Asian Jr. of Microbiol. Biotech. Env. Sc. Vol. 25, No. (1) : 2023 : 108-111

ISSN-0972-3005

DOI No.: http://doi.org/10.53550/AJMBES.2023.v25i01.016

SUITABILITY OF CROPS AND CROPPING SYSTEMS FOR CONTINGENCY CROP PLANNING IN RAINFED ALFISOLS OF YSR KADAPA DISTRICT OF ANDHRA PRADESH

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(Received 20 August, 2022; Accepted 12 October, 2022)

Key words: *Crops, Contingency crop planning, Delayed sowing*

Abstract– The experiment was conducted at the Agricultural Research Station, Utukur, Kadapa of Acharya N.G. Ranga Agricultural University during *kharif* and *rabi* seasons from the year 2017 to 2020. Treatments comprised of three sowing windows viz., August II fortnight, September I fortnight and September II fortnight allocated to main plots and eight different crops and cropping systems viz., Redgram (Asha), castor (DCH 514), cowpea (TPTC 29), horse gram (Local), black gram (TBG 104), foxtail millet (Suryanandi), Red gram + cowpea (1:1) and Red gram + horsegram (1:1) laid out in split plot design with three replications. Green gram (WGG-42) was included from 2019 onwards only. The results indicated that red gram was found as best alternative under contingency with higher net returns followed by castor, cowpea and horse gram in rainfed alfisols of YSR Kadapa district of Andhra Pradesh during normal and excess rainfall conditions whereas horse gram was found as a choice under deficit rainfall conditions.

INTRODUCTION

India has about 108 million hectares of rainfed area which constitutes nearly 75% of the total 143 million hectares of arable land. In such areas crop production becomes relatively difficult as it is influenced by erratic and uncertain behavior of rainfall which include delayed on set, early withdrawal and intermediary dry spells during the crop season. The effects of these aberrant weather conditions can be mitigated by suitable crop management decisions among which contingent crop planning is the most important one which means growing of suitable crop in place of normally sown high profitable crop of the region due to aberrant weather conditions. In the YSR Kadapa district of Andhra Pradesh, groundnut is the predominant crop grown in 75000 ha of area during kharif under rainfed conditions. But sowing of groundnut beyond July due to delayed onset of monsoons will drastically reduce the pod yield even upto to the extent of 60- 70% (Reddy *et al*., 1998). In the contingency crop planning, depending on the date of receipt of rainfall, crops are being selected assuming that the rainfall for the subsequent period is normal and hence some risk is involved to get good profits even at aberrant weather conditions. This contingency crop planning is highly location specific as the crops are being selected depending upon the suitability of crops to that location. Hence the present experiment was taken up to identify the best contingent crops under delayed onset of monsoon conditions to get some profits to the rainfed farmer by utilizing the subsequent receipt of rainfall.

MATERIALS AND METHODS

The experiment was conducted at the Agricultural Research Station, Utukur, Kadapa of Acharya N.G. Ranga Agricultural University during *kharif* and *rabi* seasons from 2017 to 2020. The soil of the experimental field was red sandy loam in texture with low nitrogen, medium in available phosphorus and high in available potash. The experiment comprised of two factors laid out in split plot design with replications. Treatments comprised of three sowing windows viz., August II fortnight,

September I fortnight and September II fortnight allocated to main plots and eight different crops and cropping systems viz., redgram (Asha), castor (DCH 514), cowpea (TPTC 29), horse gram (Local), black gram (TBG 104), foxtail millet (Suryanandi), red gram + cowpea (1:1) and red gram + horse gram(1:1). Green gram (WGG-42) was included from 2019 onwards only. The crops were sown at recommended spacings in the plots of size 7.5 m x 5.4 m. The normal rainfall for the YSR Kadapa district was 750 mm and out of four study years two years are normal rainfall years and one year was drought year and one was excess rainfall year. All the recommended agronomic and crop protection measures were followed as per ANGRAU package. Yield of various contingent crops were recorded from net plot area and extrapolated to hectare area. Economics of different treatments was estimated considering the prevailing market prices of the commodities during the season.

