



A research study on creation of seed hubs for increasing indigenous production of pulses in India

K. Ramakrishna ✉

KrishiVigyan Kendra, Palem, Nagarkurnool dist. Professor JayashankarTelangana State Agricultural University, Telangana State, India.

T. Prabhakar Reddy

KrishiVigyan Kendra, Palem, Nagarkurnool dist. Professor JayashankarTelangana State Agricultural University, Telangana State, India.

M. Rajashekhar

KrishiVigyan Kendra, Palem, Nagarkurnool dist. Professor JayashankarTelangana State Agricultural University, Telangana State, India.

B. Rajashekhar

KrishiVigyan Kendra, Palem, Nagarkurnool dist. Professor JayashankarTelangana State Agricultural University, Telangana State, India.

Adi Shankar

KrishiVigyan Kendra, Palem, Nagarkurnool dist. Professor JayashankarTelangana State Agricultural University, Telangana State, India.

Afifa Jahan

KrishiVigyan Kendra, Palem, Nagarkurnool dist. Professor JayashankarTelangana State Agricultural University, Telangana State, India.

Jagan Mohan Reddy

KrishiVigyan Kendra, Palem, Nagarkurnool dist. Professor JayashankarTelangana State Agricultural University, Telangana State, India.

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ABSTRACT

KVK, Palem, Nagarkurnool district Telangana state was allotted with the seed hub project entitled with Creation of seed hubs for increasing indigenous production of pulses in India. With the project buy back policy KVK was procured 284 quintals of Greengram (WGG 42), 571 quintals of Redgram (PRG 176), 234 quintals of Blackgram (PU 31) and 2.2 quintals of Horsegram (CHRG 19) from the farmers and INR 13, 49,989 was earned by the 51 farmers as additional income from seed production. Total 1,091 quintals of pulses seed was procured by KVK, Palem, during 2016 to 2020. (4years).Seed production was implemented on farmers' fields across different villages of Nagarkurnool and Jogulamba Gadwal districts based on farmers experience in pulse seed production through buy back agreement. These quality seeds covered through our intervention nearly 7,690 hectares, contributing 16 to 18 per cent of total cropped area under cultivation of pulses in Nagarkurnool district. The total gross amount realized from pulses seed production programme in the four years (2016-17, 2017-18, 2018-19 and 2019-20) was INR 1.24 crores. The net profit to KVK, Palem, is INR 41, 92,086. The profit generated out of seed sale has been utilized by Seed-Hub for development of additional facilities/workforce as needed for scaling quality seed production of pulses. It is noteworthy that this programme generated employment opportunities for rural youth, farm workers and farm women as seed production is a skill oriented work. Regular and timely management practices reduce additional expenditure while producing seeds, so that no additional labour and special input costs were incurred. Socio-economic status of the farmers has improved due to generation of additional income through seed production as compared to general cultivation.

Introduction

Between 1965 green revolution period and 2001, the production of pulses has increased negligibly whereas the production of wheat increased greatly. Thus, we can say that the Green

Revolution was more successful in increasing the production of wheat as compared to pulses.

Quality seed production is one of the most critical components for ensuring quality seed supply of

pulses at the doorstep of farmers. Provision of quality seeds is an important step in enhancing the yield and production of pulses. Replacing old varieties from seed chain and farmers' fields remains a major concern among research managers, extension workers and other stakeholders. Realizing importance of quality seed in enhancing productivity of pulses, Department of Agriculture, Cooperation & Farmers Welfare (DAC&FW), Government of India (GOI), approved a special project "Creation of seed hubs for increasing indigenous production of pulses in India" worth INR 225.31 crores during 2016 involving eight ICAR Institutes, 47 centers of All India Coordinated Research Projects (AICRPs) located in State Agricultural Universities (SAUs) and 95 Krishi Vigyan Kendras (KVKs). The main objective of this project was to ensure supply of quality seed and maintain sustainability with profitability to the farmers locally by developing suitable infrastructure for seed quality enhancement, safe storage and seeds development.

India holds the 1st position in means of production of pulses (it shares the ¼ of world production) (FAOSTAT 2010). Majorly six states are contributing 80 percent of Indian pulses production as well as Area and they are M.P, Maharashtra, U.P, A.P, Karnataka and finally Rajasthan (Directorate of Economics and Statistics, Department of Agriculture and Cooperation, 2010). In India all vegetarians are meeting their required proteins in diet through pulses only and cereals will compliments the proteins in daily diets, 22-24 percent of proteins holds with vitamins, minerals and amino acids, when we compare this with rice it is three times and two times with wheat, creates the noticeable difference in point of health and pulses are also reduce many diseases like non communicable vize., cardiovascular and cancers related to colon (Yude *et al.*, 1993; (Jukanti *et al.*, 2012). Chickpea has 40 percent production in total pulses than Redgram 18-20 percent, 11% with Greengram, 10-12 percent with Blackgram, and lentil with 8-9 percent and 20 percent with other pulses. According to the advanced estimates population may reach nearly 1.68 billion by 2030 and at present we have 1.21 billion populations. We need to produce 32 million tonnes pulse production by the 2030 with 4.2 percent expected growth rate (IIPR Vision 2030). Good quality seed availability is the fundamental problem to increase the

