Int.J.Curr.Microbiol.App.Sci (2018) *7*(4): 3862-3868

International Journal of Current Microbiology and Applied Sciences
***ISSN: 2319-7706* Volume 7 Number 04 (2018)**
Journal homepage: http://www.ijcmas.com

Original Research Article https://doi.org/10.20546/ijcmas.2018.704.435

Seed Village Programme - A Boon to the Rice Growing Farmers for Variety Replacement with Economic Stability

G. Narappa[1], R.B. Negalur[2*], D.H. Roopashree[1] and G.S. Guruprasad[3]

[1](Agronomy), KVK, Koppal (Gangavathi), India
[2]AICRP on Weed Management, UAS Raichur, India
[3](Agril. Entomology), AICRP on Rice, ARS, Gangavathi, India

**Corresponding author*

Keywords

Seed village, Rice, Variety replacement, Gangavathi sona, economic stability

Article Info

Accepted:
30 February 2018
Available Online:
10 April 2018

A B S T R A C T

Tungabhadra project (TBP) irrigates almost 5.20 lakh ha area, out of which 3.50 lakh ha area of three districts of Karnataka and 2 lakh ha area of Andra Pradesh. In Karnataka it covers part of Koppal district mainly Gangavathi and Koppal talukas, where in Rice is the predominant sole double crop and hence rightly called as "Rice Bowl of Karnataka". Ever since the rice cultivation has begun, BPT-5204 is the predominant *Kharif* variety covering almost 90-95 per cent of rice growing area and of recent became prone to multiple pest and disease resulting in increased cost of cultivation. TBP command area is characterized by intensive cultivation (Both fertilizer and pesticides). In such a situation, an alternate high yielding variety to BPT-5204 and assured market was the need of the hour. As a coincidence central government sponsored seed village programme was allotted to KVK, Koppal (situated at Gangavathi) for introduction of new variety during 2011-12. The seeds of newly released variety Gangavathisona (GGV-05-01) by Agricultural Research Station, Gangavathi were distributed to farmers at 50 per cent subsidized rate. After harvest the yields were higher than BPT-5204, economics indicated that higher net returns of Rs. 3,124/ha can be obtained simply by changing the variety. Further as the variety was new to the ecosystem, the incidence of most of the pests and diseases were lower compared to BPT-5204. Gangavathisona (GGV-05-01) was a duel season variety and was suitable to be grown in both *Kharif* and *Summer* seasons

Introduction

In rice production, India ranks second as it is grown in almost all the states of the country. Total estimated area under rice in India is 42.50 mha with a production of 100.12 million tones with a productivity of 2400 kg ha^{-1} (Anonymous, 2015). West Bengal has the highest rice production, while Punjab has the highest productivity of rice among the different rice growing states of India. Rice (*Oryza sativa* L.) is the major staple food for more than half of the global population. Rice is the anchors of food security in the world with challenges of climate change, which is grown under wide range of latitudes and altitudes. The World's total estimated area under rice production is 157.8 mha with a production of 749.8 mt with an average yield of 4752 kg ha^{-1} (FAO, 2015).

Seed is the starting point of agriculture and dictates ultimate productivity of other inputs. Quality seed of improved varieties is an important basic input for enhancing productivity of any crop species. As the quality deteriorates during subsequent generations, the old seed must be replaced with fresh lots of quality seeds. Therefore, it is necessary to improve the availability of quality seeds to raise the Seed Replacement Rate (SRR). To meet the potential challenge of catering to the food need of our country, a quantum increase in agricultural productivity is very much essential and hence production and distribution of high quality seeds of improved varieties/ hybrids to the farming community is becoming increasingly important. However, existing mechanisms to meet the quality seed requirements of small-scale farmers are not adequate and have serious limitations. In spite of many efforts, seed supply particularly of food grain crops is still a serious concern today, with the private seed sector reluctant to produce and market seeds due to economic considerations (Hedge, 2004). Lack of timely availability of good quality seeds of high-yielding varieties is one of the major constraints contributing to stagnant yields of major crops (Dheeraj Singh *et al.,* 2014).

