Success Stories of ICAR-IIHR Interventions in NEH Region towards Livelihood Security

ICAR-Indian Institute of Horticultural Research (IIHR)
Hessaraghatta Lake Post, Bangalore, Karnataka - 560089

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Hesaraghatta Lake Post, Bengaluru - 560089, Karnataka

ICAR-Indian Institute of Horticultural Research

(Indian Council of Agricultural Research)
Hesaraghatta, Bengaluru – 560089,
Karnataka, India
Telephone: 080-23086100
Email id : director.iihr@icar.gov.in
website : https://www.iihr.res.in/

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Compiled and Edited by

Dr. Atheequlla G.A
Dr. B Balakrishna
Dr. H.S. Yogeesha
Ms.Rashmi N
Ms.Amrutha A

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Dr Debi Sharma
Director
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Foreword

ICAR-Indian Institute of Horticultural Research (IIHR), Hesaraghatta, Bengaluru through its several dissemination programmes has been pursuing to disseminate the varieties and technologies to different agro ecological regions across the country and including North-Eastern Hills (NEH) region, where there is immense potential to improve the productivity of many horticultural crops.

NEH development programme of the ICAR is an important activity planned and implemented by the Institute with the help of NEH programme implementation committee for the last 12 years. Under NEH programme, a multidisciplinary team of ICAR-IIHR scientists from Division of Social Sciences and Training, Vegetables crops, Fruit crops, Natural Resources, Crop Protection and PHT & AE, in association with ICAR-ATARI, Zone VI & VII (Guwahati, Assam & Umiam, Meghalaya), its KVKs and line departments of respective States, is trying to reach farmers of NEH region through multiple programmes of the Institute in providing technical inputs, infrastructure development, and need based HRD support to enable reach every farmer in the region.

Introduction and large-scale promotion of ICAR-IIHR technologies through OFT's, FLD's, capacity building programmes, organised on various technologies and new varieties of the institute, have resulted in significant changes in the production, productivity, quality and income of farmers across all the NEH States. This has led to increased demand for seeds and planting materials of new varieties and hybrids of the Institute, particularly in the last three years. There is a good synergy in programmes with KVKs, NGOs and State development departments of all the NEH states, which is helping in large scale spread of varieties and technologies of the Institute. Hence, there is a need for comprehensive and systematic documentation of the field level impact of ICAR-IIHR technologies implemented under NEH programme in the form of success stories.

I am happy that our Institute is bringing out an exclusive publication, which provides comprehensive information on the outcomes of various interventions under ICAR- IIHR NEH programme implemented from 2012 onwards, specifically during 2018-19 to 2020-21. This document will serve as a reference point to augment further horticulture led developmental activities in North Eastern Hill Region. It will also be very useful for KVK's and officers of developmental departments to be cognizant of the spread of different ICAR-IIHR varieties & technologies across the NEH region.

09.07.2022
Bengaluru

Sharma

Dr. DEBI SHARMA
ICAR-IIHR, Director

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Onion Variety Arka Bheem Changing Fortune of Farm Women in Ri-Bhoi District, Meghalaya

Utpal Barua[1*], Mokidul Islam[1], G. A. Atheequlla[2] and B. Balakrishna[2]
[1]Krishi Vigyan Kendra Ri Bhoi, ICAR RC for NEH Region, Umiam, Meghalaya
[2]Scientists, Division of Social Sciences and Training, ICAR-IIHR, Bengaluru
* Corresponding author: ubarua08@gmail.com

Challenge

India is the second-largest producer of onion in the world after China. Indian share in the world onion market is 19.90%. Indian onions are famous for their pungency. In India onions have two crop cycles, the first harvesting starts from November to January and the second harvesting from January to May. It is a hardy cool-season biennial but usually grown as an annual crop.

The Ri Bhoi district of Meghalaya with an elevation level up to 1000 m msl is known for its pleasant sub-tropical climate. Where temperature during the winter months ranges between 6 ºC to 22 ºC with RH around 75%. The winter months of November to February receive very less rainfall with one or two showers (Table 1 & 2). There are few areas in the district which produce onion. But the production and productivity is very less as compared to the national average (Table 3).

Onion is an essential ingredient in every Indian culinary. It is also used in many tribal dishes of the district. Meghalaya imports most of its required quantity of onion from other leading onion growing states of the country. The tribal farmers of the district have been interested to grow onion, but unavailability promising high yielding variety from reliable source, lack of package of practices was a hindrance for them. Frequent escalation of onion prices has generated interest in them to search for good varieties and production technologies, so that they can catch the local market as well as increase their income.

