

Performance of Kadiri Lepakshi (K-1812) groundnut in Anantapuram district of Andhra Pradesh, India

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ABSTRACT

The present investigation was carried out to analyze the performance and yield gap between improved variety (Kadiri Lepakshi) and farmer's practice (K-6) during 2020-21 and 2021-22 in rain shadow region of Anantapuram. The highest average pod yield was obtained with improved variety, Kadiri Lepakshi (1907kg ha⁻¹), followed by K-Harithandra (1387 kg ha⁻¹) compared to farmer's practice (1053kg ha⁻¹). The highest haulm yield was observed with Kadiri Lepakshi followed by K-6 and K-Harithandra. The average extension gap, technology gap and technology index during 2020-21 were 909 kg ha⁻¹, 126 kg ha⁻¹ and 5.6 respectively in Kadiri-Lepakshi. Whereas, during 2021-22 the average extension gap, technology gap and technology index were 1050 kg ha⁻¹, 360 kg ha⁻¹ and 1.6 respectively. The per cent increase in yield was 74.8, 33.7 and 125, 36.9 of K-1812 and K-Harithandra during 2020-21 and 2021-22 respectively.

Key words: Kadiri Lepakshi, K-Harithandra, K-6, OFT, Groundnut, Yield, Economics and Gaps.

Introduction

The major share of groundnut production in the country is contributing from the *rainfed* areas. The abnormal weather conditions, *i.e.* excess/untimely rainfall and frequent droughts cause a reduction in the average production of groundnut in the country. Now-a-days, due to abnormal weather conditions, increased labour wages, increased input costs and high incidence of pest/diseases, farmers fetching meager income. During the *khari*f season, groundnut is the highest area grown in the Anantapuramu district. During 2020-21, the actual area of groundnut was 4.80 lakh hectares against the normal of 4.60 lakh hectares. Whereas, the actual area of groundnut was 4.40 lakh hectares against the normal average of 4.67 lakh hectares during 2021-22. The average production of groundnut was decreasing year by year.

One of the mandates of Krishi Vigyan Kendra's

(KVK) is conducting on farm testing's to assess the production potential of newly released varieties/ technologies on farmer's fields at various locations in a given farming system to disseminate varieties/ technologies into the farming community, which is a unique approach for accelerating the production potential.

In the study area, the farmers are experiencing lower yields than the district and national average productivity. It might be due to the majority of groundnut cultivating area being occupied by old and traditional varieties of groundnut (K-6). It is released during 2005-06 from Agricultural Research Station, Kadiri and it crossed 17 years to be in the seed chain. However, the variety lost its potential yield in the farmers field, and more susceptible to the pest and diseases. Farmers preferred this old variety due to its appearance, tasty and light pink colour. Hence, awareness was there on various as-

pects, a minuscule of the farmers looking ahead for the high yielding, pest, disease, wilt-tolerant and attractive seeds that suit an average rainfall of 550mm and a growing period of 112 days.

Materials and Methods

The on-farm testings were conducted in groundnut during *kharif* season from 2020-21 and 2021-22 by the Krishi Vigyan Kendra, Reddipalli, Ananthapuramu district of Andhra Pradesh to evaluate the performance of Kadiri Lepakshi (K-1812) variety. A detailed survey of enthusiastic groundnut growers was conducted in the adopted villages, and a training programme was conducted for the selected farmers on the high yielding, pest and disease resistant, drought tolerant varieties of groundnut. Farmers were explained the characteristics, growing pattern, and cultivation practices, and information material was distributed to the selected farmers. Finally, the seed was distributed to the ten farmers in three adopted villages. Table 1 shows the number of demonstrations held each year, as well as the number of villages, mandals, and areas covered.

