

INTRODUCTION OF ARKA KALYAN VARIETY OF ONION WITH ICM PRACTICES

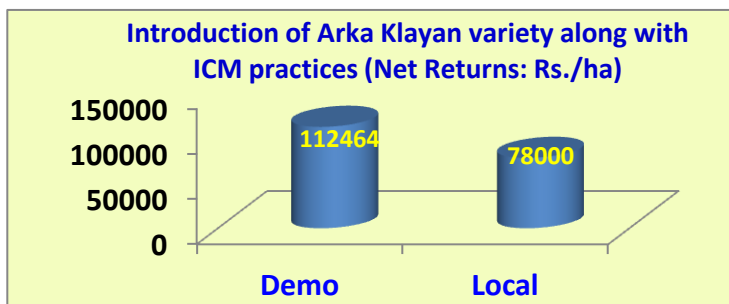
Input details:

- Organised Front Line Demonstrations on improved varieties of Arka Kalyan and Bheema Super along with ICM practices (26 ha, 35 farmers)
- Trained farmers on best practices in Onion cultivation (36 trainings., covering 719 farmers)
- KVK started seed production activity in its farm (3-4 quintal every year)
- Developed 16 farmers as seeds producing farmers and facilitated sale of seeds to other farmers. These farmers produce 40-50 quintals of seeds per year.



Output :

Technology	Area under FLD (Ha.)	No. of farmers	Yield (Qtl./ha.)		Increase in yield (%)	Net Returns (Rs./ha.)	
			Demo	Local		Demo	Local
Introduction of Arka Kalyan variety along with ICM practices	26	55	60.99	44.72	36.72	112464	78000



Arka Kalyan variety has performed very well with 36.72 per cent increased yield and net return of Rs.112464/- per hectare. Farmers got net additional return of Rs.34464/- per hectare.

Outcome and Impact : Out of total area under Onion, 35 per cent of area (12250 ha.) is under improved variety of Arka Kalyan. The variety has good bulb quality and better market price owing to its attractive bulb colour. The intervention has contributed additional returns of Rs.430 lakhs to the district economy during last five years.