Table: 1 Rainfall pattern of the district

Rainfall	Normal RF (mm)	Normal Rainy days	Normal Onset	Normal Cessation
SW monsoon (June-Sept)	1562.5	100	1st week of June	1st week October
NE Monsoon (Oct-Dec)	344.4	12	-	-
Winter (Jan-February)	40.2	5	-	-
Summer (March-May)	497.2	12	-	-
Annual	**2444.3**	**129**	-	-

Table: 2 Rainfall and temperature pattern of Ri Bhoi district

Month	Rainfall (mm)	Number of rainy days	Temperature		Relative Humidity	
			Max	Min	Max	Min
Jan	16.6	2	21.16	6.58	83.38	45.58
Feb	23.6	5	22.57	8.92	84.60	50.71
Mar	51.1	4	25.12	11.88	77.67	39.25
Apr	147	9	26.56	15.23	85.36	65.30

May	300	20	28.14	18.01	83.48	68.96
Jun	437	18	28.06	19.85	87.26	78.93
Jul	427	17	27.94	20.35	89.16	79.83
Aug	351	20	29.55	20.60	84.38	74.58
Sep	348	15	27.07	19.29	92.70	86.33
Oct	265	10	25.07	16.14	92.38	78.41
Nov	65.9	3	24.22	12.76	87.20	66.26
Dec	13.5	3	20.45	6.94	85.93	58.87
Total	2446	126				

Table: 3 Area, production and productivity of onion

Year	Area (Ha)	Production (MT)	Productivity (Kg/ha)
Ri Bhoi district, Meghalaya			
2008-09	55	516	9382
2009-10	58	545	9397
2010-11	57	536	9404
2011-12	57	536	9404
2012-13	60	566	9433
2013-14	62	589	9500
2014-15	63	597	9476
2015-16	58	665	11466
2016-17	72	826	11472
2017-18	72	826	11472
2018-19	74	849	11473
2019-20	75	861	11480
India	**1064 ('000 ha)**	**15118 ('000 MT)**	**14.2 (MT/ha)**

Initiative:

Kong Biona Lymphuid a progressive farmer of Kyrdem village, who prefers to explore and adopt new technologies, has been keen on cultivation of onion. During a farmers scientist interaction programme organized by KVK Ri Bhoi, she expressed her desire to cultivate onion crop. During that programme the Subject Matter Specialist Horticulture of KVK Ri Bhoi promised her for help and he started looking for a good variety of onion. Then he approached ICAR-IIHR, Bengaluru and discussed with concerned scientists about promoting onion cultivation in Ri Bhoi district. Then he has introduced onion var. Arka Bheem received from IIHR. Before taking up demonstration programme, group meeting was organized with all the 20 members of the SHG in the presence of KVK Ri Bhoi. The main aim of the meeting was to make SHG members understand about the new onion variety and its production, cultivation practices and possibility of enhancing income. It was also assured that during the whole course of crop production constant monitoring would be undertaken in the field so as to mitigate any difficulties arisen during crop production stage. As the farmers were not aware of the cultivation practices of onion, the SMS Horticulture after looking at the prevailing temperature, day length hour and rainfall pattern decided to go for nursery production in the month of November

inside polyhouse. The Kyrdem village is abundant with paddy cultivation, which is harvested in the month of November. Generally farmers after paddy harvest grow winter vegetables in the paddy field as fields holds enough soil moisture, so that irrigation form outside is not required. To transplant onion seedlings raised bund of 1 m width and 30 cm height were prepared, each bund at 2 foot apart. During the first year (2017) Kong Biona raised seedling of Arka Bheem on behalf of all SHG members in her polyhouse and they collectively transplanted onion in an area of 1.0 hectare during the month of January. The package of practice provided by IIHR Bengaluru was followed thoroughly during the crop production to harvest stage.

Impact

The onion bulbs were ready for harvest in the month of mid-April. In the first year, the group members could harvest a bumper yield of 375 q/hectare. The average bulb weight was 90 -100 g. Bulbs were sorted, graded and bigger size bulbs were sold in the market at a price of Rs. 30 - 35/- per Kg. This has increased their overall farm income by 15 - 20 % as compared to the previous year (Table 4). Overwhelmed by this success, the SHG members have been procuring seeds of Arka Bheem every year from IIHR and are producing onion for the last five years. The group is constantly monitored by SMS Horticulture, KVK Ri Bhoi for any technological support. The success has led to the adoption of onion var. Arka Bheem by 15 SHG's of the village comprising 20 members each. Now Arka Bheem onion is being grown in 25 villages comprising 125 SHGs in the Bhoirymbong block with active support from KVK Ri Bhoi. Kong Biona has been promoting and helping other interested farmers as a local resource person for onion cultivation.