The variety Kadiri Lepakshi duration in *kharif* season is 112 days. It is resistant to pests, diseases and drought. The major advantage of the variety is it contains 28 per cent of proteins and 51 per cent of oil compared to 48 per cent of oil in kadiri-6. The average potential yield in *rainfed* region is 20-25 q ha⁻¹, whereas in irrigated conditions is 45-50 qha⁻¹. The shelling percentage is 70%. The observed cons of this variety are a slight inferior taste for table-top consumption, poor germination of seed and slightly observed dormancy compared to K-6. Very high yielding, profuse bearing spanish variety with high oil and high protein. It is multiple resistant for drought, pests and diseases and produces stable yields (15-20 qha⁻¹) even under severe drought.

The variety Kadiri Harithandra duration is 110-115 days during *kharif* season. The average potential yield in *rainfed* region is 20-25 qha⁻¹, whereas in irrigated conditions is 35qha⁻¹. The shelling percentage is 70%. It is high yielding, spanish bunch, medium duration, with tolerance to drought, sucking pests, leaf spots and rust. Stay green with high fodder value.

Farmers were provided the entire package and procedures, including high yielding variety, seed rate, seed treatment, soil testing, fertilizer application, timely weed management measures, integrated

pest management, and so on. Subject matter experts and a team from Krishi Vigyan Kendra, Reddipalli, visited the demonstration fields on a regular and periodic basis during various stages of crop growth, collecting important growth characteristics, yield attributing characters, and economics. The technology was demonstrated at three different villages of the district, which lies between the latitude 14.67690 to 14.97542 N, longitudes of 77.55084 to 78.02839 E and altitude of 335-349 m above MSL.

The study area's soils are red sandy loam *Alfisols*. Random crop cutting experiments was employed to gather the cross-sectional with-without (treatment-control) design from the farmer's practice and demonstration, which was then assessed using straight forward statistical techniques. Pod yield and straw yield from the net plot (5 x 5 m²) for each treatment were recorded at harvest. For recording growth characteristics including plant height (cm), the number of pods per plant, number of ill filled pods per plant and test weight, ten plants were randomly chosen from each treatment.

Gross returns (kg ha⁻¹), cost of cultivation (kg ha⁻¹), and net returns (kg ha⁻¹) were computed. Grain yield was multiplied by the prevailing market price for the commodity in each year to calculate gross returns. The cost of cultivation includes the cost of agricultural activities from seed to seed and labour wages at the current wage rate. Gross profits minus cultivation costs equal net returns.

Benefit Cost Ratio = Gross returns (kg ha⁻¹) / Cost of cultivation (kg ha⁻¹)

$$\% \text{Increase in yield} = \frac{(\text{Yield obtained in improved variety} - \text{Yield obtained in farmers variety})}{\text{The yield obtained in farmers variety}} \times 100$$

The technology gap, extension gap and technology index of the study were calculated as per the formulae given by Samui *et al.* (2000)

Technology gap = Potential yield – Demonstration yield
Extension gap = Demonstration yield – Farmers practice yield

Technology index = (Potential yield - demonstration yield) * 100 / Potential yield

Effective gain = Additional Returns - Additional cost

Results

Rainfall situation

The average monthly rainfall information for the Ananthapuramu district for 2020–2021 and 2021–

2022 was showed in Table 2. The average normal annual rainfall of 495.3 mm was observed in the district. The actual rainfall of 824 mm was received during 2020-21 whereas, during 2021-22 the actual rainfall of 663.3 mm was received. The critical development phases of crops saw drought conditions in August and September of 2021. The amount of rain that really fell in June and July was more than the average monthly rainfall during the research period, which allowed farmers to plant more groundnut seeds than usual. However, in August and September of 2021-22, the crop saw deficit rainfall and deviation of -57.7 and -73.3 during the phases of blooming and pod development. Consequently, farmers will have strong output in 2021-22 as a result of plentiful rainfall during the growing season. **Pod yield:** Highest pod yield was observed with Kadiri Lepakshi (K-1812), followed by Kadiri Harithandra and K-6 during 2020-21 and 2021-22.

