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Evaluating the Impact of Contingent Crop (Niger) on Rice Fellow Upland under Rainfed Ecosystem of Jharkhand, India

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A B S T R A C T

The evaluation of contingent crop (Niger) has been placed in two different locality of Koderma (Jharkhand). The two locations for inception of trail were selected on the basis of failure of primary Kharif season crop rice on upland field condition. Aberrant and harsh weather condition including erratic, sometime lack to rainfall forced the farmers to transplant aged seeding which may directly affect the yield of rice. In the year of 2016-17 the Basdih and Paharpur village of Markacho block were selected for placement of Niger crop. The annual rainfall of Koderma region has been depicted by 200-250 mm, because of unavailability of irrigation water total 35 hectare (Basdih village 20 hectare and Paharpur 15 hectare) of rice cultivated land have been failed to grow. So short duration, drought tolerant variety of Niger (JNC-6) has been sown. After collection of field data the results shows that the yield of niger on upland area recorded 3.5 quintal per hectare (net worth income 22, 072 INR), besides the yield on medium land observed up to 4.6 quintal per hectare (net worth income 22, 934 INR). This study shows land uses change in failure of primary crop with the application of contingent crop, the focus of study was based on aware the farmers about continuous change in environmental condition and selection of technology, varieties and showing methodology according to current climatic scenario.

Introduction

Not only cereal and pulse crop under food crops, oilseed crops are also equally important for the Indian agricultural economy. India ranks third in the world after China and USA in the production of oilseeds (Calskan *et al.*, 2002). The oil seed crops have a wide adaptability and are grown under varied agro-climatic conditions throughout the world. The annual oilseed crops grown in India are soybean, groundnut, rape and mustard, linseed, sunflower, sesame, safflower and niger. The oil seeds, products and oil produced by the oilseed crops are important for cooking, preparation of pickles, flavoring the curry, animal feed, soap manufacture, industrial use, etc. (Chavan *et al.*, 1998). Oil seeds have a very significant role in Indian agriculture since almost each part of the plant is consumed either by human beings or animal depending upon the crop and in growth stage. But the

production and productivity of oil seeds is limited by a number of biotic and abiotic stresses (Hegde, 2012). Among the abiotic factors, temperature, rainfall, relative humidity, photoperiod and soil moisture are the limiting factors in realization of maximum yield (Damavandi *et al.,* 2005). Climatic condition is the most variable factor in upland rainfed crop system in which cropping pattern, timing, intensity and area cover under cropping system totally depend upon availability of rainfall and other irrigation facilities. An unavoidable and irrespective change in climate is the one which cannot be controlled by human. Nearly 86% of agriculture practices in kharif season in Jharkhand is depend upon rainfall and the maximum part this forcibly faced the challenge of unavailability of rainfall during south west monsoon. Unfortunately aberrant weather is a common feature in Jharkhand state agriculture from last one decade (minimum rainfall received 860mm during kharif season whereas the normal rainfall recorded up to 1050mm annually, data collected from state agriculture department, Koderma, Jharkhand). The rainfall is seasonal, erratic and highly variable with space and time. The aberrant nature of rainfall may be due to early or delayed onset of monsoon (< 10-12 days) and withdrawal or associated drought spells (< 10 days) at any stage of crop. The state of Jharkhand sole depends on mono cropping pattern with rice cultivation which is directly associated with rainfall and harvested water in natural or constructed water bodies. Niger (*Guizotia abyssinica* Cass.) is one of the important minor oilseed crops of India. It is considered as minor oil seed crop but it is very important in terms of its oil content, quality and potentiality. The important feature of this crop is that it gives reasonable seed yield even under poor marginal growing conditions. Niger is mainly used for extraction (about 30-50%) of oil (Gaurilow *et al.,* 2003). Oil is inferior quality and is used for soap making, lighting, lubrication and as drying oil. Whereas, plant is used for fodder and for making silage. It is mainly cultivated to a limited extent in India, it is chiefly cultivated in Madhya Pradesh, Orissa, Maharastra, Bihar, Karnataka and Andhra Pradesh mostly on the hill tops and slopes as a inter or mixed crop (Hafeez *et al.,* 2001).

