Performance of the resilient systems:

Advancing the sowing of pearl millet with pigeonpea during first week of June gives yield of 1209 Kg/ha yield and net returns of Rs.11046 per ha and benefit cost ratio of 2.7 compared to pearlmillet and pigeonpea sowing during July or August which is a low yield (954 Kg/ha), net returns (Rs.7501/ ha) and benefit cost ratio (2.1). Grain yield and net returns of pearlmillet were stable when pearl millet was sown in the month of June in all the years demonstrated while pearlmillet sown under delayed conditions recorded low yields in the pearlmillet+pigeonpea mixed cropping system.

Parameter	Practice	2011-12	2012-13	2013-14	2014-15	Mean
Yield(kg/ha)	Advanced sowing of pearl millet+ pigeonpea as intercropping system (ICS) in the first week of June	765 (9 No.)	1228 (59 No.)	701 (41 No.)	2140 (5 No.)	1209
	Sowing of Pearlmillet + pigeonpea mixed cropping system (MCS) in second fortnight of June	544	1046	625	1600	954
Net returns (Rs./ha)	Advanced sowing of pearl millet+ pigeonpea ICS	2650	11920	4015	25600	11046
	Sowing of Pearlmillet + pigeonpea mixed cropping system (MCS)	440	9190	2875	17500	7501
B:C ratio	Advanced sowing of pearl millet+ pigeonpea ICS	1.5	2.8	1.6	4.9	2.7
	Sowing of Pearlmillet + pigeonpea mixed cropping system (MCS)	1.0	2.4	1.4	3.6	2.1
RWUE (kg/ha-mm)	Advanced sowing of pearl millet+ pigeonpea ICS	2.4	2.9	1.3	6.0	3.1
	Sowing of Pearlmillet + pigeonpea mixed cropping system (MCS)	1.7	2.4	1.1	4.5	2.4

Pearl millet and pigeonpea (5:1) with advanced sowing

Impact:

Advanced sowing of pearlmillet +pigeonpea intercropping system was adopted in 60 ha by about 100 farmers every year in Girigetla micro water shed area in Thuggali mandal of Kurnool district.

Scope for up scaling:

This resilient practice has large scope for wider adoption under rainfed conditions in red soils of Kurnool and Anantapur districts of scarce rainfall zone of Andhra Pradesh with sensitization of farmers in the region, efforts by extension agencies and line departments in operationalization of contingency plans, timely availability of seed of pearlmillet and pigeonpea. If this practice is adopted even in 10000ha area in Kurnool and Anantapur districts, it is possible to achieve a production of 12MT of pearlmillet yield and 400 tons of pigeonpea seed yield under rainfed situation. Improved varieties of pearl millet and pigeonpea need to be included in the subsidy seed programme and crop insurance implemented by the Department of Agriculture, Government of Andhra Pradesh.

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PEARLMILLET + PIGEON PEA (5:1) INTERCROPPING SYSTEM: RESILIENT SYSTEM FOR RED SOILS OF SCARCE RAINFALLZONE OF ANDHRA PRADESH -A SUCCESS STORY

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Out of total cultivated area of 20.83L ha, rainfed agriculture is practiced in 16.93 lakh ha in Scarce Rainfall Zone of Andhra Pradesh comprising Kurnool and Ananthapuramu districts. The major cropping pattern under rainfed situations are groundnut + pigeonpea intercropping system, castor + pigeonpea intercropping system. Recurring droughts of 3 to 4 years are very common in this zone. The recent rainfall trends indicate delayed onset of monsoon by 15-20 days, seasonal drought during crop growing season by 15-20 days in the zone. Out of 22 years available district rainfall data (1985-2006) 14 years received deficit rainfall of varying from -6.5 to -57.0 %.The onset of rainfall is the predominant factor or in deciding cropping system in this region.These weather aberrations are impacting the sowing pattern, performance and productivity of rainfed crops. In this context agro-eco-region wise technologies for soil and moisture conservation, adoption of specific agronomic management for the prevailing aberrant situations through selection of variety, sowing time, interculture, plant protection and harvesting, which make efficient use of resources are the need of the hour.

AICRPDA- NICRA Programme :

Under National Initiative on Climate Resilient Agriculture (NICRA). the 23 network centres of All India Coordinated Research Project for Dryland Agriculture (AICRPDA), since 2011, have been demonstrating resilient practices in participatory mode in farmers fields. The focus has been to implement contingency measures to on real-time basis to cope with weather aberrations such as delayed onset of monsoon, early, midseason and terminal droughts during crop growing season. The Operational Research Project (ORP) centre and Main Centre of AICRPDA at Anantapuramu adopted Aminabad and Girigetla villages located in Girigetla micro watershed of Thuggali mandal in Kurnool district, Andhra Pradesh.