Conclusion

The farmers were happy with the production of onion and it has helped to increase their livelihood. The farmers expressed their desire to go for increasing the onion production by bringing more areas under the crop. The technology has helped to increase the cropping intensity. Paddy fields, which were fallow after harvest has been utilized to grow onion and same fields were utilized to grow paddy during June – November.

Table: 4 Economics of onion production

S.N	Particulars	IIHR variety	Farmers practice
1.	Variety Name	Arka Bheem	Local variety
2.	Season	Nov - April	Oct - Feb
3.	Average price obtained per kg	Rs. 30-35/-	Rs. 20-22/-
4.	Yield obtained per hectare	375 q/ha	150 q/ha
5.	Gross cost of cultivation (Rs./ha)	1,32,200/-	1,08,600/-
6.	Gross income (Rs./ha)	7,75,500/-	2,25,000/-
7.	Net income (Rs./ha)	6,43,300/-	1,16,400/-
8.	Benefit Cost Ratio	5.86:1	2.07:1

Field Photos

Transplanted onion in the main field

Onion bulb harvesting

Farmer harvesting bulbs

Farmers making bunch of bulbs for storage

SMS Horticulture inspecting storage of Onion

Arka Bheem onion bulbs

Income Enhancement through Cultivation of Garden Pea In Ginger Fallow By Farmers Of Ri-Bhoi District, Meghalaya

Utpal Barua[1*], Mokidul Islam[1], G. A. Atheequlla[2] and B. Balakrishna[2]
[1]Krishi Vigyan Kendra Ri Bhoi, ICAR RC for NEH Region, Umiam, Meghalaya
[2]Scientists, Division of Social Sciences and Training, ICAR-IIHR, Bengaluru
* Corresponding author: ubarua08@gmail.com

Challenge

The Ri Bhoi district of Meghalaya with an elevation level upto 1000 m msl is known for its pleasant sub-tropical climate. Where, temperature during winter month ranges between 6 ºC to 22 ºC with RH around 75%. The winter months of November to February receives very less rainfall with one or two showers (Table 1 & 2).

Ginger is one of the important spice crops of the Meghalaya and is the third largest ginger producing state in our country, producing 66379 MT from an area of 9963 hectare during the year 2019-2020. Ri-bhoi district is one of the important ginger hubs of the state. In the year 2019-2020 the district produced 10998 MT of ginger from an area of 1032 hectare with a productivity of 10657 kg/ha. The tribal farmers of the district cultivate ginger in the midland to highland areas in the hilly side with a sloping of 20 – 60 per cent. The crop is sown from last week of March to first fortnight of April with the onset of one or two pre monsoon showers. Crops are ready for harvest by first week of December and after that the area is left as fallow.

Pea is another important vegetable crop of the Ri Bhoi district. Farmers cultivate pea for its green pod so they prefer garden pea for cultivation. During the year 2019-2020 Ri Bhoi district produced 72 MT of garden pea from an area of 63 ha with a productivity of 1143 kg/ha. The farmers of the district grows pea as rice fallow crop in the low land area. Pea is highly nutritive and rich in protein and recently Govt. of India has emphasized on production and consumption of pea under nutri-sensitive agriculture.

There was a need to introduce a crop in the ginger fallow to increase cropping intensity and enhance farmers' income.

Initiative

Arka Priya is a garden pea variety developed by IIHR, Bengaluru which is resistant to powdery mildew and rust. The variety matures in 90 days from seed sowing and can tolerate temperature up to 35 ºC during its flowering and pod initiation stage. So, with the intervention of IIHR, Bengaluru, KVK Ri Bhoi has planned to introduce garden pea var. Arka Priya in these areas and was first introduced in the year 2017-2018 through demonstrations at Mr. Kynshew Dapsuk Kharkrang of Umiet village. Before undertaking demonstrations, group meeting were organized in the village to make farmers and Self Help Group Members understand about the technology to change their mind set. During the whole course of crop production constant monitoring of field was undertaken to mitigate any difficulties arisen during crop production stage.

