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Compartment Bunding : A Drought Coping Practice

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In the Northern dry zone of Karnataka, the cultivated area under the rainfed situation is 32.3 lakh ha. The region is characterized majorly dry semi arid climate with the probability of two drought years out of five years. Potential evapo- transpiration is 1576 mm while, the mean annual rainfall is 594 mm. The length of growing period is 90-120 days. The major soil types are medium to deep black soils. Under the rainfed situation, the major crops cultivated during *kharif* are pearl millet, pigeonpea, greengram, groundnut, maize while sorghum, chickpea, sunflower and safflower during *rabi* season.

In recent years, the weather abrasions such as delayed on set of monsoon, seasonal drought and other extreme events are impacting on net crop sown area, performance and yield of prominent crops and ultimately on agricultural production.

AICRPDA- NICRA programme

Under NICRA, the AICRPDA Vijayapura since 2011 had been demonstrating the simple doable resilient rainfed technologies/practices to cope with various weather abberations in the region, the AICRPDA- NICRA programme being implemented, both on station and on farm (at village level). The main focus had been the demonstration of real time contingency crop plan implementation (RTCP) under on farm situation in a participatory mode. The centre adopted Kavalagi village for demonstrating this programme.

AICRPDA- NICRA Village profile

The program is being implemented in Kavalagi village, Vijayapura tehsil in Vijayapura district, Karnataka. The total cultivated area is 1327 ha out of which 1307 ha is rainfed. The mean annual rainfall is 606.8 mm with seasonal rainfall of 387.5 mm during *kharif* (June - September). The major soil types are shallow to medium deep black soils, shallow red soils and gravelly soils.

Location of the Kavalagi village in the Karnataka and in Vijayapura district

The major rainfed crops during *kharif* are pearl millet, pigeonpea, greengram, groundnut, maize and sorghum, chickpea, wheat, sunflower and safflower during *rabi* season. The number of small, marginal, medium and large farmers is 144, 53, 200 and 04, respectively. The ground water table is 70-90 m. below ground level The source of irrigation is open and bore- wells covering 1.5% of cultivated area.

Resilicnt Practice Introduced

Among the different technologies demonstrated, compartment bunding is one of the technology, which is well accepted by the farmers, the details of the technology, the performance, the impact and the performance are discussed in this bulletin.

In Northern dry zone of Karnataka, *kharif* cropping is not possible due to workability and tillage related constraint in medium to deep black soils. The soils of Vijayapura, Bagalkot and Koppal districts of Karnataka state are deep black soils. The infiltration capacity of the soil is very low and results in more runoff. *Kharif* cropping many a time is limited by the soil physical condition that prevents tillage related activities. Thus *rabi* season is only assured. In the absence of water conservation, the availability of moisture for *rabi* crops in the later part of the cropping season is very less to complete life cycle. Thus *rabi* yields may be not assured. The farmers are not following any in situ moisture conservation practices except field boundary bunds. Hence, conservation of moisture is most important to get better production.

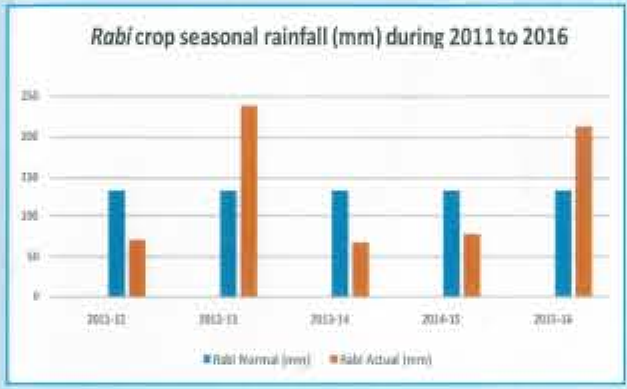
It involves making square compartments on the field to retain rain water and to arrest soil erosion. After receipt of early rains in June and July, land is harrowed to remove the germinating weeds. Then compartmental bunds (0.15 m height) are formed using bullock or tractor drawn bund former. The size of the bunds varies from 3x 3 m to 4.5 x 4.5 m depending on the slope. The cost of laying of compartment bunds is Rs 250/ ha, these bunds are retained till the sowing of *rabi* crops. Rabi crops are sown with seed cum fertilizer drill during second fortnight of September to first fortnight of October. Compartment bunds provide more opportunity time for water to infiltrate into the soil and help in conserving soil moisture. In most of the villages, the availability of bullock pairs are declining, under this context, recently, demonstrated the tractor drawn bund former in the farmers' fields. The farmers opined that the laying of the compartment bunds by the tractor drawn bund former is fast, it covers 1 to 1.5 ha per hour and cost of compartment bund would be 150 to 200/ha only.

