

## Case Study: Promoting Pigeon Pea with System of Intensification

### Context

The rising water crisis of the world, is attracting attention towards consumption patterns. India, which displays a meagre 38% water efficiency, needs a closer look at its water usage, especially because despite being home to the largest population in the world, it holds only 4% of the available water resources. With up to 70% of the water consumption in India being accounted for by agriculture, there is a dire need to address the traditional farming technique and to create and propagate alternative methodologies that promote water efficiency.

The Indo- Gangetic plains, which is a fertile plain, with highest population density (776 persons/sq. km)<sup>1</sup> and low per capita farm land holding, (0.88 ha). This has created a pressure on households to increase farm productivity resulting into an over exploitative behaviour of community towards natural resources, including water. Due to about 75% of net sown area being irrigated<sup>2</sup>, a water intensive cropping pattern has evolved in the region contributed mainly by introduction of improved high yielding crops and varieties, to meet the food security and economic well-being of farming households.

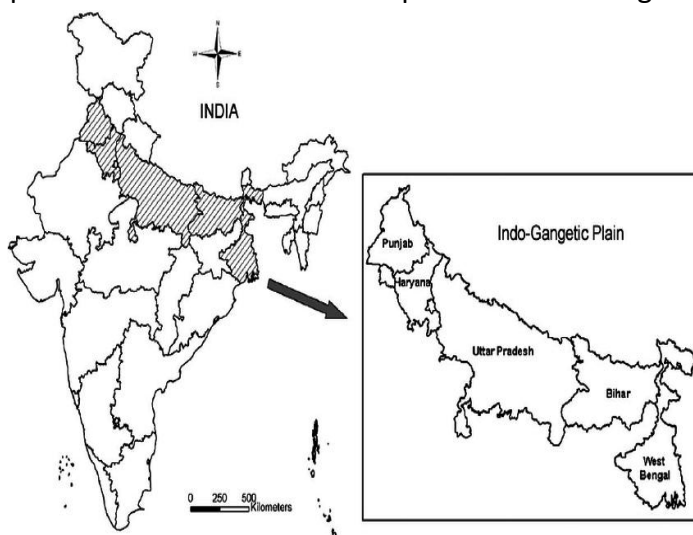


Figure 1: Image source: [www.researchgate.net](http://www.researchgate.net)

Major source (90% area) of irrigation in this region is tube-well. Since availability and access to ground water and energy is not a limiting factor, especially with no cost attached to water, the use and wastage of water in agriculture and for day-to-day domestic course is quite liberal with almost no recycling.

Most common cropping system of region consists water intensive crops of wheat, sugarcane, paddy, vegetables and at some locations mint (for menthol), besides mustard and limited area under pulses. Most common and preferred pulse for consumption in rural household of this region is Pigeon pea, locally also called 'tuar dal'.

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### Background Information

<sup>1</sup> Trends in Agriculture in Ganga basin, Dec'2011 by Consortium of IITs

<sup>2</sup>Trends in Agriculture in Ganga basin, Dec'2011

PANI (People's Action for National Integration) has partnered with HUF (Hindustan Uniliver Foundation) to initiate a program 'Water for Public good' as project implementing agency (PIA), with involvement of 10 grass root NGO sub-partners of PANI for ground implementation of project. This program kick-started in November 2014 with the prime goals to optimize water uses/ productivity and improving economic situation of 26500 small and marginal farmers by promoting water efficient and sustainable agriculture practices amongst community. This project has been layered over an on-going agro based livelihood program - FASAL, also under implementation by PANI at the same locations, funded and supported by Tata Trusts.

### **Pigeon Pea- A Look at the Challenge**

Yield of Pigeon pea is very low at 6-7 quintal per hectare (against state average of 8 q/ha), due to several reasons like, use of mostly undisruptive and self-retained poor quality seed by farmers, cropping under degraded or unfertile soil and poor agronomic practices (mainly broadcast method of sowing with high plant population with practically no after care). Gradually, already low area under Pigeon pea has shown further reduction during recent past due to unfavourable economic return to farmers, frequent infestation of pod borer insect & diseases like sterility mosaic virus and wilt. High crop damage by raising population of wild blue bull (*Neel Gai*) is also quoted as one of the reason by the farmers not to go for this crop.

In 'Water for Public Good' program, one of the strategies to optimize water use in agriculture is to promote low water demanding crops and reduce the area under crops of high water demand. Pigeon pea was identified as one potentially strong crop to take the area under wheat and paddy, which being a crop growing through *Kharif and Rabi* practically doesn't need irrigation, less labour intensive and being leguminous crop not so nutrient exhaustive, rather it adds to soil nitrogen and contribute to sustainability of soil fertility. It stands out economically much favourable than wheat-paddy cycle to farmers with low cost of cultivation.