RESULTS AND DISCUSSION

Amount and distribution of rainfall during the study period

The data on amount of rainfall and number of rainy days is perused in Table 1. Out of four years of study, it was observed that during 2017 and 2019, sufficient amount of rainfall of 537.2 and 57 2m mwas received with well distribution of 29 and 37 days respectively. Whereas in the year 2020, almost double the rainfall of 1127 mm was received in 42 rainy days and the year 2018 is a severely drought year with receipt of only 123.2 mm rainfall in 11 rainy days resulting in failure of crops. The rainfed agro-ecology is characterized as vulnerable for agricultural operations which revolve around moisture availability due to rainfall pattern, amount, intensity and its uses for crop production (Dekha and Nath, 2000).

Performance of crops

During normal rainfall years of 2017 and 2019, the productivity was decreased with successive delay in time of sowing except for horse gram where higher productivity was observed with September II fortnight sowing which might be due to the optimum time of sowing of horse gram is September. The inter crops of cowpea and horse gram failed due to excessive growth of the main crop of red gram.

During deficit rainfall year of 2018, the crop performance was poor and even September II F.N crop was not taken up due to non-receipt of rainfall. Under these severely deficit rainfall conditions, Horse gram crop gave good yield compared to other crops and meager yield was also received from intercrops during this year due to poor growth of the main crop.

The performance of red gram, castor, cowpea and horse gram was satisfactory during high rainfall year of 2020. It was unable to harvest foxtail millet due to excessive rains and the crop was failed. Low yield in black gram and greengram was also due to excessive rainfall. Sahadeva Reddy *et al.* (2019) reported jowar, horse gram, cowpea, bajra and field bean as suitable contingent crops for delayed monsoon conditions in the scarce rain fall zone of Andhra Pradesh.Whereas Vikramarjun *et al.* (2019) reported french beans as the best contingent crop in Karnataka under delayed sowing conditions from August II fortnight to September II fortnight .

Economics

During 2017 and 2019, where sufficient rainfall was received during the crop period, satisfactorily

Table 1. Amount and distribution of rainfall during the crop growing period at different years

Month/year	2017		2018		2019		2020	
	Rainfall (mm)	Rainy days	Rainfall (mm)	Rainy days	Rainfall (mm)	Rainy days	Rainfall (mm)	Rainy days
August	153	8	51.6	5	168.8	8	144	8
September	158	10	19.8	2	126.6	9	406.8	11
October	96	6	37.0	2	181.2	10	147.4	5
November	30.4	3	14.8	2	50.6	5	314.8	10
December	-	-	-		23.4	2	47.8	5
January	-	-	-		9.0	2	55.4	2
February	-	-	-		-	-	10.8	1
March	99.8	2	-		11.4	1	-	-
Total	537.2	29	123.2	11	571	37	1127	42

Table 2. Productivity (Kgha^{-1}) of different crops as influenced by time of sowing under changing climate

Crop /cropping system/Year	2017			2018			2019			2020		
	Aug II F. N	Sep I F. N	Sep II F. N	Aug II F. N	Sep I F. N	Sep II F. N	Aug II F. N	Sep I F. N	Sep II F. N	Aug II F. N	Sep I F. N	Sep II F. N
Red gram	1497	1250	986	297	235	-	1542	1428	1271	1613	1411	1810
Castor	1353	1244	1203	244	225	-	1979	1651	1551	1847	2230	2300
Cowpea	2523	1722	1451	346	301		2667	1635	1543	1654	1648	1521
Horse gram	648	679	725	466	557	-	663	671	726	983	950	979
Black gram	648	557	562	211	-	-	632	583	565	386	609	411
Foxtail millet	636	638	535	9	13	-	652	950	777	155	-	-
Red gram + cowpea	1319	995	933	287124	273257	-	1642	1434	1171	1812	1725	1829
Red gram + horse gram	1493	825	771	125303	188254	-	1568	1428	1156	1742	1456	1991
Green gram	-	-	-	-	-	-	578	498	640	580	343	271

Table 3. Net returns (Rs ha^{-1}) realized bygrowing different crops at varied times of sowng under changing climate

