BK. Water resources of Odisha: Issue and Challenges. Regional Centre for Development Co-operation, 2010. http://www.rcdcindia.org/PbDocument/8adc57865d55134-7374-401a-97b4-118393445fd2Water%20Resource%20Booklet%20FINAL.pdf
8. Government of Odisha, Odisha Human Development Report 2004, Planning and Coordination Department, Bhubaneswar, 2005, http://Odishagov.nic.in/P&C.
9. Ward PS, Makhija S. New modalities for managing drought risk in rainfed agriculture: Evidence from a discrete choice experiment in Odisha, India. World Development, 2018;107:163-175.
10. Pradhan RP. Agriculture efficiency of Odisha: Problems and prospects. Journal of Rural Development. 2003;22(2):220-247.
11. Ray-Bennett NS. Multiple disasters and policy responses in pre and post-independence Odisha, India. Disasters, 2009;33(2):274-290.
12. Sharma HR, Singh K, Kumari S. Extent and Source of Instability in Food grains Production in India. Indian Journal of Agricultural Economics. 2006;61(4):647-666.