

Drought management by small holder farmer in Angul district of Odisha

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ABSTRACT

People subjected to the extreme climate have been forced to cope with the situation with management schedules. Climate risk studies have largely neglected household coping and adaptation strategies. In this paper we analyze drought impacts, drought risk management, and resulting drought resilience in Rainfed patches based on socio-economic data collected from 25 randomly selected farmer's Associations. We find that severe drought periods have led to a significant depression of crop yields and declining productivity of livestock in the past. Drought periods have drastically increased the proportion of food insecure households and lengthened the duration of food insecurity in the area. Since, with climate change, drought periods are predicted to become more frequent in this region in the future, the problem of food insecurity is likely to become even more severe. Ex-ante adaptation strategies are widely practised in the area and include the storage of crop residues as fodder for livestock, the rearing of drought tolerant varieties, mixed cropping, the use of short duration crop varieties, integrated farming system and the adoption of soil and water conservation practices. Ex-post coping strategies utilized to manage the consequences of drought include the sale of assets and the reliance on consumption loans and support offered by rural microfinance. The two coping strategies

seen in the district are diversification of income sources especially non-agricultural ones and sale of assets. Therefore, suitable policies are urgently needed to strengthen farmers' capacity to adapt to and cope with drought. Training farmers in the production and conservation of livestock fodder as well as in soil and water conservation practices appear to be key policy options relevant in the area. Moreover, improving farmers' access to climate related information, especially drought forecasts, could improve the timely adoption of effective adaptation measures.

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Introduction: Droughts and famines have received attention in the recent years. About one third of the country is either drought prone or frequently under the vulnerability of occurrence. The strategies viz. Relief to drought hit areas, DPAP and popularization of dry farming worked well. Drought is a recurrent phenomenon and an important constraint to rainfed rice production in Angul district of Odisha. At least 46 thousand ha of rice area (43 % of the total rice area) in the district are subject to drought of different intensities.

Review of Literature:

Hanumantha Rao, Ray and Subbarao (1988) in their pioneering study on unstable agriculture and droughts found that agriculture in drought prone areas has been highly unstable. They also observed that production instability varied with crops. There is some evidence to show that unstable agriculture incomes tend to raise the incidence of poverty and also vulnerability of poor. (Desai *et al* 1979 and Chen 1991). Improved rice technologies that help reduce losses to drought can play an important role in long-term drought mitigation. Important scientific progress is being made in understanding the physiological mechanisms that impart tolerance of drought (Blum 2005, Lafitte *et al* 2006).

Watershed-based approaches that are implemented in drought-prone areas of India provide opportunities for achieving long-term drought proofing by improving overall moisture retention within the watersheds (Rao 2000).

Objectives: The general objective of the study is to understand the impact of drought on household vulnerability in Angul district.

Specifically

1. To analyze impact of drought on rural households
2. To analyze households' adaptation strategy for drought.
3. To examine strategy for drought management
4. To suggest suitable contingent measures for reducing vulnerability

Materials and Methods

Study Area: Angul lies between 20° 31' N & 21° 40' N latitude and 84° 15' E & 85° 23' E longitude. The total geographical area of Angul is 6232 sq.kms, thus it is the 11th largest district among 30 districts of Orissa. The relevant secondary data has been collected from 3 blocks of the district selected purposively.

Selection of village : 3 villages from each block have been selected purposively as per diversification and frequency of drought.

Selection of sample household: Stratified sample selection for household was used to determine the number of household selected from each village. Primary data collection done through well designed structured questionnaire.

Limitation of the study: Study is area based which pertains to drought and its impact, and management strategy.

Figure 1 District Map



Table 1 Sample information

District	Blocks	Villages	Total household	Sample household
Angul	Angul	Shyamsunderpur	125	50
	Chhendipada	Handiguda	120	45
	Banarpal	Kulei	85	40