PROMOTION OF HIGH YIELDING VARIETY OF ONION

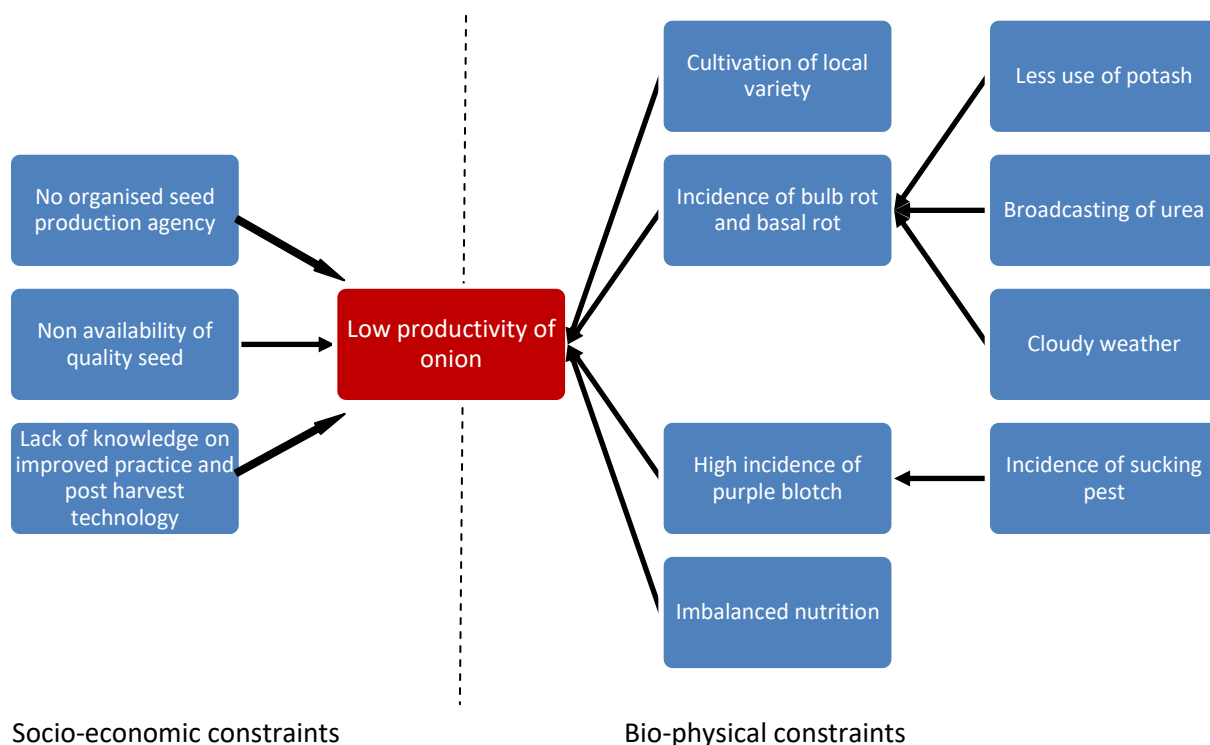
A Case Study by KVK, Gadag

Introduction: Onion is one of the important vegetable crops grown in India. In terms of area, India ranks first in the world with over 480 thousand hectares accounting for around 21 percent of the world area under onion. Globally, the country occupied the second position after China in Onion production with a production share of around 12 percent. Productivity, however is low at around 12.2 mt/ha, which is lower than the world average of 14.00 mt/ha. In India onion is extensively cultivated over a large area spread almost throughout the country. It is produced for both domestic consumption as well as for exports. The major onion growing states are Maharashtra, Gujarat, Tamilnadu, Karnataka and Andhra Pradesh. In Karnataka, onion is cultivated in about 60,000 hectare with the annual production of 3.60 lakh tonns. The productivity is 6 tonn per hectare. The major onion growing districts in Karnataka are Bijapur, Gadag, Chitradruga, Davanagere and Belgaum. It is being cultivated both in kharif and rabi season. Kharif onion is extensively grown under rainfed situation.

Onion Scenario in Gadag district: Onion is the major vegetable crop grown in Gadag district. It is mainly cultivated in Kharif season under rainfed situation. Area under onion cultivation is 17164 hectares (Reference year 2009-10) with the production of 192566 tonns. The district productivity is 4.76 tonns per hectare. Out of 5 blocks in Gadag district, Ron block stands first in area (12257 ha) followed by Gadag (8055 ha.), Shirahatti (2847 ha), Mundaragi (1550 ha) and Naragund (430 ha). The crop is cultivated in deep black to medium soils and red loamy soils. Usually dry chilli and desi cotton are grown as inter crops in the onion based cropping system. This is an old practice followed by the farmers.

Productivity constraints: There has been a gradual decrease in the productivity and quality of onion bulb production. To understand the factors of productivity constraints, KVK interacted with the farmers of major onion growing villages and made the problem-cause analysis. The problem-cause tree for low productivity in onion as analysed by KVK scientists in consultation with the farmers is presented in the Figure:1

Figure1: Problem-Cause tree for low productivity in onion



Problem cause analysis: The problem-cause tree presented in the figure-1 reveals that farmers have faced the productivity constraints in onion mainly due to incidence of basal or bulb rot and purple blotch disease. Under high intensity rainfall situation especially during September-October, the local variety (Bellary red) is more susceptible to bulb rot/ basal rot thereby making heavy losses to farmers. The basal rot (*Fusarium oxysporum*) is more severe in the areas where crop rotation is not followed. Initially yellowing and stunted growth of plant are observed and later on, the leaves dry from top to downwards. In advanced stage, the bulbs start decaying from lower end and ultimately whole plant will die. Climate factor like cloudy weather, broadcasting of urea and potash deficiency favour the development of the disease.