While harvesting of ginger the whole area is dug up to takeout rhizomes with minimal physical injury to rhizomes. Arka Priya seeds were sown in those plots in the second fortnight of December with minimum land preparation work and immediately covered with soil followed by crop residues

of ginger and other biomasses. Mulching was necessary to conserve soil moisture and it added to the soil fertility. Other package of practices was followed for pea to obtain maximum yield.

As the ginger growing areas are upland and there is a lack of moisture during the months of December to March. Though two to three showers occur during these months in short spells, yet it was not enough to cultivate any crop without soil moisture conservation practices and irrigation. So the areas near the water sources with low sloppy gradients were selected for these demonstrations. Small water harvesting structures (Jalkund) were constructed near these plots and drainage channels were connected to these areas to harvest rain runoff. A jalkund of size 5x4x2 m^3 could hold 40000 litres of water and was enough to irrigate one acre of land. The crops were irrigated manually twice in a week. The crop was ready for first picking by the first week of March. It required three to four plucking to harvest the crop and harvesting was completed by third week of March.

Impact

The Self Help Group members of the Umeit village harvested pea @ 11 q/ha and sold in the market with an average price of Rs. 70/- to 80/- per kg (Table 3). This is has generated extra income out of their fallow land and also improved soil fertility status. The success of this demonstration was disseminated with the conduct of field day with active participation of villagers from 6 nearby village along with officials from state horticulture department to showcase the technology. The farmers of the nearby villages adopted the technology in the following years with an adoption percentage of 54%. Mr. Kynshew Dapsuk Kharkrang harvested 100 Kg good quality seed from his field and helped other farmers next year to grow Arka Priya in ginger fallow areas. He proved himself as progressive farmer of the area, showed resilience to adopt new technologies and become a role model for the farmers of the area. He received Jagjivan Ram Abhinbav Kisan Puruskar from ICAR, New Delhi.

Table: 1: Economics of ginger – pea cropping system

Technology	Parameters	Cost (Rs/ha)	NR (Rs/ha)	BCR
Ginger-pea cropping system	Ginger Yield: 211.3 q/ha Green pod yield: 115 q/ha	185450	626557	4.38:1
Ginger- fallow (Monocropping of ginger)	Ginger Yield: 180.5 q/ha	155975	261540	2.67:1

Conclusion

The farmers were happy with the production of Arka Priya and it has helped to increase their livelihood. The farmers expressed their desire to go for increasing the Arka Priya production by bringing more areas under the crop. Sensing the good traits like yield, productivity, disease tolerance, etc few farmers even saved the seeds of this garden pea variety. This technology enabled them to have increased the cropping intensity as well as imporved soil fertility status.

Field Photos

Transplanted onion in the main field

Onion bulb harvesting

Crop 60 days after sowing

Inspection of state department officials

First harvesting of crop at 80 days

Harvested pods

Pod size and seed numbers

Harvested seeds

Yard Long Bean Variety Arka Mangala Enhanced Farm Income of Women Farmers in Ri-Bhoi District, Meghalaya

Utpal Barua[1*], Mokidul Islam[1], G. A. Atheequlla[2] and B. Balakrishna[2]
[1]Krishi Vigyan Kendra Ri Bhoi, ICAR RC for NEH Region, Umiam, Meghalaya
[2]Scientists, Division of Social Sciences and Training, ICAR-IIHR, Bengaluru
* Corresponding author: ubarua08@gmail.com

Challenges

Yard long bean (*Vigna unguiculata* subsp. *sesquipedalis* L.) is one of the economically important leguminous vegetable crop, which is generally known as vegetable cowpea. It is a variety of cowpea and grown primarily for its strikingly long immature pods and is a vigorous climbing annual vine. It enriches soil fertility by fixing atmospheric nitrogen. Because of its quick growth habit, it has become an essential component of sustainable agriculture in marginal lands. In Meghalaya, it is generally cultivated in isolated pockets and mostly in kitchen gardens. The optimum average temperature during the growing period is 20ºC to 30ºC. It prefers full sunshine during growth and development, whereas cloudy and rainy weather causes low yield due to poor fruit set and the dropping of young pods.

The production and productivity of yard-long bean in the Ri Bhoi district of Meghalaya is mainly constrained by low yield and sensitivity to photoperiod. In general, the farmers of the district cultivate yard long bean as a rice fallow crop, during the month of March to May. They grow yard-long beans during this period, due to its photo-sensitive nature. But the yield and productivity of existing local varieties is less. The farmers of Ri Bhoi district of Meghalaya have been cultivating traditional local type yard long bean varieties and seed materials have been passed on by farmers to farmers since time immemorial. The agrarian population of the district relishes this vegetable in their diet with many non-vegetarian preparations. With time, the varietal identity and purity has been lost. This variety is known as ‘Buri’ in the local Khasi dialect and is low yielder and photo-sensitive.