Government has been intervening to promote pulse production through various programs like 'Oil Seed & Pulses Development Program' and National Food Security Mission. Under the ambit of Indian Council of Agricultural Research, large number of high yielding varieties and matching integrated crop management technologies have been developed having capacity to enhance pulses production to the tune of 25-30% within short span. Certain policy support is provided to address various issues like quality input supply, storage,

buffers stock for seed and grains, remunerative MSP (Minimum Support Price) and procurement.

In above context, it was imperative to intervene through a well-designed intervention to achieve dual objectives of water conservation and addressing pulse production, both being issues of national importance.

## Strategies

### Design Principle:

To increase the area under Pigeon pea by making it more remunerative for farmers than regular paddy-wheat crop cycle. Achieve phenomenal production enhancement, through introducing improved varieties, proven and efficient crop management practices and sustainable crop protection measures.

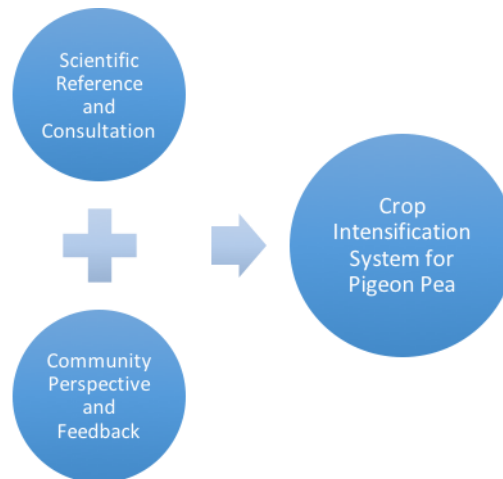


Figure 2: Intervention Design Strategy

### Intervention Introduced:

A detail Package of Practice was developed and drafted on the basic principles of Crop Intensification System, incorporating a reported practice of nipping by ICRISAT and other scientists<sup>3</sup> to increase the yield. Problem of disease and pest infestation was addressed through NPM and sustainable preventive recommendations.

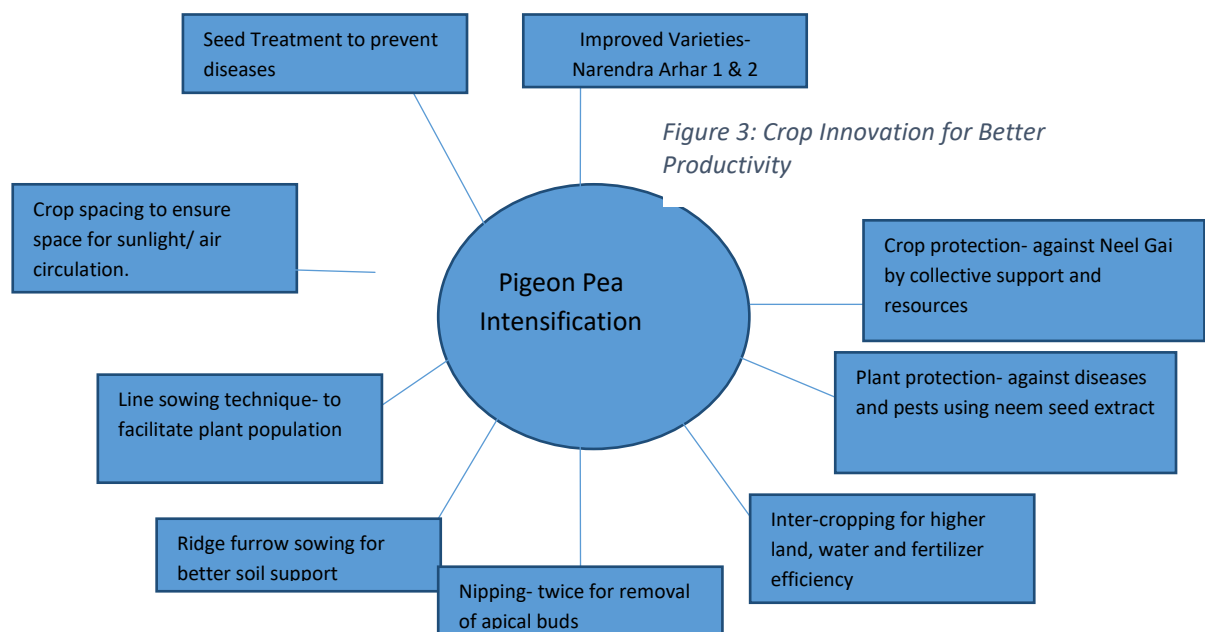


Figure 3: Crop Innovation for Better Productivity

<sup>3</sup>Arjun Sharma et al (2003) and Mallikarjun C (2012)

## Process for Adoption and Scaling up of Intervention

### Intervention Objective

Out of the total 120 Gram Panchayats being involved with the intervention, an estimated target has been set to make the project success in creating a behavioural change to lead to better farming techniques in pigeon pea. A few measurable outcomes are expected to reflect as direct outcomes of the intervention

- Through intervention 8000 households will adopt the practice,
- A total of 2000 (acres) in area to be utilized for Pigeon Pea cultivation,
- 3000 tonnes of production quantity in terms of grains and 7000 tonnes as biomass are expected as a result of this intervention.
- As compared to traditional cultivation of paddy-wheat cycle, pigeon pea farming is expected to lead to an incremental income of INR 40000 per acre.
- As a result of all the above, it is estimated that up to 14 MCM water will be saved by the alternative farming system.