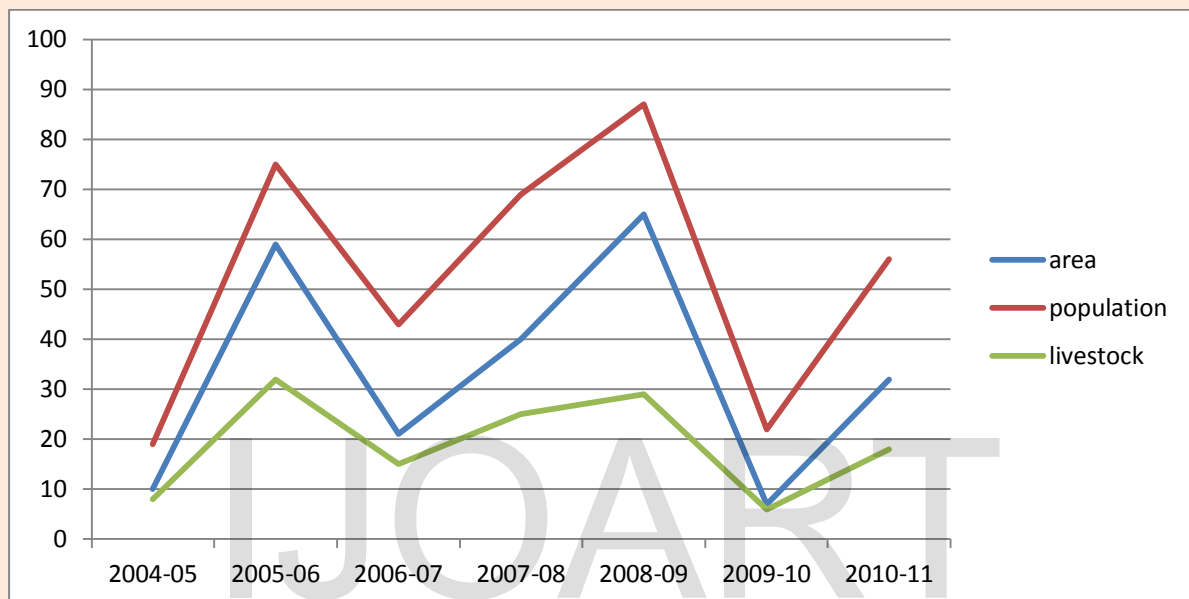
Concept of Drought:

Meteorological drought –Based on degree of dryness and duration of dry period (when precipitation is less than 25% to its normal).

Agricultural Drought : When inadequate soil moisture produces acute crop stress and affects productivity.

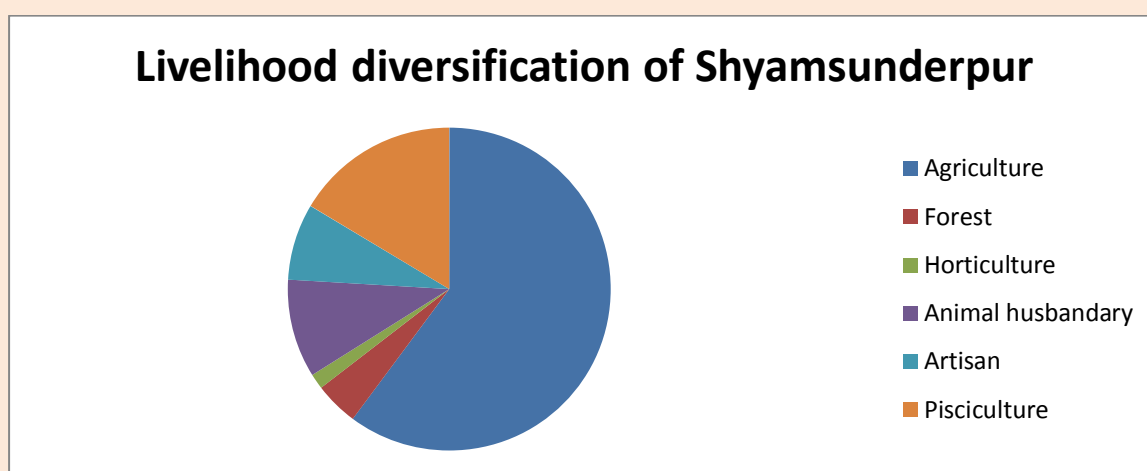
Socio-economic drought: The aggregation of all the above drought when precipitation is not adequate to meet the need of human activities.