Initiative

During frequent visits to the villages and discussions with the farmers by Dr. Utpal Barua, SMS Horticulture of KVK Ri Bhoi, he came to know about the problem of cultivating local yard-long bean faced by the farmers. Then he approached IIHR, Bengaluru for a good variety of Yard Long Bean and eventually was introduced to Arka Mangala. Arka Mangala variety of yard long bean developed by IIHR, Bengaluru is a photo insensitive, pole type, string less, long bean. The crop matures in 100 days and possesses high yield potential. At the request of farmers, he brought 100 Kg seeds of the variety and started demonstration in the Umeit village in 2 ha area during the kharif season of the year 2018. Mrs. Perserlyne Dohling and a group of 19 women farmers under her SHG came forward to grow the new yard long bean variety. Before undertaking demonstrations group meetings were organized in the village to make farmers understand the uniqueness of the variety to motivate them. During the whole course of crop production, constant monitoring of field was undertaken to mitigate any difficulties arising during crop production stage.

Key Results

With the intervention of KVK Ri Bhoi, the variety Arka Mangala was selected to be grown in the month of July-October. The monsoon starts receding by the month of August. The crop was raised as rainfed and scientific package of practices were followed for successfully raising the crop. The crop was ready for first picking by last week of September. It required three to four plucking to harvest the crop and harvesting was completed by third mid of October.

Impact

The farmers of the demonstrated areas could get a 75% increase in yield. The income of the farmer increased not only due to increase in yield, but also, due to quality of pods. Field days were organized with the active participation of farmers from nearby villages in the presence of officials from state horticulture department to showcase the technology. The farmers of the nearby villages adopted the technology with an adoption percentage of 68% in the following year 2019-2020 and 2020-2021.

S.N	Particulars	IIHR variety	Farmers practice*
1.	Variety Name	Arka Mangala	Buri (Local Variety)
2.	Season	Kharif	Pre Kharif
3.	Area cultivated	2 ha	2 ha
4.	Average price obtained per kg	Rs. 30/-	Rs. 20/-
5.	Yield obtained	200 q/ha	114 q/ha
6.	Gross cost of cultivation (Rs./ha)	82,500/-	78,800/-
7.	Gross income (Rs./ha)	558700/-	228000/-
8.	Net income (Rs./ha)	476200/-	149200/-
9.	Benefit Cost Ratio	6.7:1	2.89:1

Conclusion

The farmers were happy with the production of yard long bean Cv. Arka Mangala and which helped them to increase their livelihood. The farmers expressed their desire to go for increasing the Arka Mangala production by bringing more areas under the crop. The technology not only helped to increase the cropping intensity but also soil fertility status.

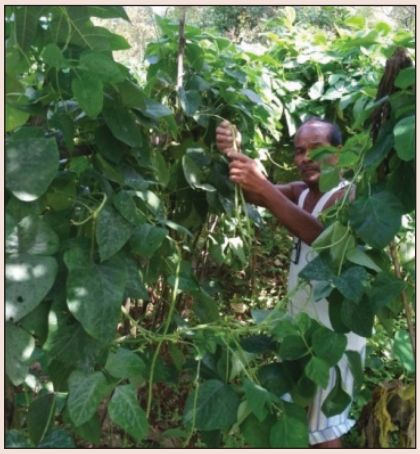
Field Photos

Interaction and imparting training to women farmers

Crop at initial growing stage

Full grown crop stand

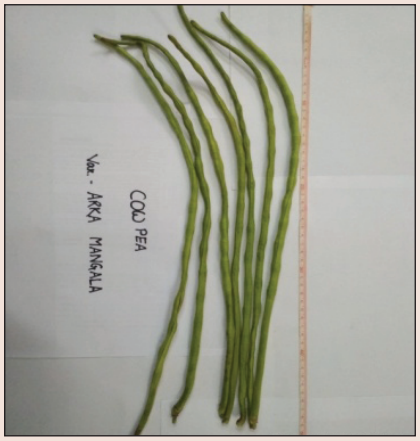
Recording of data



First harvesting of crop at 90 days

Visitors from nearby villages appreciating pod size

Farmer harvesting pod



Pod size

Successful Cultivation of Tomato Cv. Arka Rakshak in Open Field Conditions in Champai District, Mizoram