Incidence of purple blotch disease *Alternari porri* has significantly affected the productivity of onion in Gadag district. Hot and humid climate favours the development of the disease. The symptoms occur on the leaves and flower stalks as small sunken whitish streaks with purple colour centre. The lesions girdle leaves & flower stalks and cause dropping. The infected plant fail to develop bulbs. The disease is aggravated by high incidence of thrips which act as vector for the disease.

Application of imbalanced nutrition is another factor affecting the productivity of onion. Farmers use less of Potash fertilisers resulting in poor quality of bulbs.

Lack of knowledge delivery systems on improved cultivation practice, non-availability of improved quality seeds also contribute for the low productivity of onion.

Problem wise technology intervention made by KVK

Sl. No.	Problems	Type of intervention	Name of technology intervention
1	Incidence of basal / bulb rot & purple blotch	<ul style="list-style-type: none"> • Technology Assessment • Front Line Demonstration 	<ul style="list-style-type: none"> • Assessment of Arka Kalyan variety for tolerance to bulb rot and purple blotch disease • Front Line Demonstration on introduction of Arka Kalyan variety
2	Imbalanced nutrition (Less usage of potash)	<ul style="list-style-type: none"> • Front Line Demonstration • Training of farmers 	<ul style="list-style-type: none"> • Application of balanced dosage of Nitrogen, Phosphours and Potash
3	Non-availability of quality seeds of improved variety	<ul style="list-style-type: none"> • Seed production 	<ul style="list-style-type: none"> • Seed production activities at KVK farm and progressive farmers' fields • Training of farmers in seed production of Arka Kalyan variety
4	Lack of knowledge on improved cultivation practices	<ul style="list-style-type: none"> • Training of farmers 	<ul style="list-style-type: none"> • Organisation of on-campus and off-campus training programmes

Details of interventions

1) **Technology assessment:** Low productivity of onion was due to cultivation of local cultivar (Bellary red) which is susceptible to basal/bulb rot. During the year 2002-03, KVK interacted with the scientists of Indian Institute of Horticultural Research (IIHR), Bangalore regarding the productivity constraints. The scientists of IIHR suggested to assess the performance of Arka Kalyan variety released by IIHR which is high yielding and tolerant to bulb rot.

Characteristics of Arka Kalyan variety: The variety has globe shaped, medium to large size bulbs. The bulb has deep coloured outer scale and fresh succulent internal scales. Average bulb weight is 130-180 gms. The variety is pungent with TSS of 11-13 percent. It is moderately resistant to purple blotch disease caused by *Alternaria porii* and is also tolerant to bulb rot. The variety matures in about 140 days.

Location of On-Farm Testing: Assessment of Arka Kalyan variety was taken in Hulkoti and Kurthakoti villages in Gadag block during the year 2002-03. It was tested in 6

farmers' fields each with an area of 0.2 hectare along with farmers' practice of cultivation of Bellary red variety.

Performance of technology with performance indicator:

Technology Assessed	Performance indicators			
	% bulb rot (per 100 sq. m)	% Index of purple blotch	Yield (tonn/ha)	B.C ratio
Performance of Arka Kalyan variety	7.27	26.83	23.36	1.55
Performance of Bellary red variety	12.38	38.42	20.28	1.35

The results of on-farm testing conducted to assess the performance of Arka Kalyan variety reveals that incidence of purple blotch is comparatively less in case of Arka Kalyan variety and there is almost 50 percent reduction in the incidence of bulb rot compared to Bellary red variety. Yield wise Arka Kalyan has given 15 percent more yield compared to Bellary red.

Farmers' opinion on the performance of variety: KVK facilitated participatory performance ranking by the farmers for both the varieties and the farmers indicated the following ranking with respect to different parameters.