The highest pod yield during 2020-21 was observed of 2124 kg ha⁻¹, 1624 kg ha⁻¹ and 1215 kg ha⁻¹ in K-1812, K-Harithandra and K-6 respectively. Whereas, 1690 kg ha⁻¹, 1150 kg ha⁻¹ and 890 kg ha⁻¹ was observed in K-1812, K-Harithandra and K-6 respectively during 2021-22. The percent increase in yield was 74.8, 33.7 and 89.8, 36.9 of K-1812 and K-Harithandra during 2020-21 and 2021-22 respectively. This could be attributed to a higher number of branches, pods per plant, and test weight, which is the essential yield attributing character for better yields. The highest haulm yield was observed with Kadiri Lepakshi followed by K-6 and K-Harithandra, it might be due to more number of branches and stay green nature of improved variety leads to retaining of leaves on plant till harvest, whereas in K-6, leaves fall off as it reaches to maturity as well.

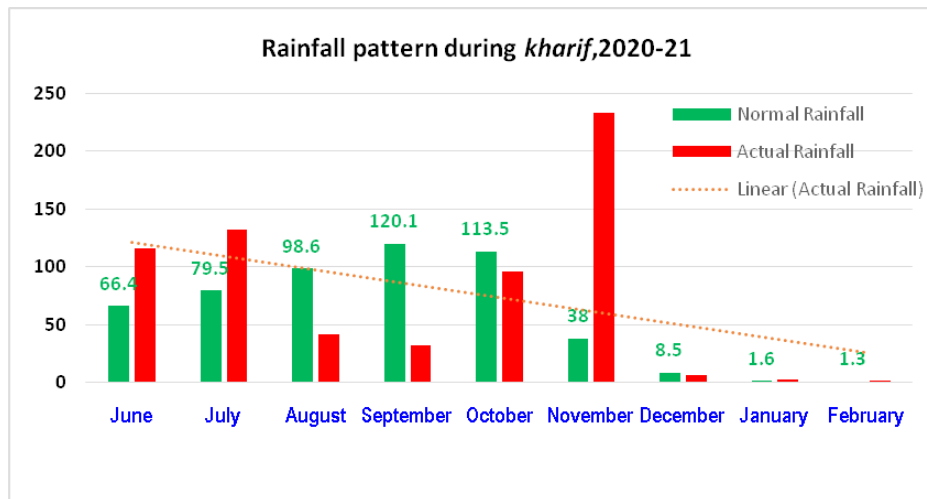
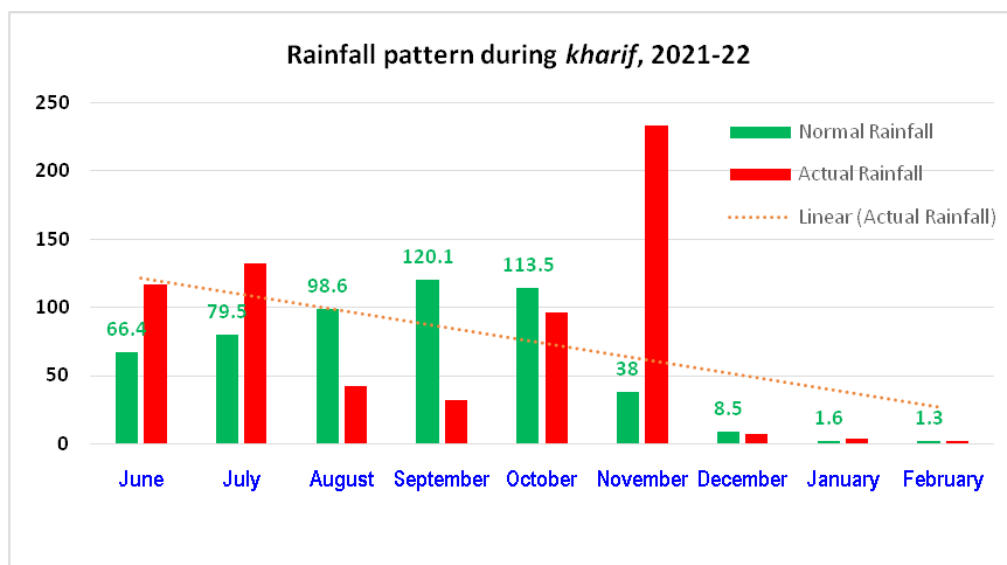