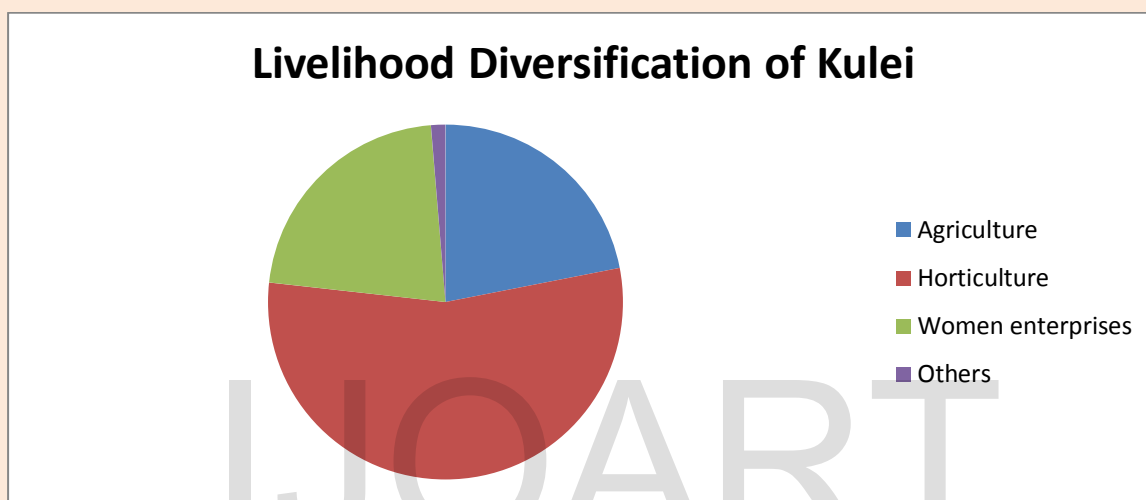
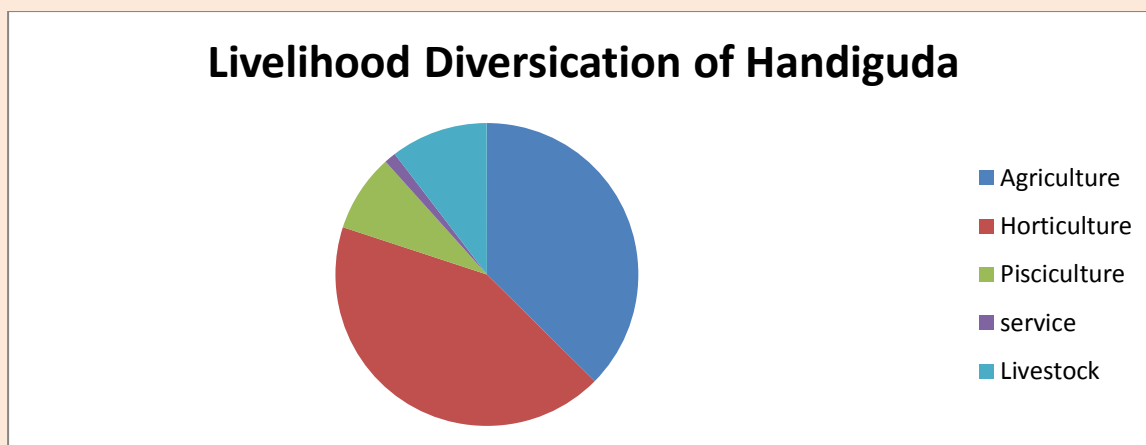
TABLE 2: Area, population and livestock affected by drought in Angul



Source: Field survey

Figure 2. Livelihood diversification of the villages





Figures 2(a,b,c) indicate occupational diversification of the village .Horticulture takes the centre-stage in the villages Women based enterprises viz. Preservation of fruits and vegetables and mushroom are into focus. Rural artisans and service household families show diversification. This represent typically arid and semiarid villages.

Table 3. Household level impact of drought

Consumption behaviour	Normal year	Drought year
Av.No. of meals per day	2.5	1.8
% of household reducing meals per day during drought year	-	75
Frequency of meals per day	2 meals-49%	2 meals -33%

(%)	3 meals-51%	3 meals -77%
% of household reducing qty. Of food per meal during drought	-	74
% of household consuming unusual food in drought years not normally eaten		46

Source: Field Survey

Table 3 shows that Consumption behaviour of farming households show great variation ranging from reducing quantity(74%) to changing food pattern(46%)

Outmigration in search of job:

The drought prone areas of Angul have traditionally been an area of push factor for outmigration in search of employment and livelihood. More than 21% of total household syrveyed reported at least one family member outmigrating in search of livelihood to sustain life.