Materials and Methods

The crop inception was placed to study the impact of Niger (*Guizotia abyssinica* Cass.) on rice failed field on two different locality of Koderma Jharkhand for seed yield and quality during 2016-17. The Cultivar JNC-6 has been used for cultivation and the reploughing of rice field was done with country plough. The Basdih village field latitude is N24.365919, longitude E85.746940 and Paharpur village latitude N24.760846. The experimental site has a red soil, sandy loam and gravel soil. The climatic condition is drought, heat wave, cold wave and hailstorm. Before plantation of contingent crop following important factors might be keep in priority (Matinfer *et al.,* 2011):

Select efficient crops and cropping systems matching the length of growing season. Some of the promising non-rice crops for rainfed uplands are maize, cowpea, Pigeon pea, Chick pea, and Niger.

Choose short duration varieties which possess faster rate of growth, deep and penetrating root system and ability to escape drought.

Store rain water to use as life saving irrigation.

Perform off season ploughing to conserve moisture, reduce pest and weed problem and to facilitate early sowing. Two to three Plough and sowing the crops across the slope to develop a ridge and furrow type of land configuration for effective soil moisture conservation to overcome

drought for longer period.

Follow partial mechanization to ensure timeliness and precise of operations (desired depth and tilth) to utilize land, rainfall and other natural resources effectively.

Results and Discussion

In the year of 2016-17 during Kharif season aberrant nature of rainfall (deviation% 45.44) bounded farmers to transplant aged seeding (< 30 days) in main field moreover approximately fifteen hectare of upland and medium area were uncultivated due to insufficient availability of irrigation. According the available research data due to transplanting of aged seeding and lack of irrigation it may reduced the grain yield which was directly affect the economic condition of farmers. To minimize the losses of farmers the contingent crop Niger i.e. drought resistant, high yielding variety JNC-6 (Jackson, 1967) was demonstrated on combinedly forty hectare of upland and medium land in Basdih and Paharpur village of Markacho Block. Contingency planning refers to mitigate any unexpected, unusual, unfavorable and unwanted accidental weather situations occurring at any time without prior knowledge at any time before the crops are sown or even after the crops are sown (Jadhav and Deshmukh, 2008) (Fig. A–E).

Table.1 Appearance of seasonal rainfall during monsoon Kharif 2016-17

Rainfall summary for month	Actual (mm)	Normal (mm)	Deviation (Actual minus Normal) (mm)	Deviation (%)
				(Actual – Normal) x 100 / Normal
June	60.66	165.7	146.7	88.53%
July	470.8	323.7	147.1	45.44%
August	322.9	160.8	162.1	50.20%
September	101.8	214.3	112.5	52.49%
October	46.4	64.6	18.2	28.17%
Details of dry spells experienced	1) From: 03.09.17 To: 15.09.17. 2) From: 03.10.17 To: 31.10.17			

Table.2 Economic study of placement of contingent crop on rice failed crop

S.No	Area of demonstration	Area (Ha)	Yield (q/Ha)	Gross input	Gross return	Net return
1	Upland rainfed	35	3.5	13,560	35,632	22,072
2	Medium land	5	4.6	15,590	38,524	22,934

Fig.A Rice growing failed upland field; **Fig.B** Ploughing of field; **Fig.C** Sowing of Niger seed through ZTSD; **Fig.D** Germination of Niger Seed; **Fig.E** Typical growth of Niger





The contingency crop planning therefore is proposed to mitigate such situations through the choice of appropriate crops and varieties, cropping systems or other necessary relevant farm practice1s (Table 1 and 2). Timely formulation and implementation of contingent agricultural plans helps to mitigate the adverse effects of scanty rainfall on production and productivity of crops (Jagtap *et al.*, 2015). Use of resource-conservation technologies (Zero Tillage Seed Drill Cum Fertilizer machine and Direct Seeded Rice) and a shift from sole cropping to diversify farming system is highly warranted (Madhu Bala and Kedar Nath, 2015). The success of contingent cropping system shows that the suitable crop compatibility, production potential and economics during failure of main crop.

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