Table 1. Salient features of groundnut varieties assessed during the study period

S. No.	Variety	Duration (days)	Potential yield (q/ha)	Shelling %	100 seed weight (g)	Oil content (%)	Special features
1	Kadiri Lepakshi (K-1812)	112	20-25 (kharif) 45-50 (rabi)	70	40-45	51	Very high yielding, profuse bearing spanish variety with high oil and high protein. Multiple resistant for drought, pests and diseases.
2	K-Harithandra (kharif)	110-115	20-25 (kharif) 45-50 (rabi)	72	40-45	49	High yielding, spanish bunch, medium duration, with tolerance to drought, sucking pests, leaf spots and rust. Stay green with high fodder value.
3	K-6	100-105	20-22 (kharif) 40-42 (rabi)	72	40-45	48	Early, high yielding, spanish bunch, attractive kernel and synchronous maturity.



Growth parameters and yield attributes

The demonstration showed higher number of branches per plant, number of pods per plant and number of filled pods per plant compared to replaced variety and farmer's variety in the study period. As discussed earlier the number of pods per plant was higher in improved variety (19.5), followed by K-Harithandra (13.6) over control (10.2) in pooled years. The plant height of improved variety was lower compared to farmer's variety (K-6). The plant height is more in case of K-6 (37.4 cm) followed by K-Harithandra (25.9) and Kadiri Lepakshi (24.9) in pooled data. The number of branches were highest in Kadiri Lepakshi (10.6), followed by K-Harithandra (8.1) over control (5.6). Hence, it is yielded higher compared to other treatments. The test weight (mean 100 seed weight) in Kadiri Lepakshi was 26.1 g, but the test weight in check was

22.2 g. As a result, the demonstration yielded more than the control. The Kadiri Lepakshi stay green variety and produces more number of branches provided optimum space has to be maintained. The leaf area is also low compared to K-6. It seems to be small leaves. The one of the disadvantage is that, the improved variety has more number of unfilled pods compared to farmer's practice, it might be due to semi spreading nature of improved variety.

Economics analysis

Economic returns were observed as a function of yield and market price. The sale price of groundnut variety Kadiri Lepakshi was measured less due to middleman/millers in the market was procuring fewer prices compared to Kadiri Harithandra and K-6. The variety K-6 was procuring with highest price in the local market, it is due to good colour of

Table 2. Rainfall particulars of study area from 2020-21 to 2021-22

Month	Normal Rainfall	2020-21		2021-22	
		Actual	Deviation	Actual	Deviation
June	66.4	111.5	68	116.4	75.3
July	79.5	177.3	123	132.0	66.1
August	98.6	70.5	-29	41.7	-57.7
September	120.1	249.7	108	32.1	-73.3
October	113.5	119.3	5	96.2	-18
November	38.0	67.6	78	233.0	513.2
December	8.5	22.5	165	6.7	-27.0
January	1.6	0	-100	3.1	93.8
February	1.3	5.6	330	2.1	61.5
Total	495.3	824		663.3	