Malsawmkimi[1], Saplalrinliana Henry[1], Atheequlla G.A[2]., and B Balakrishna[2]
[1]KVK, Champai, Mizoram, [2]
Scientists, Division of Social Sciences and Training, ICAR-IIHR, Bengaluru

Farmers Details

Name : Mr Vanlalmuana

Village : Tuipui

Block : Khawzawl

District : Champai

Challenge:

Mr. Vanlalmuana, an young and hardworking farmer from Tuipui village strived very hard for giving a comfortable life to his family. Earlier he took tomato cultivation in open field conditions, but hardly it was remunerative due to, high incidence of diseases and low productivity. Every year several parts of Mizoram had to import tomatoes to meet the demand. Though there was huge demand for tomato, the farmers were unable to meet it due to the following challenges faced by them

- Low yield of existing local varieties
- High incidence of bacterial wilt, leaf curl virus & blight diseases, especially in open field conditions during kharif season.

Initiatives:

Viewing these problems, during 2014-2015, KVK, Khawzawl brought Arka Rakshak seeds from IIHR and conducted on farm trial at Tuipui village. Trial was conducted during kharif season. KVK scientists imparted scientific cultivation practices, pest and diseases management to the farmer.

Impact:

Tuipui has now become a commercial tomato village in the District. Farmers of tuipui village become aware about scientific tomato cultivation like, time of sowing, nutrient management, pest and diseases management etc. The impact was reached out to 60 farmers in the village. Neighboring villages like Tualte, Chawngtlai, Ngaizawl and Khawzawl also replicated the technology and started cultivating tomato because of its productivity and profitability. Mr.Vanlalmuana came up with great result. The neighboring farmers came to know the about his produce and quality of ArkaRakshak. He built his own house through the income earned solely through cultivation of tomato Cv. Arka Rakshak..He motivated the neighbouring farmers to adopt the same for the entire village. Tuipui tomatoes are said to have fetched a good market price because of its quality.

S.N	Particulars	Variety
1.	Variety Name	Arka Rakshak
2.	Season	*Kharif*
3.	Area cultivated in acres	1
4.	Average price obtained per kg	50
5.	Yield obtained per acres	45qtl
6.	Gross cost of cultivation per acre (Rs./ac)	40500
7	Net income per acre (Rs./ac)	184591

Tomato Variety Arka Rakshak in the field of Mr. Vanlalmuana

Field day organize in field of Mr. Vanlalmuana

Conclusion: Import of tomato's from neighbouring states is greatly reduced. Horizontal expansion of tomato crop happened to a significant extent. Almost all the farmers know the variety by name. Through KVK & State department of Horticulture, they get the seeds from IIHR regularly. This village has have almost become a tomato hub. It has improved the Socio-economic status of tomato growing farmers.

Tomato variety Arka Samrat enabled livelihood of Mizoram Farmer

Malsawmkimi[1], Saplalrinliana Henry[1], Atheequlla G.A.[2], and B.Balakrishna[2],
[1]Subject Matter Specialist (Hort.), Senior Scientist and Head, KVK, Khawzawl, Champai
[2] Scientists, Division of Social Sciences and Training, ICAR-IIHR, Bengaluru

Farmers details:

Name : Mr.Lalrinkima

Village :Chawngtlai

District :Khazwal District

State : Mizoram

BACKGROUND OF THE FARMER

Mr. Lalrinkima (56 years) hailing from Chawngtlai village, Khawzawl District of Mizoram is one among the many farmers whose success story is worth exemplifying. His formal education upto class X has augmented his farming career to a prodigious extent too. He currently owns 3 acre of land and grow different kind of vegetables. He is supported by his family of four sons and three daughters. Though his earning is also centred on other casual opportunities like masonry works etc, he has ventured out to achieve more innovative work in the field of agriculture.

Challenges:

1. Lack of high-yielding and disease-resistant varieties in tomato
2. Inability to cultivate tomato in open fields during *kharif* season
3. Inadequate source of income to support the family

Initiatives:

To tackle the above problems, staff of KVK, Champhai in collaboration with ICAR-IIHR undertook to demonstrate tomato cultivation variety Arka Samrat in Chawngtlai village covering an area of one acre in *kharif* season in the year 2019-20.

Keeping in view the urgent needs, KVK Champhai took the initiative of tomato cultivation and identified their problems through Participatory Rural Appraisals, farmer-scientist interaction meetings etc. Consequently, the farmer was convinced about the potential of this particular variety wherein he agreed upon and took up cultivation in *kharif* season of 2019-20.