Sl. No.	Parameters	Ranking of Varieties by farmers	
		Arka Kalyan	Bellary Red
(i)	Tolerance to bulb rot	1 st Rank	2 nd Rank
(ii)	Resistance to purple blotch	1 st Rank	2 nd Rank
(iii)	Bulb colour	1 st Rank	2 nd Rank
(iv)	Bulb shape	1 st Rank	2 nd Rank
(v)	Marketability	1 st Rank	2 nd Rank
(vi)	Yield	1 st Rank	2 nd Rank



Participatory performance ranking of the varieties with respect to different parameters reveals that Arka Kalyan variety is ranked first for its better performance against bulb rot and purple blotch disease. Farmers are of the

opinion that the bulbs of Arka Kalyan are very attractive and has a marketing edge over Bellary red variety.

2) Front Line Demonstrations: KVK has successfully assessed the performance of Arka



Kalyan variety of onion to address the problems of onion growers. Then, variety was taken to farmers' fields by organising Front Line Demonstrations in different cluster villages of Gadag district. The main objective was to show maximum production potentiality of the improved variety to the farmers and extension functionaries. In this context Front Line

Demonstrations were organised on farmers' fields and the details are presented below.

Table-1: Details of FLDs implemented by KVK

Year	Area (ha)	No. of farmers	Yield (Q/ha)		Increase in yield (%)
			Demonstration	Local check	
2005-06	15	30	255.0	172.0	74.15
2006-07	20	50	98.6	79.2	28.00
2007-08	20	50	115.2	90.6	29.00
2008-09	20	50	118.0	88.3	33.74
Total(Average)	75	180	146.7	107.52	41.22

Economics of demonstration (Rs/ha)				Economics of check			
Gross cost	Gross return	Net return	B.C Ratio	Gross cost	Gross return	Net return	B.C Ratio
10500	153000	142500	13.50	7800	103200	95400	10.23
7500	69020	61520	8.20	6500	55440	48940	7.1
8250	97910	89670	10.86	7260	67950	60700	8.3
9650	94400	84750	8.78	7850	61810	53960	6.8
8975	103582	94610	10.34	7353	72100	64750	8.11

During the period from 2005-06 to 2008-09, KVK organised front line demonstration on farmers' fields in an area of 75 hectares covering 180 farmers from 11 villages of Gadag

district. The performance of Arka Kalyan variety was very good compared to local check (Bellary red). There has been an increase in yield ranging from 28 to 74 percent.

The data presented on the economics of demonstration reveals that benefit cost ratio of the demonstrated technologies over a period of four years of demonstrations was 10.34 compared to 8.11 of local check variety.

Farmers' feedback about the demonstrated technology

- Arka Kalyan variety is tolerant to bulb rot as the outer scale is thin and do not retain the water.
- The attractive bulb colour fetches more price (about Rs.150-200 per quintal) compared to other varieties in Bangalore market.
- Yield potential of Arka Kalyan variety is about 40 percent more compared to Bellary red variety.
- Arka Kalyan variety matures 10-15 days later compared to Bellary red variety and thus the harvest of crop does not coincide with heavy rabi rains in Gadag district.

3) Seed production of Arka Kalyan variety

After the successful performance of Arka Kalyan variety through assessment and front line demonstrations, there was lot of demand for the seeds from participating cluster villages. The demand was not only from Gadag district farmers but also from Transfer of Technology Centres (i.e. KVKs) and farmers from neighbouring districts. Looking in to the demand, KVK initiated seed production activities both in it's farm as well as in identified progressive farmers' fields.

Time line of Interventions: Details of sequence of interventions taken up by KVK on seed production activities is presented in the following time line chart.

