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# Performance and economic impact of Pigeaon pea-(BDN-711) under drought condition in NICRA Village of Marathwada region of Maharashtra

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**Abstract**
Identifying drought tolerant Variety for Marathwada region of Maharashtra appears to be the major challenge to increase the productivity. Tolerant crop variety with consistently higher yields under deficit rainfall is of paramount importance. Rainfed crops are more vulnerable to climate change because of the limited options for coping with variability of rainfall and temperature. In addition there are another natural vagarious were identified like dry spell ranging from 10-15 days occurred in every year, decreased in rainy days, increased intensity of rainfall, erratic behaviour of rainfall, unseasonal rains occur in the month April-May, heavy incidence of frost occurs in the month of September-January in NICRA Village. The productivity and economic returns of pigeon pea in improved technologies were calculated and compared with the corresponding farmer's practices (local check). Improved practices recorded higher yield as compared to farmer's practices. The improved technology recorded higher yield of 1267kg/ha over farmers practice 942 kg/ha. In spite of increase in yield of pigeon pea, technology gap, extension gap and technology index existed. The improved technology gave higher gross return (60945 Rs. /ha), net return (51436 Rs. /ha) with higher benefit cost ratio (3.19) as compared to farmer's practices. The variation in per cent increase in the yield was found due to climate vulnerability. It is concluded that the demonstrations of BDN-711 variety of Pigeaon performed well under drought condition.

**Keywords:** Climate resilient, Pigeaon pea, drought, adaption, NICRA

## Introduction
Pigeon pea (*Cajanus cajan* (L.) Millsp.) is an important rainfed legume crop for millions of smallholder farmers in India and in many other countries of the tropical and subtropical regions of the world. In India, it is cultivated in about 3.6 M ha and contributes about 20% to the total pulses production of the country. However, its average productivity has remained strikingly low at about 760kg /ha. To work out a suitable strategy to improve the productivity of pigeon pea, it is imperative to assess the potential yield in the region of interest and gap between the potential and actual yield obtained by the average farmers. This analysis in turn also helps to know the major factors associated with these yield gaps for a given location or a region.

Considering the extreme vulnerability of dryland farming to climate change and significant rise in the frequency of extreme weather events in recent year. ICAR has launched National Innovation in Climate Resilient Agriculture (NICRA) project to enhance the resilience of Indian Agriculture. As party of this initiative extensive technology demonstration of location specific best-bet practices are conducted on farmer's field.

Technology demonstration component (TDC) of NICRA aims at demonstration of proven technologies to enhance the adaptive capacity and to enable farmers cope with current climatic variability. Location specific technologies which are developed by the National Agricultural Research System (NARS) which can impart resilience against climatic vulnerability are being demonstrated.

Technology demonstration is the main component of NICRA conducted in a systematic manner in farmer's field to worth of new practices/ technology the baseline survey was conducted by Krishi Vigyan Kendra and it was found that farmers were using traditional varieties which are frequently affected by terminal drought. Keeping in view the constraint, Krishi Vigyan Kendra, Aurangabad conducted demonstration on pigeon pea BDN-711 with crop management practices in Shekta village.

## Materials and Methods

Technology demonstration on pigeon pea variety BDN-711 was conducted by Krishi Vigyan Kendra, Aurangabad in NICRA (National Innovations in Climate Resilient Agriculture) during the period from 2012-2016 in Shekta village of district Aurangabad. The total 100 number of demonstration was conducted in these villages. In general soil of the area under study was medium to heavy, low to medium fertility status. The component demonstration of technology in pigeon pea was comprised i.e. improved variety BDN-711, short duration, escaping terminal drought, and wilt resistant. Totally 40ha of area was covered in five consecutive years. In the demonstration, one control plot was also kept where farmers practices was carried out. The demonstration were conducted to study the technology gap between the potential yield and demonstrated yield, extension gap between demonstrated yield and yield under existing practice and technology index. The yield data were collected from both the demonstration and farmers practice by random crop cutting method and analyzed by using simple statistical tools. The technology gap, extension gap and technological index [3] were calculated by using following formula as given below-

## Results and Discussion

During five years of technologies results obtained are presented in Table-1. The results revealed that the demonstration on pigeon pea an average yield was recorded 1267 kg/ha under demonstrated plots as compare to farmers practice 942 kg/ha. The highest yield in the demonstration plot was 1983 kg/ha during 2016and in farmers practice 1260 kg/ha during 2016. These results clearly indicated that the higher average grain yield in demonstration plots over the years compare to local check due to drought resistant of BDN-711 variety. The average yield of pigeon pea increased 32.64 per cent. The yield of pigeon pea could be increased over the yield obtained under farmer's practices of pigeon pea cultivation

## Technology gap

The technology gap, the differences between potential yield and yield of demonstration plots were1100,1000,1050,1300, and 217 kg/haduring2012,2013,2014,2015, and 2016, respectively. On an average technology gap under five year demonstration programme was 933.4 kg/ha. The technology gap observed may be attributed to dissimilarity in the soil fertility status, agricultural practices and local climatic situation.