A village, wherein trained group of farmers are involved in production 'of seeds of various crops and cater to the needs of themselves, fellow farmers of the village and farmers of neighboring villages in appropriate time and at affordable cost is called "a seed village concept". To upgrade the quality of farmer-saved seed, which is about 80-85% of the total seed used for crop production programme, as the SRR (Seed Replacement Rate) in most crops is below the scientifically desirable level of 25 per cent in respect to self- pollinated crops (Kapoor, 2006). Seed village programme was implemented by Krishi Vigyan Kendra, Koppal (Gangavathi) with the objective of organizing seed production cluster, increasing seed production for meeting local demand, increasing seed replacement rate as well as for introduction of new crops. Seed village concept is to promote the quality seed production of foundation and certified seed classes.

Materials and Methods

Koppal is situated between 15* 09' 00" to 16* 03' 30" North atlitude and 75* 47' 30" to 76* 48' 10" East Longitude. It consists of four talukas *viz.,* Koppal, Gangavathi, Kustagi and Yelburga. Koppal district is surrounded by Raichur district in the east, Gadag district in the West, Bagalkot district in the north, Bellary district in the south. The two talukas, namely Koppal and mainly Gangavathi of district Koppal are being irrigated by Tungabhadra project (TBP) / reservoir constructed across Tungbhadra river, where in Rice is the predominant sole double crop.

BPT-5204 was the predominant *Kharif* variety covering almost 90-95 per cent rice growing area and become prone to pest and disease resulting in increased cost of cultivation. Central government sponsored seed village programme was allotted to KVK Koppal (Gangavathi) for the introduction of new variety during 2011-12 for variety replacement. Under this program, a survey was made in both the talukas to identify the interested farmers ready to replace regular BPT-5204 with new Gangavathi sona (GGV-05-01) for obvious reason, after identification quality seeds of newly released and improved variety of paddy released by ARS, Gangavathi *i.e.,* Gangavathi sona (GGV-05-01) were distributed by the KVK, Koppal to the identified farmers from districts like Koppal, Raichur, Bellary in the beginning and extended to Yadgir and Davanagere in the subsequent years covering around 63 vilages since 2011-12 to 2014-15 (Table 1).

Each farmer was supplied with 25 kg seeds required for an acre at 50 per cent subsidized rate. Number of off campus and on field trainings programmes on seed production technology for the identified farmers in the selected seed villages were also arranged on seed treatment, raising nursery, maintaining isolation distance, identifying off type plant and other agronomic practices. With the help of record of quantity of initial seed distributed to the identified farmers, seed spread from farmers to farmers was recorded with identified farmers during survey conducted to study horizontal study, who supplied the seeds to neighboring farmers during subsequent seasons and so also the cumulative area over the years. Information concerning variety-wise area under paddy crop, sources of seed, seed rate, time of sowing and harvesting, the yield obtained and economics of cultivation of both BPT-5204 (Sona) and Gangavathisona (GGV-05-01) was calculated. The SRR for paddy crop was worked out for certified seeds using Equation

$$SRR = \frac{C \times 100}{A \times K}$$

Where,

SRR = Seed replacement rate for the paddy crop,
C = Certified seeds used by the farmers,
A = Area under the paddy crop, and
K = Seed rate per unit of area.

Results and Discussion

In India, nearly more than 85 per cent of the seed used in farming is produced by the farmer himself (Banerjee, 1984). Farmers in developing countries often have three major sources of seed, *viz.*, seed purchased from a formal seed industry; seed obtained from other farmers and self-retained seed from the previous year's crop (Tetley *et al.,* 1991) (Fig. 1).

Impact of improved variety

The variety Gangavati sona suitable for both *Kharif* as well as summer season in TBP area. The experiment's findings revealed that there was a substantial increase in the grain yield and net returns of the selected variety of paddy as compared to the present popular variety used by the farmers (Table 2). It was moderately tolerant to Brown plant Hopper (BPH) damage, a major insect pest of the region and Neck blast disease. Its unique character of complete panicle exertion with about 1-2" out- side the flag leaf as compared to helps plant to resist occurrence of neck blast unlike in checks, which, either of them have 0-0.5" panicle exertion paving the way for the development of neck blast in favorable condition. The rice variety Gangavathi sona yielded on an average 74.25 q/ha as compared to 70.85 q/ha from variety BPT-5204 (Sona). It matured ten days earlier to BPT 5204, gives best grain yield even at soil salinity (EC 6.5 to 8.5 ds/m). These results are in accordance with the results of Singh *et al.,* (2012), Verma and Sidhu (2009) and Dheeraj Singh *et al.,* (2014) who stated that improved agricultural technologies and varieties significantly increased the yield of crops under normal climatic conditions. Research suggests that there is a good potential for improving performance and productivity in the agricultural sector which can only be attained through positive transformation of the sector, including increased availability and use of improved seed varieties (Ampofo, 1990).