2002-03

- KVK brought 100 gm of seeds of Arka Kalyan variety from IIHR, Bangalore
- KVK started seed to bulb production in it's farm
- Then bulb to seed production was taken up
- Produced 38 Kg of seeds from this initiation

2003-04

- KVK used 15 Kg of seeds for technology assessment programme
- 23 Kg of seeds were supplied to progressive farmers for large scale assessment
- KVK produced 180 quintals of bulbs for further seed production

2004-05

- 255 Kg of seeds were supplied to farmers for commercial cultivation
- Seed production at KVK farm and farmers' fields
- Organised training to 30 farmers on seed production

2005-06

- 620 Kg of seeds were supplied to farmers and TOT centers (KVKs) of Zone VIII

2006-07

- 480 Kg of seeds sold to farmers and TOT centers
- FLD programme on farmers' fields were carried out in the other potential cluster villages of Gadag district
- Organised trainings on seed production and cultivation aspects

2007-08

- KVK produced 491 Kgs of seeds and supplied to farmers
- FLDs on farmers field were organised in potential cluster villages of Gadag district
- KVK organised trainings and extension activities

2008-09

- 431 Kgs of seeds were supplied to farmers and TOT centres (KVKs)
- Trainings and extension activities were carried out to popularise the variety
- FLDs and seed production activities were taken up
- Supplied 80 Kgs of seeds to University of Agricultural Sciences, Dharwad (National Seed Project Unit) and UAS, Dharwad produced 32 quintals of Arka Kalyan seeds for the season of 2009-10.

Table 2: Details of seeds supplied to farmers and TOT centres by KVK

Year	Gadag district farmers		Other District farmers		TOT centres		Total		
	Qty (Kgs)	No. of farmers	Qty (Kgs)	No. of farmers	Qty (Kgs)	No. of centres	Qty (Kgs)	No. of farmers	No. of TOT centres
2003-04	38	28	-	-	-	-	38	28	-
2004-05	255	27	-	-	-	-	255	27	-
2005-06	415	73	146	22	65	5	626	95	5
2006-07	271	32	85	10	130	5	486	42	5
2007-08	206	42	83	17	210	7	499	59	7
2008-09	140	31	81.0	19	210	6	431	50	6
2009-10	176	27	149	14	71	2	396	41	2
Total	1501	260	544	82	686	25	2731	342	25

Table 3: Sale of seeds to TOT Centres

Name of Centre	Quantity (Kgs)
TOT Centres of Karnataka state	
KVK, Bijapur	50
KVK, Chitradurga	40
KVK, Chamarajnagar	30
KVK, Raichur	60
KVK, Davanagere	90
KVK, Dharwad	70
KVK, Koppal	60
KVK, Haveri	75
KVK, Chikkamugalur	50
KVK, Bidar	51
NSP Unit, UAS, Dharwad	80
TOT Centres of Tamilnadu State	
KVK, Erode	20
KVK, Sirugamuni	10
Total	686

Presentation of the data in the table-2 reveals that during the period of 2003-04 to 2009-10, KVK has produced 1501 Kgs of Arka Kalyan onion seed in it's farm and supplied to 260 farmers belonging to Gadag district. Further, 544 Kgs of seed was supplied to 82 farmers belonging to neighbouring districts namely Dharwad, Bellary, Bagalkot, Bijapur, Davanagere and Koppal. During the same period 12 KVKs of Karnataka and Tamilnadu states received 686 Kg of seed for implementation of Front Line Demonstration programme (Table-3)

Overall 2731 Kg of seed was produced and supplied to 342 farmers and 12 Krishi Vigyan Kendras including NSP Unit of UAS, Dharwad. In addition 38 quintals of Arka Kalyan onion bulbs were supplied to University of Horticultural Sciences, Bagalkot and its farmers for seed production.

Seed production by farmers

During the year 2004-05 of Kharif season, KVK trained 30 farmers of the district on



onion seed production technology. Farmers were trained on various aspects related to bulb to seed method of production. Emphasis was given on selection of mother bulbs and maintenance of isolation



distance. Out of 30 farmers, 8 farmers started the seed production and the foundation seeds of Arka Kalyan varieties brought from Indian Institute of Horticultural Research, Bangalore was supplied to farmers.