## Extension gap

Extension gap of 300,300,150,150, and 723, kg/ha was observed during haduring2012, 2013, 2014, 2015, and 2016 respectively. On an average extension gap was observed 324.60 kg/ha which emphasized the need to educate the farmers through various extension means i.e. demonstration for adoption of improved production and protection technologies, to revert the trend of wide extension gap. More and more use of latest production technologies with high yielding varieties will subsequently change this alarming trend of galloping extension gap.

## Technology index

The technology index shows the feasibility of the demonstrated technology at the farmer's field. The technology index varied from 9.86 to 59.09 per cent. On an average technology index was observed 42.42 per cent, which shows the efficacy of good performance of technical interventions. This will accelerate the adoption of demonstrated technical intervention to increase the yield performance of pigeon pea.

## Economic return

The inputs and outputs prices of commodities prevailed during the study of demonstration were taken for calculating net return and benefit: cost ratio [Table- 2].

The cultivation of pigeon pea under improved technologies gave higher net return Rs. 29600, 33500, 33685, 51500, 76287, per ha over to farmer's practice Rs. 16800, 22300, 26708, 49750, 40490, during 2012,2013,2014,2015, and 2016 respectively. The benefit: cost ratio of pigeon pea cultivation under improved cultivation practices were 2.65, 2.98, 3.20, 2.94, and 4.19, as compared to2.10, 2.43, 1. 80, 2.71and2.75 under farmer's practice.

This may be due to higher yield obtained under improved technologies compared to farmer's practice.

## Adaption and spread of BDN-711

Pigeaon pea BDN-711 is suitable to medium to heavy soil of Maharashtra. In Shekta Village frequent drought and terminal moisture stress during flowering and pod development stages generally result in lower yield of Pigeaon pea. Introduction of drought tolerant, short duration, wilt resistant variety of BDN-711 with 150-155 days duration is an alternative to long duration (180 days) varieties which face moisture stress at flowering and pod development stages. Result indicated that Pigeaon pea variety BDN-711 with improved production technologies gave higher yield 1430.60kg per ha than that farmers practice 1127.38kg per ha.

High income and economic security of climate resilient variety covered 80% in the village during last few years as a intercrop and sole crop. During 2019-20 kharif season the BDN-711 was cultivated in 1720 ha benefiting 2800 farmers and spreading in Aurangabad Dist.

## Conclusion

The Demonstration of BDN-711 produces a significant positive result and provided the researcher an opportunity to demonstrate the productivity potential and profitability of the latest technology (Intervention) under drought situation, which they have been advocating for long time. The productivity gain under demonstration over existing practices of pigeon pea cultivation created greater awareness and motivated the other farmers to adopt suitable production technology of pigeon pea in the district.

Therefore, for enhancing the production & productivity of pigeon pea crop, strategy should be made for getting the more and more recommended technologies adopted by the farmers.

$$\textbf{Percent increase yield} = \frac{\text{Demonstration yield-farmers yield}}{\text{Farmers yield}} \times 100$$

$$\textbf{Technology gap} = \text{Potential yield-Demonstrated yield}$$

$$\textbf{Extension gap} = \text{Demonstrated yield – Yield under existing practice}$$

$$\textbf{Technology index} = \frac{\text{Potential yield - Demonstrated yield}}{\text{Potential yield}} \times 100$$

**Table 1:** Yield, technology gap, extension gap and technological index of pigeon pea variety BDN-711

| Year | Demo No. | Area (ha) | Average yield (kg/ha) | | Per cent increase | Technology gap (kg/ha) | Extension gap (kg/ha) | Technological index (%) |
|---|---|---|---|---|---|---|---|---|
| | | | Demo | Farmers practice | | | | |
| 2012 | 20 | 08 | 1100 | 800 | 37.5 | 1100 | 300 | 50.00 |
| 2013 | 20 | 08 | 1200 | 900 | 33.33 | 1000 | 300 | 45.45 |
| 2014 | 20 | 08 | 1150 | 1000 | 15.00 | 1050 | 150 | 47.72 |
| 2015 | 20 | 08 | 900 | 750 | 20.00 | 1300 | 150 | 59.09 |
| 2016 | 20 | 08 | 1983 | 1260 | 57.38 | 217 | 723 | 9.86 |
| Total/Average | | | 1267 | 942 | 32.64 | 933.4 | 324.60 | 42.42 |

**Table 2:** Economic impact of BDN-711 variety of pigeon pea

| . Year | Demo No. | Area (ha) | Gross Income (Rs./ha) | | Net Return (Rs./ha) | | B:C Ratio | |
|---|---|---|---|---|---|---|---|---|
| | | | Demo | Farmer's Practice | Demo | Farmer's Practice | Demo | Farmer's Practice |
| 2012 | 20 | 08 | 44000 | 32000 | 29600 | 16800 | 2.65 | 2.10 |
| 2013 | 20 | 08 | 50400 | 37800 | 33500 | 22300 | 2.98 | 2.43 |
| 2014 | 20 | 08 | 33685 | 60000 | 33685 | 26708 | 3.20 | 1.80 |
| 2015 | 20 | 08 | 76500 | 63750 | 51500 | 49750 | 2.94 | 2.71 |
| 2016 | 20 | 08 | 100142 | 63630 | 76287 | 40490 | 4.19 | 2.75 |
| Total/Average | | | 60945 | 51436 | 44914 | 31210 | 3.192 | 2.358 |

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