Weather experienced during 2011-2015.

The onset of monsoon was delayed in 2014-15 (July 5) by 28 days, however, the onset of monsoon was quite normal during the years 2011, 2012, 2013 and 2015. Further, the early, mid season and terminal droughts are very common phenomena in the NICRA village. The dry spells of more than 10 days occurred 3,1, 2, 3 and 3 times during the year 2011-12, 2012-13, growth (Table 1). It was also noticed that during rabi season, after sowing hardly one or two rainfall events were observed, further there would be long dry spell.

Table 1. Duration of dryspells during 2011-15

Dry spells during the year	Duration (Days)	Dates & Months	Crops	Stage of the crop	Impact of dry spells
2011-12	[illegible]	June [illegible] to July [illegible]	Pigeonpea and pearl millet	Seedling stage / vegetative stage	Due to these dry spells some of the area of pearl millet and pigeonpea were vitiated
	14	July [illegible] to July [illegible]	Pigeonpea and pearl millet	Vegetative growth stage	
	[illegible]	August [illegible] to Sept [illegible]	Pigeonpea and pearl millet	Grand growth stage	
		Sept [illegible] onwards no rainfall	Pigeonpea and pearl millet and sorghum, chickpea and safflower	Grand growth stage	
2012-13	11	July [illegible] to August [illegible]	Pigeonpea, pearl millet, groundnut, horsegram and sunflower	Seedling stage / vegetative stage	There was not an impact of these dry spells on Kharif and rabi crops
		November 4 onwards no rainfall	Pigeonpea, pearl millet, groundnut, horsegram and sunflower, sorghum, chickpea and safflower	Groundnut has been harvested and other crops were Physiological maturity	
2013-14	11	July [illegible] to [illegible] August	Pigeonpea, pearl millet, groundnut, horsegram and sunflower	Seedling stage / vegetative stage	Due to these dry spells Final production was [illegible] per cent yield was decreased in pigeonpea, groundnut and pearl millet crops
	11	Sept [illegible] to Oct [illegible]	Pigeonpea, pearl millet, groundnut, horsegram and sunflower	Grand growth stage	
		Oct [illegible] onwards no rainfall	Pigeonpea, pearl millet, groundnut, horsegram and sunflower, sorghum, chickpea and safflower	Flowering stage	
2014-15	[illegible]	June [illegible] – July [illegible]	Pigeonpea, pearl millet and groundnut	Seedling stage / vegetative stage	Due to early season drought (dry spells) area of gross sown area of pigeonpea and pearl millet crop was decreased and overall production of these crops were less compared to Normal rainfall years
	[illegible]	Aug [illegible] – Aug [illegible]	Pigeonpea, pearl millet and groundnut	Growth and flowering stage	
	[illegible]	Sept [illegible] – Oct [illegible]	Sunflower, pigeonpea, pearl millet, sorghum, chickpea and safflower	Seedling/ vegetative, grand growth and maturity stage, respectively	
	[illegible]	Dec [illegible] – Jan [illegible]	Sunflower, pigeonpea, rabi sorghum, chickpea and safflower	Flowering and seedling stage	
		Mar [illegible] onwards dry spell	Pigeonpea, pearl millet and groundnut	Seedling stage / Vegetative stage	
2015-16	[illegible]	June [illegible] - July [illegible]	Pigeonpea, pearl millet, groundnut, greengram, horsegram, sunflower, cotton and chilli	Seedling stage	Due to prolonged dry spells pigeonpea and pearl millet, groundnut and some of the area of greengram has been vitiated. The yield of Kharif crops were less production compared to normal rain fall years
	28	July [illegible] to August [illegible]	Pigeonpea, pearl millet, groundnut, greengram, horsegram, sunflower, cotton and chilli	Vegetative growth stage	
	12	August [illegible] to August [illegible]	Pigeonpea, horsegram and sunflower	Vegetative to grand growth stage	
	[illegible]	September [illegible] to October [illegible]	Pigeonpea, horsegram, sunflower, sorghum, chickpea and safflower	Grand growth to flowering stage and seedling stage	