During the rabi season, KVK guided the eight farmers on selection of mother bulbs for bulb to seed production programme. The name of the farmers who have taken up seed production is given in Table 4.

Table 4: Name if seed production farmers

Sl. No.	Name	Village	Block	Area of seed production (ha)
1	Venkappa A. Bhandi	Dundur	Gadag	0.4
2	T.H.Bhandi	Dundur	Gadag	0.4
3	H.H.Bhandi	Dundur	Gadag	0.2
4	Veeranagouda B. Jakkanagoudar	Hirehandigol	Gadag	0.5
5	V.D. Morab	Yavagal	Ron	0.5
6	M.R. Rithi	Gulaganji	Ron	0.4
7	Vijay B. Patil	Keralli	Shirahatti	0.4
8	Hanumanthappa Mahantaiya	Keralli	Shirahatti	0.2

The farmers produced the seeds for the Kharif season of the year 2005-06.

During the period from 2005-06 to 2009-10, farmers have produced 46 quintals of seed and supplied it to the fellow farmers of their village, neighbouring villages and district farmers.

Year wise quantity of seed produced and supplied by farmers is given in the Table 5 and 6.

Table 5: Year wise quantity of seed produced by seed growers

Year	Quantity of seed (quintals)
2005-06	8.4
2006-07	10.2
2007-08	10.5
2008-09	7.2
2009-10	9.7
Total	46.0

Table 6: Year wise sale of seed within and outside villages

Year	Within the village (Quantity in quintals)	Outside the village (Quantity in quintals)
2005-06	3.20	5.20
2006-07	3.35	6.85
2007-08	4.70	5.80
2008-09	2.30	4.90
2009-10	3.2	6.5
Total	16.75	29.25

Spread of Arka Kalyan variety by KVK effort

Seed production activities of KVK has paved the way for spread of Arka Kalyan variety in Gadag and neighbouring districts. The perusal of table 7 reveals that there has been consistent spread of variety during the period from 2004-05 to 2009-10. Dissemination

Table 7: (A) Spread of Arka Kalyan due to supply of seeds by KVK

Year	Gadag district		Other districts		Total	
	Area (ha)	No. of villages	Area (ha)	No. of villages	Area (ha)	No. of villages
2003-04	12	7	-	-	12	7
2004-05	102	8	-	-	102	8
2005-06	210	48	58	15	268	63
2006-07	108	26	34	7	142	33
2007-08	120	29	36	4	156	33
2008-09	160	28	60	18	220	46
2009-10	70	14	59.0	14	129	28
Total	792	160	247	58	1029	218

The variety was spread in an area of 1029 ha covering 218 villages in Gadag and neighbouring districts.

(A) Spread of variety through farmers efforts under KVK guidance

There has been a large scale diffusion of variety from farmers to farmers in the district. The variety was spread in an area of 1840 hectares during the period from 2005-06 to 2009-10.

Table 8:

Year	Area under variety (ha)	No. of villages
2005-06	336	38
2006-07	408	61
2007-08	420	57
2008-09	288	31
2009-10	388	29
Total	1840	216

(C) Spread of variety through UAS, Dharwad and UHS, Bagalkot

Year	University of Agricultural Sciences, Dharwad		University of Horticultural Sciences, Bagalkot	
	Quantity in Kgs		Area covered in Ha	
2009-10	3200	1280	-	-
2010-11	900	360	800	320
2011-12 (Planned)	4500	1800	-	-
Total	8600	3440	800	320

Through the efforts of both Universities, Arka Kalyan Onion Variety has reached to more than 3700 Ha in the districts of Northern part of Karnataka State.

Summary:

Intervention of KVK Gadag through technology assessment, front line demonstrations and seed production activities has immensely helped the farmers to enhance the production of onion. The variety has not only spread in Gadag district but also diffused in to other districts of Karnataka State. As there is lot of demand for seeds of Arka Kalyan variety, many farmers have taken up seed production activities in Gadag district.