pod, taste and mostly using for table purpose. Total average gross returns realized from from K-Lepakshi, K-Harithandra and K-6 were 102420/- and 90970/-, 95320/- and 72850/-, 46470/- and 58710/- Rs ha⁻¹ during 2020-21 and 2021-22 respectively. It was observed that additional gain ranged from 35260 Rs ha⁻¹ to 52950 Rs ha⁻¹ with K-Lepakshi variety compared to K-6 and 20140 Rs ha⁻¹ to 45850 Rs ha⁻¹ in K-Harithandra compared with farmers practice, though the improved variety fetching less price in the market. The benefit cost ratio is also high for the K-Lepakshi (3.3 and 2.0 during 2021 and 2022 respectively) followed by K-Harithandra (3.0 and 1.6) compared to K-6 (1.6 and 1.3). The per cent increase in yield is also higher for K-Lepakshi followed by K-Harithandra. The higher gross returns, net returns and B:C ratio was due to higher pod yield and stover yield compared to farmer's practice. The demonstrated yield was higher than the average yield of the district, which was performed

with a crop cutting experiment by the Department of Agriculture (Table 6). The average district yield was 473 kg ha⁻¹ during 2020-21 and 519 kg ha⁻¹ during 2021-22. The effective gain was ranged from 32260 Rs ha⁻¹ to 49950Rs ha⁻¹ with K-Lepakshi variety compared to K-6 and 17140 Rs ha⁻¹ to 42850 Rs ha⁻¹ in K-Harithandra compared with farmers practice. These results were in conformity with that of Saravanan *et al.*, (2018) and Reager *et al.*, (2020)

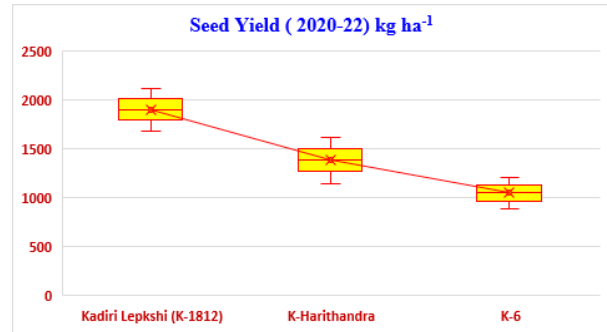


Table 3. Pod yield and economics of groundnut influence by on farm testings from 2020-21 and 2021-22

Particulars	2020-21			2021-22			Pooled		
	Kadiri Lepakshi (K-1812)	K-Harithandra	K-6	Kadiri Lepakshi (K-1812)	K-6	K-Harithandra	Kadiri Lepakshi (K-1812)	K-Harithandra	K-6
Seed yield (kg/ha)	2124	1624	1215	1690	1150	890	1907	1387	1053
Haulm yield (kg/ha)	2736	2132	2251	2760	1840	1964	2748	1986	2108
Gross income(Rs/ha)	102420	95320	46470	90970	72850	58710	96695	84085	52590
Cost of cultivation (Rs/ha)	31500	31500	28500	44500	44500	41500	38000	38000	35000
Net returns (Rs/ha)	70920	63820	17970	46470	31350	11210	58695	47585	14590
B:C ratio	3.3	3.0	1.6	2.0	1.6	1.3	2.5	2.2	1.4
% Increase in yield	74.8	33.7		89.8	36.9		82.3	35.0	
Additional gain	52950	45850		35260	20140		44105	32995	
Effective gain	49950	42850		32260	17140		41105	29995	

The selling price of K-Lepakshi is 4500/- per quintal, whereas K-Harithandra and K-6 are 5800/- per quintal during 2021-22

Table 4. Growth parameters of demonstration and farmers practice of groundnut as influenced by on farm trials from 2020-21 and 2021-22

Particulars	2020-21			2021-22			Pooled		
	K-Lepakshi	K-Harithandra	K-6	K-Lepakshi	K-Harithandra	K-Lepakshi	K-6	K-Harithandra	K-6
Plant height (cm)	25.9	26.5	36.4	23.8	25.3	38.3	24.9	25.9	37.4
No. of branches per plant	11.1	7.2	6.0	10.1	8.9	5.1	10.6	8.1	5.6
No. of filled pods per plant	21.1	15.4	11.5	17.9	11.7	8.9	19.5	13.6	10.2
Number of unfilled pods per plant	8.0	7.0	2.1	4.6	3.1	2.7	6.3	5.1	2.4
% Increase over farmers practice									
Plant height (cm)	-28.8	-27.2		-37.9	-33.9		-33.5	-30.7	-28.8
No. of branches per plant	85.0	20.0		98.0	74.5		91.0	45.0	85.0
No. of filled pods per plant	83.5	33.9		101.1	31.5		91.2	32.8	83.5
Number of unfilled pods per plant	281.0	233.3		70.4	14.8		162.5	110.4	281.0

who observed higher benefit-cost ratio through improved technologies in groundnut.