During the period of cultivation, KVK also made numerous field visits, organized field days and trainings for the neighbouring farmers too. Plant protection chemicals were also provided as and when required based on the diagnostic visits made by KVK personnel, telephonic conversations and Whatsapp® interactions.

The efforts made by Mr. Lalrinkima were already visible after few weeks of initiation and could sum up excellent results after his final harvest. He immediately gained popularity and his neighbouring farmers also came to know the about his produce and quality of Arka Samrat. He motivated his neighbouring farmers to adopt the same which now gradually spread to the entire village.

Impact:

Out of the many un-mentioned socio-economic impacts, marketing status and farming situation impacts, few observed parameters are consolidated and highlighted below. These parameters highlighted are scaled against the predominantly grown farmers' variety which was grown sparsely and unscientifically in the said location.

S.N	Particulars	IIHR variety	Farmers practice*
1.	Variety Name	Arka Samrat	Samrudhi
2.	Season	*Kharif*	*Kharif*
3.	Area cultivated in acres	1	1
4.	Average price obtained per kg	60	50
5.	Yield obtained per acres	55qtl	25qtl
6.	Gross cost of cultivation per acre	50769.00	50000.00
7	Net income per acre (Rs./ac)	279231.00	75000.00

Besides the impact mentioned above, which were scaled against Samrudhi variety, it is worth mentioning that tomato cultivation gained popularity in the entire of the village which is still spreading out to many adjoining villages also. District administration, other line departments and financial institutions had also come to know about this development, and expressed willingness to render possible help upon this unique achievement.

Field photos of Arka Samrat tomato in Mr. Lalrinkima's Field

Triple Disease Resistant Variety of Tomato Arka Rakshak – Doubled The Income Of Farmers in Serchhip District, Mizoram

Vanlalhmuaka Ngente & T. Vanlalngurzauva,
KVK, Serchip, Mizoram

FARMER'S DETAILS:

Name : Zemawia

District : Serchhip

State : Mizoram

Challenges:

i. Lack of high yielding and disease resistant varieties. Low yield of the existing local varieties.

ii. Susceptibility to diseases with the local variety

iii. Poor performance of local variety during kharif. Local variety not suitable for open cultivation during the kharif season

Initiatives:

Tomato farmers of Serchhip District faced serious problem due to high incidence of diseases in the tomato since long. Due to this problem, farmers could not go for large scale cultivation in open condition. Sadly, only few farmers could afford greenhouses. Even for such farmers, high disease incidence coupled with low yield resulted in great distress among them. In an attempt to unravel this problem, varietal evaluation of Arka Rakshak was conducted during the kharif season of 2018-19 and 2019-20 in two villages.

With an objective of finding a solution faced by our farmers as stated above, On-farm trial was conducted during the kharif season of 2018-19 and 2019-20 in an open field condition to evaluate the performance of Arka Rakshak under Serchhip District. The results from the trials showed positive results. Eventually, farmers were convinced after seeing its performance.

Impact:

As a result to this On Farm Trial, the farmers who usually grew local vegetables which could not serve higher income nearby this farmer has realized the productivity of this crop. As such, they have replicated growing this particular variety of tomato. More than 30 farmers from 6 different villages have started tomato cultivation in open condition.

Besides these farmers, other farmers in other villages are also planning to replicate the technology and this is expected to bring forth the District to sufficiency in supply of tomato requirements.

Parameters		IIHR Variety (Arka Rakshak)	Farmers practice (Local variety)
Plant height		70cms	120cms
Av. no of fruit/plant		74.4nos	48.2nos
Av .Wt of fruit(g)		81.4	12.5
Av. Wt of fruit/plant (Kg)		6.05	1.7
Plant mortality	30 DAP	3%	10%
	90 DAP	nil	5%
Yield Q/Ha.		635.5	240.02
BC Ratio		**3.62**	**1.93**

Field photos of Arka Rakshak Tomato variety of Mr. Zemawia

A high yielding and short duration variety of French bean Arka Arjun has doubled the farmers' income in Serchhip District, Mizoram

Kenny Zohmingliana & Dr. T. Vanlalngurzauva
KVK, Serchip, Mizoram

Farmer's details:

Name : Lungtiawii

Village : N. Vanlaiphai

Block : E. lungdar

District : Serchhip

State : Mizoram

Challenges:

Local French bean varieties were mostly pole type which required staking, resulting into high labour requirement. Also the crops are long duration with lower productivity per unit time.