Economic impact

The comparison was also made to determine the economic benefit of the improved variety Gangavathi sona and to compare it with the existing popular variety BPT-5204 (Table 3).

Table.1 Distribution of rice seeds var. Gangavathi sona under seed village scheme from 2011-12 to 2014 -15 at KVK and ARS, Gangavathi

Sl. No.	Year	Name of the District	Number of Villages	Qty (q)	Total No. of Farmers
	011-12				
1		Koppal	16	271.5	1086
2		Raichur	2	25.75	103
3		Bellary	2	28	112
		Total	**20**	**325.25**	**1301**
	2012-13				
1		Koppal	1	12.5	50
2		Raichur	2	28	112
3		Bellary	1	10	40
		Total	**4**	**50.5**	**202**
	2013-14				
1		Koppal	8	64.5	258
2		Raichur	15	190.75	893
3		Bellary	4	76.5	186
4		Yadgir	1	12.5	50
5		Davanagere	1	5	20
		Total	**29**	**319.25**	**1407**
	2014-15				
1		Koppal	1	7.5	30
2		Raichur	7	75	300
3		Bellary	2	21.25	85
		Total	**10**	**103.75**	**415**

Table.2 Comparison of yield between Gangavathi Sona & BPT-5204

Parameters	Gangavathi sona	BPT-5204	Over local
Average yield (q/ha)	74.25	70.85	3.40 q more
Straw yield (q/ha)	84.65	80.06	4.59 q more
Duration (days)	130 to 135	140 to 145	10 days early

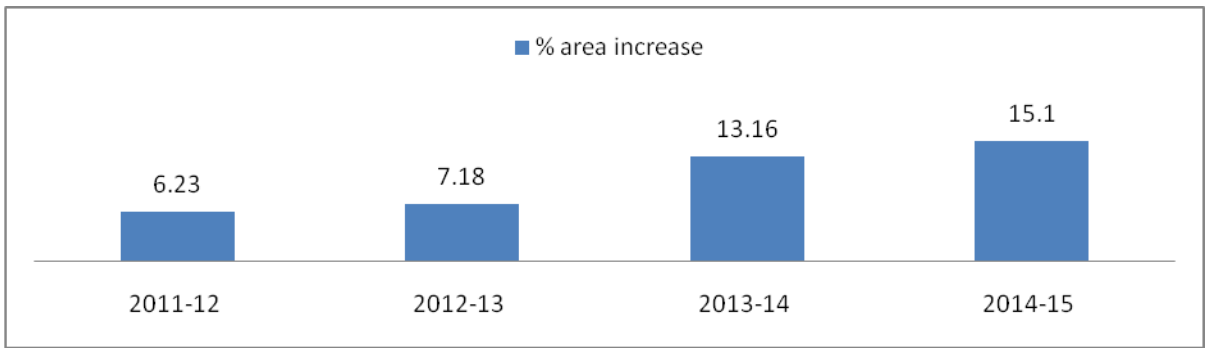
Table.3 Comparison of economics between Gangavathi Sona & BPT-5204

Parameters	Gangavathi sona	BPT-5204	Over local
Expenditure (Rs.)	56,150	58,425	2,325/- less
Gross returns (Rs.)	1,11,375	1,10,526	849 /- more
Net returns (Rs.)	55,225	52,101	3,124 /- more
B:C	2.01:1	1.89:1	

Table.4 Horizontal spread and economics of paddy variety Gangavatisona (GGV-05-01) from seed village programme

Year	Qnty of seed distributed (q)	Seed spread farmers To Farmers Approx. q x 2 season	Total seed Spread /distributed (q)	Total Area coverage (ha)	Cumulative Area coverage	Variety replacement rate (out of 3.5 lakh ha of TBP area) (%)	Average grain yield of 72 q/ha	Average rate per q. (Rs.) of Paddy	Anticipated economic benefit to the farming community (Rs) Value realized (Rs)
2011-12	**325.25**	13315	13640	21824	21824	6.23	1571328	1300	2042726400
2012-13	50.5	2020	2070	3312	25136	7.18	238464	1400	333849600
2013-14	319.25	12770	13089	20942	46078	13.16	1507824	1400	2110953600
2014-15	103.75	4150	4254	6806	52884	15.10	490032	1400	686044800
Total	**798.75**	**32255**	**33053**	**52884**			**3807648**	**5500**	**5173574400**

Fig.1 Cumulative area coverage of Gangavatisona over the year



The findings revealed that the cost of cultivation of the improved variety Gangavathi sona (Rs. 56150) was lower than the local variety (Rs. 58425). Significant difference was observed with respect the gross returns and benefit cost ratio. The net return from improved variety was Rs. 55225/- per ha which was 6.0 % higher as compared to the return from local variety (Rs. 55101/- per ha) with a B:C ratio of 2.01:1 and 1.89:1, respectively.