Rabi crop seasonal rainfall graph reveals that actual rainfall in three years out of five years was far less than the normal rainfall.

Performance:

The compartment bunding enhanced in-situ moisture conservation with mean rain water use efficiency (13.89) and resulted in mean chickpea seed yield of 1047 kg/ha with mean net returns of Rs. 26181 per ha. This higher yield is more significant even during the years of low rainfall (four years out of five years received the less than the normal rainfall). Further, during the year 2011-12, there was no rainfall after 11th September and also during the year 2015-16, there was no rainfall after 2nd October. In addition to this, the *rabi* seasonal rainfall recorded during the years 2011-12, 2013-14 and 2014-15 was around 50 per cent less than the normal.

Table 2. Performance of chickpea in compartment bunded area

Year		2011-12	2012-13	2013-14	2014-15	2015-16	Mean
Yield (kg/ha)	Compartment bunds	900	900	990	1243	1200	1047
	Without compartment bunds	550	625	816	975	775	748
Net returns (Rs/ha)	Compartment bunds	22865	23100	19010	35530	30400	26181
	Without compartment bunds	12715	13750	15584	26950	16800	17160
B:C ratio	Compartment bunds	3.35	4.08	5.00	4.86	4.80	4.42
	Without compartment bunds	2.34	2.83	4.90	4.31	3.10	3.49
RWUE (kg/ha-mm)	Compartment bunds	12.71	4.83	14.50	16.12	21.31	13.89
	Without compartment bunds	7.76	3.17	12.00	12.65	13.77	9.87

Chickpea with compartment bunding

Chickpea without compartment bunding

Impact:

Over the period of five years farmers in the NICRA village were convienced about the performance of the compartment bunding even during the abnormal years. This practice was adopted in 186 ha by 98 farmers during 2011-2015 in NICRA village and also by the farmers of the neighboring villages viz., Madbhavi, Honnutagi and Kumatagi. The technology was popularized through organization of the field days, publishing the popular articles in electronic and press media. This has resulted in further spread of technology in the Vijayapura district.

Scope:

In Norther dry zone of Karnataka, chickpea is grown around 6 lakh ha in black soils. This technology can be popularized for wider adoption in convergence with centre and state schemes like MGNREGA, Krishi bhagya, NHM etc.

If this technology is adopted by atleast 20 per cent of the area additional monetary benefit would be Rs. 94.32 crore. For wider adoption of this technology, there should be policy for availability of bund former either through custom hire centre or providing subsidy. The upscaling of the technology can be done through line departments, Krishi Vidynana Kendra (KVKs), Agricultural Technology Management (ATMA), Non-Governmental Organisation (NGO) etc. Large scale demonstrations can be taken up by line departments, KVK, ATMA, NGO and also through MGNREGA. Each year this activity can be included in the shelf of works of the Panchayat Raj system. Limitation of this system is connecting of the bunds at the junction by engaging one man day per ha.

For more details contact

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