Crop /cropping system/year	2017			2018			2019			2020		
	Aug II F. N	Sep I F. N	Sep II F. N	Aug II F. N	Sep I F. N	Sep II F. N	Aug II F. N	Sep I F. N	Sep II F. N	Aug II F. N	Sep I F. N	Sep II F. N
Red gram	54850	42500	29300	4850	1750	-	57100	51400	43550	60650	50550	70500
Castor	31414	27272	25714	-728	-1450	-	55202	42378	38938	50186	64740	67400
Cowpea	53305	25270	15785	2110	535	-	58345	22225	19005	22890	22680	18235
Horse gram	12680	13765	15375	6310	9495	-	13205	13485	15410	24405	23250	24265
Blackgram	25360	18990	19340	-4770	=	-	24240	20810	19550	7020	22630	8770
Foxtail millet	2260	2330	-1275	-	=	-	2820	13250	7195	-14575	-	=
Redgram + cowpea	43950	27750	24650	8690	12645	-	62100	51700	38550	68600	64250	69450
Red gram + horsegram	52650	19250	16550	6855	8290	-	56400	49400	35800	65100	50800	77550
Green gram	-	-	-	-	-	-	20460	14860	24800	20600	4010	-1030

higher returns of Rs 29300 to 57100/- were obtained by growing red gram at all times of sowing viz., August II F.N, September I F.N and September II F.N. This was followed by cowpea for vegetable purpose during August II F.N and castor during September I F.N and September II F.N. The crops like black gram and green gram are chance crops as rainfall at flowering results in flower drop and reduces yield drastically. Korra crop is not suitable for rainfed alfisols under contingency.

During the deficit rainfall year of 2018, net returns were calculated by reducing cost of cultivation to half as advanced operations after sowing like top dressing, sprayings were not performed due to severe drought. Horse gram is the best choice with returns of Rs 6310 to 9415/- at different times of sowing and inter cropping has some advantage over pure cropping under these conditions.

Under excess rainfall situations like the year 2020, the crops like red gram, castor, cowpea and horse gram gave comparatively higher returns than black gram and green gram as excess rains in these crops results in heavy vegetative growth with poor flowering.Prathyusha and Sampath Kumar (2019) reported higher net returns with cluster bean followed by foxtail millet and little millet under delayed monsoon conditions during September I and II F.N sowings.

CONCLUSION

It was concluded that red gram was found as best alternative under contingency with higher net returns followed by castor, cowpea and horse gram in rainfed alfisols of YSR Kadapa district of Andhra Pradesh during normal and excess rainfall conditions whereas horse gram was found as a choice under deficit rainfall conditions.

ACKNOWLEDGEMENTS

The author is grateful to the Acharya N.G. Ranga Agricultural University, Lam, and Guntur for providing financial support for conducting the trial.

Conflict of interest

There is no conflict of interest.

REFERENCES

Deka, R.L. and Nath, K.K. 2000. Rainfall analysis for rainfed crop planning in the upper Brahmaputra valley zone of Assam. *Journal of Agrometeorology*. 2: 47-53.

Prathyusha, C. and Sampath Kumar, D. 2019. Identification of Suitable Contingent Crops for Delayed Onset of Monsoon in Scarce Rainfall Zone of Andhra Pradesh. *Int. J. Curr. Microbiol. App. Sci*. 8(11): 1176-1178.

Sahadeva Reddy, B. and Ravindranatha Reddy, B. 2019. Evaluation of contingent crops for delayed onset of monsoon in scarce rainfall zone of Andhra Pradesh. *Journal of Agricultural Research and Technology.* 44 (1): 161-164.

Vikramarjun, M., Senappa, C., Thimmegowda, M.N. and Kalyanamurthy, K.N. 2019. Yield performance of different contingent crops under delayed sowings in chaging climate in rainfed agriculture. *Indian J. Dryland Agric. Res & Dev*. 34(2): 33-37.

Yellamanda Reddy, T., Murali Rao, M. and Padmalatha, Y. 1998. Identification of suitable contingent crops for arid tropics of Andhra Pradesh. Proceedings of Symposium on soil and water management for sustainable crop production. *Society of Agronomists of ANGRAU.* 27-30.