Horizontal spread of improved variety from seed villages

The farmers in TBP area those suffering from low yields of the popular variety BPT-5204 under saline condition prefers Gangavathi sona (GGV-05-01) variety. Out of 3.50 lakh ha in TBP paddy area approximately 80,000 ha already been affected by salinity due to excess and injudicious use of water and fertilizer. Under saline condition the variety BPT-5204 yielded 15 to 20 q/ha whereas GGV-05-01 yielded 25 to 30 q/ha in salinity stress area, *i.e*., 8-10 q/ha of yield advantage up to EC 6.5 to 8.5 ds/m soil salinity stress. Gangavathi sona (GGV-05-01) variety gave financial confidence to the farmers having saline soils and cultivating rice. It is dual season variety; farmers grow both in *kharif* as well as in summer season, but BPT-5204 is being grown only in K*harif* season, there offering opportunity to farmers of saline soils to grow in summer also. The DSR (Direct seeded rice) farmers prefer Gangavathi sona (GGV-05-01) over BPT-5204 as it gives 15-20 % higher grain yield under DSR situation. As it matures ten days early than BPT-5204, under circumstances like delay in release of

canal water, delay in planting and planting of aged seedlings of BPT-5204 leads to chaffy grains due to poor emergence of panicles due to cold (temp. < 19 ^{0}C) during the months of October-November. Joshi *et al.,* (1995) also reported that in addition to grain yield, farmers also consider other parameters like growing period, plant height, thresh ability, milling recovery, taste and other characters of rice. Out of 3.50 lakh ha in TBP rice cultivable area, Gangavathi sona (GGV-05-01) occupies 15.10 per cent area during 2014-15 as nil during 2011-12.The new improved technologies will eventually lead to the farmers to discontinue the old varieties and to adopt new variety. Sharma *et al.,* (2011) reported similar results.

By growing Gangavathi sona (GGV-05-01) in TBP area, from the intervention of seed village programme implemented from 2011-15, it has realized worth of Rs.5173574400 (Table 4). On the contrary growing of BPT-5204 it could realised 15 % less (Rs. 4397538240) *i.e.,* loss of Rs.776036160. Gangavathi sona (GGV-05-01) can be grown with less cost of production, as it is moderately resistant to BPH and neck blast, if incidence occurs requires only 2 to 3 less sprays than the BPT-5204 requires and saves around Rs.2000 to 2500/ acre.

Spread of paddy variety Gangavatisona (GGV-05-01) variety

Due to its special features, variety Gangavathi sona has spread to many districts of Karnataka apart from tungbhadra command area and also to parts of Andhra Pradesh due to its performance in the field. It has spread to districts *viz*. Koppal Dist: All villages under Gangavati taluka and parts of Koppal. Raichur district: All villages under Sindnour, Manvi, parts of Devadurga and Raichur. Bellary district: Parts of Sirguppa taluk, Bellary and Hospet (Kampli, yammiganur village etc). Yadigiri district: Parts of Surupura and yadagir taluk. Other districts like parts of Davangeri, Shimogga, parts of Tumkur, Chamarajanagar, Mysore and Mandya. In Andhra Pradesh (AP): Parts of Vijayavada, Maruteru, Tirupati, Vaijaka and parts of Kamam district in Andhra Pradesh.

The results of the seed village programme revealed a substantial increase in the yield of improved rice variety Gangavathi sona (GGV-05-01) as compared to predominant prevailing variety BPT 5204. The results also showed that high rate of horizontal spread of seeds to more farmers and farmer's willingness to adopt new technologies especially with regard to adoption of new variety/seed.

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How to cite this article:

Narappa, G., R.B. Negalur, D.H. Roopashree and Guruprasad, G.S. 2018. Seed Village Programme - A Boon to the Rice Growing Farmers for Variety Replacement with Economic Stability. *Int.J.Curr.Microbiol.App.Sci.* 7(04): 3862-3868.
doi: https://doi.org/10.20546/ijcmas.2018.704.435