A significant variation has been observed in the percentage of outmigrating households in drought region.Both the villages V1 and V3 have reported exceptionally high % .The % migration in Handiguda is only 7% It is noteworthy to mention that V2 have shown economic diversification and ina way strength to fight natural calamities.

Table 4 : Harvest loss (%) of agricultural produce.

Block	Village	0-25		25-50		➤ 50		NR		Total	
		f	%	f	%	f	%	f	%	f	%
Angul	Shyamsunderpur	8	16	11	22	22	44	9	18	50	100
Chendipada	Handiguda	14	31.11	13	28.88	8	17	10	22.22	45	100
Banarpal	Kulei	24	60	7	17.5	5	12.5	4	10	40	100

Source:Field Survey

Table 4 reveals that village 1 report the maximum loss followed by V2 and then V3.Correspondingly t was also found that V3 has adopted technological interventions which has subsequently resulted in higher yield and coping strength.

TABLE 5 Household reported total failure of crops in drought area

Villages	Yes	%	No	%	NR	%	Total	%
V1	31	62	16	32	3	6	50	100
V2	9	20	20	44.44	16	35.55	45	100
V3	14	35	26	65	0	0	40	100

Source : Field survey

Table 6 Response on coping strategy of farmers during drought season(Agriculture)

Village	Grow crops		DR		Mix crops		Partial Mechanization		Mulching		Total	
	f	%	f	%	f	%	f	%	f	%	f	%
V1	6	12	28	56	2	4	14	28	50	100		
V2	9	20	21	46.67	5	11.11	10	22.22	45	100		
V3	1	2.5	19	47.5	8	20	12	30	40	100		

TABLE7 Significant Demonstration for drought management

Sl.No	Interventions	Farmers	Area (ha)	Av.yield (q/ha)	Av.net return	B:C Ratio
1.	Crop Diversification with Arhar + groundnut intercropping	10	2	13.5 17.5	20,200	2.01
2.	INM in Maize	10	1	29.2	41000	2.5
3.	INM in Sugarcane	10	1	113.8	49,8000	1.78
4.	ICM in groundnut	12	5	19.6	52,400	3.0
5.	ICM in Mung	11	5	6.8	26,600	2.23
6.	ICM in Arhar	15	5	16.6	18,500	2.20
7.	Water management through Drip irrigation in banana	5	2	480	100,000	2.08
8.	IPM in Paddy	10	1	22.5	11,200	1.73
9.	IPM in Sugarcane	10	1	113.8	49,800	1.78
10.	Varietal substitution(short duration Udaygiri)	10	1	17.0	9,000	1.53

Table: 8 Socioeconomic adaptation

Village	Reduction of food		Migration		Sale of assets		Diversification		Borrowing loan	
	f	%	f	%	f	%	f	%	f	%
V1	21	42	23	46	0	0	2	4	4	8
V2	16	35.55	6	13.33	20	44.44	2	4.44	1	2.2
V3	7	17.5	0	0	12	30	4	10	17	42.5

Table 9 Household reported irregularity in agricultural income in drought & normal years

Land holding size(acre)	Reported irregularity in agril.income		Grand total	Average income(Rs./yr.)	
	Yes	No		Household No.	Normal yr.
0-2	36	14	50	15,000	8500
2-4	29	16	45	28,700	12,450
➤ 4	30	10	40	40,000	21,497
Grand total	95	40	135	83,700	42,447

CONTINGENT CROP PLANNING FOR ANGUL DISTRICT

- Growing moisture tolerant upland rice varieties Vandana(90 days) and Mandakini(100 days)
- Following partial mechanization to utilize natural resources effectively
- Adopting intercropping system preferably arhar,maize,groundnut and rice based.
- Adopting Integrated farming system
- Adopting mulching to reduce moisture stress
- Vegetables like tomato,cauliflower ,radish,brinjal,cowpea can be grown
- The ideal pre rabi crops with residual moisture conditions are black gram,castor, and sesamum
- Provide protective irrigation
- Maize Varities like Ganga-11(100 days) and Navjot(90 days) can be grown.

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