productivity. Actual needed quality seed for pulse production is 33 lakh quintals but 28 lakh quintals only available for replacing rate (Ali *et al.*, 2016). Generally 20-25 percent protein content withholds by pulses and they have the ability to atmospheric nitrogen fixation like ca 30-150 kg/ha creates minimum guaranteed returns and man days for work this is how pulses are making best place in world agriculture (Ali and Gupta 2012). By the initiation of AICPIP all India coordinated pulse improvement project in the year 1966. With these pulses improvement was intensified (Singh and Singh 2016). Many number of high yielders in pulses with all resistance or tolerance to many diseases (Chauhan *et al.*, 2016).

Material and Methods

The seed hub project (12-11/2016-NFSM- Seed Hubs/1492) was allotted to KVK, Palem, during 2016-17 and a one-time grant of INR 50 lakhs was sanctioned in the first year for creating infrastructure such as seed processing plant and storage facility. In addition to this, INR 1 crore has been allocated to the seed hub as revolving fund to meet expenses for production, procurement and processing of seeds. At KVK Palem, the seed production was implemented on farmers' fields across different villages of Nagarkurnool and Jogulamba Gadwal districts.

Farmer Selection

Farmers were selected based on prior experience in pulse seed production and availability of adequate irrigation. The selected farmers were already a part of the seed production programme of Telangana State Seed Development Corporation (TSSDC) and had good knowledge and skills for undertaking quality seed production. Their fields were equipped with appropriate irrigation, infrastructure and assured irrigation.

Farmer Training

Farmers were trained by KVK staff in seed certification procedures *viz.*, online registration, rouging, isolation distance, field inspection, seed processing and geo-tagging. The KVK conducted four on-campus trainings with 110 farmers and training was divided into two sessions for four batches. Two off-campus trainings were conducted with 45 farmers and training was divided into two sessions for two batches in farmers' fields.

Seed Distribution

Subsequently, breeder seeds of different varieties of red gram, green gram and black gram were distributed by the KVK to seed producing farmers for producing foundation seed in farmers' fields. During the last four years (2016-2020), with the support of KVK, Palem, 51 farmers have produced seed.

Field Inspections

Inspections and field visits were organised by scientific staff of KVK, Palem, certification officers and NFSM (National Food Security Mission) consultants during cropping period to create awareness of production technologies of pulses.

Buy Back Policy

Under the buy-back policy, farmers and KVK entered into a Memorandum of Understanding (MoU). The farmers agreed to follow suggestions the KVK makes with respect to seed production including quality, purity, other management practices and sell seeds to the KVK based on the price offered by the University.

Promoting appropriate varieties

Seed production of newly released and high yielding/farmer preferred varieties were taken up as per fixed targets. In Pigeonpea (red gram) production, there has been a consistent demand for wilt resistant, short and medium duration varieties owing to terminal moisture stress usually experienced by the mid-late and late cultivars that were hitherto grown. The recently released Pigeonpea variety, PRG-176 (Ujwala), is a short duration (140 days) variety that suits well in areas where the crop is grown on light red soils under rainfed conditions. Green gram is an important pulse crop predominantly grown in Khammam and Warangal districts of Telangana. With concerted breeding efforts of scientists, the variety WGG-42 was recently released by PJTSAU, Hyderabad. The variety WGG-42 is an extra early duration (60 days), resistant to yellow mosaic virus, uniform maturity with long pods and shiny bold seeds. Black gram variety PU-31 is highly suitable and popular in the farming communities of Khammam and Mahabubnagar districts.

Results and Discussion

Economic Benefits to the Farmer due to Best Integrated Crop Management Technology