Technology gap

The technology gap is the difference between potential yield and demonstration yield. The technology gap was recorded 126 kg ha⁻¹, 626 kg ha⁻¹ and 1035 kg ha⁻¹ for groundnut varieties K-1812, K-Harithandra and K-6 respectively for 2020-21 and 360 kg ha⁻¹, 1100 kg ha⁻¹ and 1410 kg ha⁻¹ for 2021-22. During different years the disparity in technology gap may be attributed to more viability of preferred technologies differential pattern of rainfall over different years (Pawar *et al.*, 2018).

Extension gap

The extension gap is the difference between the demonstration yield and farmer's practice yield. The extension gap was recorded 909 kg ha⁻¹, 409 kg ha⁻¹ and 1050 kg ha⁻¹ and 310 kg ha⁻¹ for 2020-21 and 2021-22 respectively (Table 6). During the study, the extension gap between 310 to 1050 kg ha⁻¹ emphasized the needs to educate the farmers through various means for adoption of improved groundnut production technologies (Lakhani *et al.*, 2020). Strengthening of extension programs and location-specific on-farm research, encouragement and adoption of the improved package of practices lower the technology gap (Shankar *et al.*, 2022).

Technology index

The technology index is the technology gap divided by potential yield multiplied by 100. It indicates that, more scope is there potential to increase yield or due to more years of cultivation or long years to

stand in seed chain, it loses its potential yield. The highest technology index was recorded for K-6, followed-Harithandra and K-Lepakshi, *i.e.* 62.6 and 46.0 during 2022 and 2021 respectively. The lowest technology index indicates the yield obtained was nearer to the potential yield. Therefore, the technology index was between 5.6 and 1.6 during the study period, illustrating that farmers reached potential yield. This emphasized the role of Krishi Vigyan Kendra to train the non-beneficiary farmers through various means for the adoption of improved cultivation practices of groundnut Dash *et al.*, 2021.

Conclusion

The on farm testing's organized by KVK, Reddipalli, Ananthapuram, Andhra Pradesh had significantly increased yield and economics of groundnut by introduction of high yielding variety (Kadiri Lepakshi). The average pod yield of groundnut was increased by 82.3 per cent in improved variety, 35.0 per cent in replacing variety over the farmers' practice. The gross returns, net returns and benefit-cost ratio were higher in demonstrations as compared to the farmers' practice. The additional gross returns, net returns, additional cost with incremental benefit-cost ratio were high in improved practice. The study showed the positive response of demonstrated variety over the existing practices in respect to yield enhancement and economic return of groundnut in the Ananthapuram district of Andhra Pradesh.

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Table 5. Details of area particulars, average yield of district and production

Particulars	2020-21	2021-22
Normal area of groundnut (ha)	4,60,137	4,67,436
Actual area (ha) in Ananthapuram district	4,80,595	4,40,988
Average yield (kg/ha) Crop cutting experiment	473	519
Production (MTs)	2.28 Lton	2.5 Lton

Table 6. Extension gap, technology gap and technology index for 2020-21 to 2021-22

Particulars	2020-21			2021-22		
	K-1812	K-Harithandra	K-6	K-1812	K-Harithandra	K-6
Extension gap (kg/ha)	909	409	—	1050	310	-
Technology gap (kg/ha)	126	626	1035	360	1100	1410
Technology index	5.6	27.8	46.0	1.6	48.8	62.6
Additional return	40905	23722		47250	17980	

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