### Change in Perspectives of Various Actors

It has been understood that to achieve the final objective of water efficiency and conservation, immediate outputs, especially in terms of production and financial gain, are powerful factors to influence the farmers for a behaviour change. A change in perspective before and after the intervention revealed a positive growth incentivised by comparative results of farming techniques propagated through the intervention. This can be assessed at various levels



Figure 4: A flowering Pigeon Pea crop cultivated with intensification method

### **Community Feedback on Adoption**

A visibly positive response was observed amongst farmers who adopted the technique. Many stated that the quality of grains and yield had been appreciably better through this mechanism. Simultaneously, pest and disease infestation was observed to be minimized. For next crop cycle, several farmers plan to cultivate pigeon pea in larger field area as it is more profitable as compared to yield of traditional paddy-wheat crop cycles.

*“This cropping methodology has changed my perspective about Aarhar dal. With this year’s cultivation, we have now sufficient pulse for self - consumption, otherwise, we never ate pulses in our daily food as it was usually unaffordable. But now things have changed. We will even help other farmers to cultivate pigeon pea.”*

- Suraj Singh, Faizabad, Uttar Pradesh

### **Other Farmers Observation**

For farmers who did not adopt through the intervention this year, the experience has been commonly one of inspiration. Their feedback reveals surprise and appreciation of the plant size- “they grow like a small tree instead of a simple plant.” There is acknowledgement of considerable increase in yield observed during crop cutting. Additionally, in lieu of the comparable profit, farmers are motivated to collectively address challenges of *Neel Gai*. A common consensus around cultivating pigeon pea through the intensification method has been achieved. Furthermore, farmers also seem to agree that intercropping of Pigeon pea with ground nut, pumpkin and other pulses is a lucrative technique to adopt.

Other stake holders like **Gram Pradhans (Village leaders) and Government officials** of agriculture & allied departments are also acknowledge the efficiency of the intensification method and agree to encourage and support its production. The credibility of the success also increases as government officials (like- ADO Ag.) endorse the intensification process highlighting low cost and high yield as the best incentives.

### **Pigeon Pea- a jack of all crops!**

Stake holders support intensification in cultivation of Pigeon Pea for its multifaceted qualities. It supports cottage pulse industry, household pulse sufficiency, fodder, fuel. Additionally, the crop is also credited with providing nutritional security as a high protein food. With the high price in the market, Pigeon pea can provide considerable economic benefit to poor farmers.

### ***Feedback from Program team / Front -line Workers of Program***

For the central program team as well as the sub-partners, along with the front line workers, the education and promotion of the intensification methodology in Pigeon Pea has brought its own share of learnings. The initial

#### **Additional benefits of Pigeon Pea Cultivation**

- Biomass production potential is high (2.5:1)
- Provides good cooking fuel to community
- Useful for making thatch house, wooden basket.
- Increases soil fertility
- Animal fodder potential -with processing waste

resistance from the farmers was around maintaining recommended distance of planting because of a lack of trust in the mechanism and the risk of wasting precious land and using lesser seeds. However, once the benefits were technique was understood through adoption, the intervention actors now believe that area expansion and scaling up is likely in the next season because of high yield, lesser water consumption and because over all, it is a low cost intervention. It overall produces a yield three times higher than the national average.

### **Outcomes:**

Over all, it has been observed through the intervention that an alternative methodology of high yielding crop with low water consumption is possible to employ.

In the year 2015-16 of the intervention, 739 farmers adopted the system intensification technique for pigeon pea cultivation. A total of 240.5 acres of land were employed in arhar farming in that year with an average productivity of 1.2 tons per acre.

A good sign of acceptance and viability of the intervention revealed itself as these numbers almost doubled in the year 2016-17 as more than 1600 farmers adopted the technology in a farming area of more than 500 acres.

Instead of using a top down approach by enforcing an intervention, since the strategy and design is built bottom up with the grass root context, challenges and perspective in mind, the intervention has produced a high acceptance and likelihood to expand in the future. With high yield and

consequential increase in income, the risk and threat perception (Neel gai, disease and pest etc.) nullifies or at least decreases appreciably.