KVK, Palem, procured 284 quintals of green gram (WGG 42), 571 quintals of red gram (PRG 176), 234 quintals of black gram (PU 31) and 2.2 quintals of horse gram (CHRG 19) from the farmers. The details of seeds procured during the four years, 2016-17 to 2019-20, and their procurement price are given below in Table 1. INR 13,49,989 was earned by the 51 farmers as additional income from seed production. It might be because of good seed bed, soil position and ideal tillage for crop stand establishment it will help in root and shoots development initially. Pulses need deep plough in Kharif then harrowing twice and then planking. Similarly in Rabi season plough, harrowing and planking. One time irrigation may be given if water is available. In zaid season Greengram Crop refuge may be incorporated with the help of deep plough to improve cereal based cropping system it may increase the succeeding crop productivity, income and status of soil (Pooniya *et al.*, 2014). Sowing time will play major role in crop development and reduce the biotic and abiotic factors these are all leads to increase in unit area production (Ali *et al.*, 1998). Crop spacing may vary with season, variety, planting method. Narrow spacing will be convenient for early duration pulses while the broad spacing needs the crops which are long in duration for spreading the stature.(Choudhary *et al.*, 2014b). According to the weather conditions and crop duration seed requirement may differs. Initially, per meter population decides the seed requirement (Prasad. 2012). Ridge and furrow method of planting gives 25- 30 percent more yields when we compare with flat bed plantings in case pulses in Kharif season (Singh and Singh. 2008 *et al.*, Das *et al.*, 2014). Use of fertilizer in right time, method, and dose will increase use efficiency of fertilizers and mean while it maintains the soil health (Das *et al.*, 2014). India's most pulse crops are under rainfed condition in Kharif season. Pulses needs good drainage facilities they are highly sensitive to the excessive water conditions (Sharma *et al.*, 2005). Fluchloralin used as pre plant incorporation and pendimithalin used as pre emergence herbicide followed by one hand weeding at 30 days after sowing results higher yields in pea at Jabalpur (Madhya Pradesh) (Mishra and Bhan., 1997).

Table 1: Details of seeds procured by the KVK from 2016-2020

SN	Crop	Local Market Rate of the seed (Rs./Q)	KVK Procurement Rate (Rs./Q)	Additional Amount by ICM technology (Rs./Q)	Quantity Procured (Q)	Total Additional amount (Rs.) over local rate
2016-17						
1.	Greengram	6,310	7,500	1190	26.4	31,416
2.	Redgram	5,600	6,515	915	216.9	1,98,463
3.	Blackgram	9,100	11,000	1900	28.8	54,720
4.	Horsegram	4500	5500	1000	2.2	2200
Total						2,86,799
2017-18						
1.	Greengram	5,310	6,515	1205	32	38,560
2.	Redgram	5,700	7,500	1800	129	2,32,200
3.	Blackgram	9,200	11,000	1800	64.76	1,16,568
Total						3,87,328
2018-19						
1.	Greengram	6,200	7,500	1300	88.79	1,15,427
2.	Redgram	5,800	7,000	1200	182.70	2,19,240
3.	Blackgram	6,800	7,500	700	133.11	93,177
Total						4,27,844
2019-20						
1.	Greengram	7,050	8,300	1250	136.82	1,71,025
2.	Redgram	5,800	7,500	1700	42.14	71,638
3.	Blackgram	6,800	7,500	700	7.65	5,355
Total						2,48,018

(Ahmad *et al.*, 1999) integrated pest management protocols proved that for controlling the gram pod borer NPV 250 LE per hectare then cypermethrin 0.02 percent with 10 days gap was recorded the significant change in yield when we compared to nuclear poly hydrosis virus then cypermethrin second place. Integrated disease management vize. Crop rotation, solarisation of soil, cultivation of resistant varieties and summer deep plough, fungicide seed treatments like captan, vapam, and use of neem cake 150 kg per hectare to minimize the root rot disease. Arbuscularmycorrhizae will also do the same in pulses disease management. (Kumar *et al.*, 2014). As per the (FAO), holistic approach like ICM was developed in recent years to reduce all problems like weed, water, fertilizer, pest and disease management (Varatharajan *et al.*, 2019). Proper growth and yield both efficient

irrigation and moisture management are essential in pulses. In case of less water availability for legumes, the irrigation water must be applied at critical growth stages using simple irrigation scheduling approaches like IW/CPE ratio as mentioned (Rana *et al.*, 2014). Very recently integrated crop management practices were generated and it was created the good difference as well as relation when we compare to single practice like weed irrigation, soil and biotic factors. Researchers kept many efforts to improve the crop productivity and are also included the soil condition improvement. (Das *et al.*, 2013). It is noteworthy that this programme generated employment opportunities for rural youth, farm workers and farm women as seed production is a skill oriented work. Regular and timely management practices reduce additional expenditure while producing seeds, so that no additional labour

Table 2: Economic benefit to KVK Palem from pulse seed sale.