AICRPDA- NICRA Village:

In the adopted villages (Aminabad and Girigetla), the annual average rainfall is 620 mm while the rainfall in Thuggali mandal varies from 329.4 to 878.4mm, indicating high degree of variability. The normal onset of monsoon in the villages is first week of June, however in recent years, the onset and withdrawal are varying early by 15 days, respectively. Further, the amount and distribution during crop growing season resulting in prolonged dry spells affecting the production of major rainfed crops such as groundnut, castor and pigeonpea. Generally, in the adopted villages, farmers take up sowing of pearl millet / pearl millet + pigeonpea mixed cropping during July/ August only after completion of groundnut sowings and giving least importance to these crops which ultimately produced low yields. Under such situations, it was felt necessary to advance the sowing of these climate resilient crops to reap their potentiality. Hence, the cropping systems pearl millet + pigeonpea (5:1) was proposed and advanced sowing time was recommended.

Resilient Practice Introduced :

To develop climate resilient alternate cropping systems, pearlmillet and pigeonpea (5:1) inter cropping system was introduced with early sowing of pearlmillet + pigeonpea intercropping system in second fortnight of June to avoid mid-season/ terminal drought and was compared with performance of normal sown pearl millet + pigeonpea mixed cropping system during second week of July/ August.

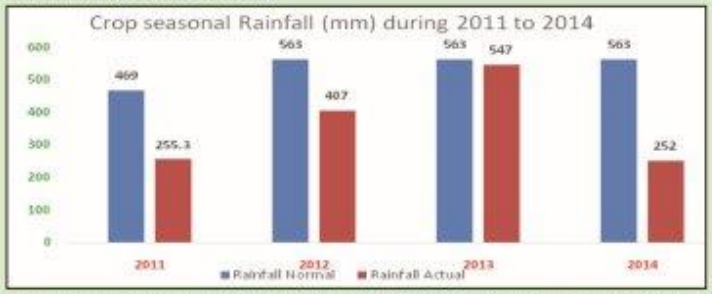
Summer ploughing is done on receipt of pre monsoon showers during April, May and June to conserve the soil moisture. The soil moisture conservation measures such as cultivation and sowing across the slope were done with the receipt of monsoon showers during June or July. Improved varieties of bajra (Navabharath) improved pigeonpea varieties (LRG-41and PRG-158) were preferred for sowing. Sowing of pearl millet and pigeonpea was done at 5:1 ratio with row to row spacing of 30 cm using bullock drawn seed drill. The fertilizers applied were 30 Kg N, 30 Kg P_2O_5 and 20 kg K_2O per ha were applied at the time of sowing as basal and 30 kg of N per ha at the time of knee high stage at 55 days after sowing. The conservation furrows are opened for every twelve rows of pearl millet at 20 and 40 days after sowing or with the receipt of rain during crop growth period immediately after intercultivation activity in the crop.

Weather experienced during 2011-14

a. Onset of monsoon (normal & actual)

The onset monsoon was delayed in 2011 and while the onset of monsoon was normal in the years 2012, 2013and 2014.During 2011 south west monsoon period, 255.3 mm was received in Girigetla micro watershed area, Thuggali mandal, Kurnool district as against normal rainfall of 469 mm. The rainfall received during south west monsoon period was 407 mm against the normal of 563 mm. during 2012.During crop growth period the rainfall received was 547 mm in 20 rainy days,in 2013 and mean crop seasonal rainfall (mm) during *kharif* was 547 mm. Whileactual rainfall received was 252 mm against normal rainfall of 563 mm during 2014.

b. Crop seasonal rainfall (Normal & Actual)



However, due to coincidence of dryspells with various stages of pearlmillet and pigeonpea, the crop do not perform well resulting in low yields.

c. Dry spells experienced

Table 1: Dry spells during crop growing season (2011-14)

Dry spell	Dry spells		Stage of crop Pearl millet	Impact of dry spells
	Duration (Days)	Period		
2011	15	13.06.11 to 28.06.11	Vegetative stage	Due to short duration crop growth was satisfactory with receipt of rains from tillering to harvesting
	24	22.08.11 to 16.09.11	Tillering to reproductive stage	
2012	17	21.06.12 to 07.07.12	Vegetative stage	Pearl millet able to withstand dryspells during initial stage and recovered with subsequent rains.
	11	09.07.12 to 19.07.12	Vegetative stage	
	11	04.08.12 to 17.08.12	Vegetative stage	
	10	24.08.12 to 02.09.12	Grain development stage	
	24	04.09.12 to 27.09.12	Grain development stage	
2013	15	02.06.13 to 09.07.13	—-	Pearl millet growth affected during tillering and grain development stage. Hence, reduction (49%) in yield was recorded.
	26	19.07.13 to 13.08.13	Vegetative stage	
	23	20.09.13 to 13.10.13	Grain development stage	
	59	13.10.13 to 31.12.13	Maturity stage	
2014	22	10.06.14 to 02.07.14	——	Pearl millet crop was able to with stand long dry spells during initial and middle stage of crop and recovered with receipt of rains.
	40	10.07.14 to 19.08.14	Vegetative stage	
	18	27.08.14 to 15.09.14	Grain development stage	
	18	17.09.14 to 06.10.14	Grain development stage	