SN	Material sold	Quantity sold (quintals)	KVK sale Price (Rs/Q)	Gross amount earned (Rs)	Procurement price paid to farmers	Net profit to KVK, Palem
2016-17						
1.	Greengram	26.4	11,000	2,90,400	1,98,000	92,400
2.	Redgram	216.9	11,000	23,85,900	14,13,103	9,72,797
3.	Blackgram	28.8	13,000	3,74,400	3,16,800	57,600
4.	Horsegram	2.2	11,000	24,200	12,100	12,100
Total		274.3	-	30,74,900	19,40,003	11,34,897
2017-18						
1.	Greengram	32	11,000	3,52,000	2,08,480	1,43,520
2.	Redgram	129	11,000	14,19,000	9,67,500	4,51,500
3.	Blackgram	64.76	13,000	8,41,880	7,12,360	1,29,520
Total		225.76	-	26,12,880	18,88,340	7,24,540
2018-19						
1.	Greengram	88.79	11,000	9,76,690	6,65,925	3,10,765
2.	Redgram	182.70	11,000	20,09,700	12,78,900	7,30,800
3.	Blackgram	133.11	13,000	17,30,430	9,98,325	7,32,105
Total		404.6	-	47,16,820	15,09,031	17,73,670
2019-20						
1.	Greengram	136.82	11,000	15,05,020.00	11,35,606	3,69,414
2.	Redgram	42.14	11,000	4,63,540.00	3,16,050	1,47,490
3.	Blackgram	7.65	13,000	99,450.00	57,375	42,075
Total		186.61	-	20,68,010.00	15,09,031	5,58,979

and special input costs were incurred. The buy-back policy of KVK, Palem, has been quite satisfactory for the farmers and 12-18 per cent higher procurement price was paid over prevailing minimum support prices of the government. The additional income earned from seed production helped farmers start other enterprises, thus opening newer avenues for further development for them.

Economic benefit to the KVK, Palem (Institution) due to technology

The quantity of pulse seed produced at KVK, Palem, sold to farmers during the period 2016-2020 and the amount earned by the KVK is given below in table 2. 1091 quintals of seeds of pulses were produced by KVK, Palem during 2016-20. Accordingly, these quality seeds covered acreage of 7,690 ha which is contributing 16 to 18 per cent of total cropped area under cultivation of pulses in Nagarkurnool District. The total gross amount realized from pulse seed production programme in the four years (2016-17, 2017-18, 2018-9 and 2019-20) was INR 1.24

crores. The net profit realized to the KVK, Palem is INR 41, 92,086. The profit generated out of seed sale has been utilized by Seed-Hub for development of additional facilities/workforce as needed for scaling quality seed production of pulses.

Impact of the Project from 2016-17 to 2019-20

We have covered almost 7,690 ha area of Nagarkurnool, Mahabubnagar, Narayanpet, Wanaparthy and Jogulamba Gadwal, parts of Nalgonda and Ranga Reddy districts. The total number of farmer beneficiaries is 9,481 (Table 3) who are getting 25-30 per cent higher profits than before. Cultivation of long duration crops like cotton and red gram in rainfed conditions without technical knowledge leads to increased cost of cultivation and reduction in net income. This is a recurring problem faced by farmers of erstwhile Mahabubnagar district, parts of Nalgonda and Ranga Reddy districts. Even in pulses crops (red gram, black gram and green gram) farmers are getting low yields (an average of 4-6 quintals/acre).

Table 3: Area coverage and number of farmers seed during 2016-17 to 2019-20.

Crop	2016-17		2017-18		2018-19		2019-20		Total Impact	
	Area Covered (Acres)	No. of farmers	Area Covered (Acres)	No. of farmers	Area Covered (Acres)	No. of farmers	Area Covered (Acres)	No. of farmers	Area Covered (ha)	No. of farmers
Redgram	3615	1807	2150	1075	3045	1523	1456	743	4106	5148
Blackgram	480	240	1079	540	2218	1109	-	-	1511	1889
Greengram	440	220	536	268	1479	740	2313	1202	1907	2430
Horse gram	27	14	0	0	0	0	-	-	11	14
Total	4562	2281	3765	1883	6742	3372	3769	1945	7535	9481

due to lack of availability of quality seeds. Therefore, we introduced our good quality varieties like PRG-176 (Ujwala) in red gram, PU-31 in black gram and WGG-42 (Yadadri) in green gram. In addition, we also provided technical guidance for integrated crop management for these crops. As a result, with all these practices, farmers are now able to produce 7-8 quintals/acre with minimum cost of cultivation.

Conclusion

This programme has attracted several farmers of the district to pulses seed production in a farmer participatory mode not only in their main field but in the marginal land as well, resulting in additional expansion of pulses cultivation over 7,690 ha during last three years (2016-2019). Additionally, productivity of Blackgram (*Vigna mungo* (L.)

Hepper) or urd, Greengram (*Vigna radiata* (L.) Wilczek) or mung, and Redgram (*Cajanus cajan* (L.) has increased around 200-300 kg/ha with the implementation of the seed hub project. It has generated year-round two-three fold more income for farmers.

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Conflict of interest

The authors declare that they have no conflict of interest.

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