Initiatives:

a) Crop: French bean

b) Variety: Arka Arjun (Bushy, photo insensitive, Short duration, MYMV disease tolerant)

c) Broad Bed and Furrow Technology: 90 cm top bed, furrow : 45 cm, Furrow depth : 20 cm

d) Seed Rate: 60 Kg/Ha

e) Spacing: 30 × 15 cm

f) RDF: 100 : 40 : 20 Kg/Ha N:P:K

Interventions:

Keeping in view the problem faced by the farmers as stated above, a On Farm Trial on Varietal Evaluation of Arka Arjun variety of French bean was carried out 2018 – 2019. Followed by frontline demonstrations in the year 2019 – 2020.

Training, Field Day and Farmers-Scientist interaction meets were conducted during this period to sensitize the farmers about this new variety introduced by KVK, Serchhip District, Mizoram.

Farmers usually keep their land fallow after harvesting their Paddy crops. Thus, for maximum utilization of land and to increase their income, this technology was also disseminated which resulted in enabling the farmers to meet additional revenue/ income. As a result of its great success, farmer has adopted cultivating this variety both in Rice based and Maize based Cropping system respectively.

Impact:

As this particular variety is bushy type and short duration, it is well adopted by the farmers in and around N.Vanlaiphai area. The technology disseminated rapidly among these farmers, as it was aptly

suiting the farmers' requirement for crop rotation in protected cultivations and in areas where there is scarcity of water. It served very well for farmers with lesser labor force. The intervention also met the demand of high gap of supply in protein rich food source in the area.

Parameters	IIHR Variety (Arka Arjun)	Farmers practice (Local Variety)
Plant height	38.2 cm	
Av. no of pod/plant	25.4	20.67
Av .Wt of pod(g)	38.82	34.23
Av. Wt of pod/plant (Kg)	0.985	0.707
Yield Q/Ha.	56.1	51.2
BC Ratio	3.1	2.6

Field photos:

French bean Cv. Arka Arjun in the field of Lungtiawii

Blossoming Gladiolus Cultivation At Siaha District, Mizoram: A Success Story

Mrs. S. Sisi and Dr.H. Vanlalhmuliana, KVK, Siaha, Mizoram

Siaha District is located at the south eastern part of Mizoram and bounded on the south and east by Myanmar with an area of 133.9 km² and population of 56,574(2011 census). There are 92 village councils and temperature during winter varies from 8°C- 21°Cand 24°-35° C in summer.

Challenge

Majority of the farmers at Siaha District are new to commercial flower crops cultivation where flower crops were grown in small scale. The farmers cultivated flower crops, in small pocket of areas for decorating home surroundings and for cut flowers purpose. There is always demand for flowers.Fresh cut flowers are in demand every Sunday for Church Service, Funerals, bouquets in every official functions, Weddings and in receiving Guests. Problem of the farmers were lack of knowledge on scientific cultivation of flower crops cultivation, non-availability of high yielding seeds and planting materials, lack of inputs like farm yard manure in bulk, no irrigation facilities, fertilizers and pesticides which is not available at our district further there are no local dealers.

Initiatives:

Quality flower crop materials received from ICAR-IIHR, Bengaluru under NEH programme for mitigating the above challenges in the farmers' field. KVK, Siaha has taken initiative by conducting motivational campaign, training and demonstration on improved package of practices for cultivation of different types of commercial flower crop. Seed Distribution programme was conducted in the presence of Siaha District Florist Association.

There is a general scarcity of water during winter season in our district. In order to cultivate flower crops successfully farmers were advised and ensured to make use of residual moisture available post monsoon and to start cultivation early.

- Land preparation demonstration for planting of corms.
- Lime and farm Yard Manures application prior to planting.
- Right time of planting and method of Irrigation was illustrated.
- Intercultural operations.
- Gap filling and timely weeding was also demonstrated.
- Integrated Pest management and Integrated Disease management.
- Diagnostic visit, Farmer Scientist Interaction, Group discussion, field visit, Need based trainings.

Key Result

S.N	Particulars	IIHR Variety	Farmers practice
1	Variety Name	Arka Amar	Local
2	Season	Rabi	
3	Area cultivated in Acres	4	-
4	Average price obtained per spike	Rs.20	Rs.10
5	Yields obtained per acre	1,40,000 spike / ha	1,25,000 spike / ha

Impact

The impact of the programme was visible in production and productivity with horizontal spread in the district.The production of cut flowers partially meet the local demand and decreased the inter-state and district import flowers to a good extent. Fresh cut flowers are much cheaper with quality product. This programme provide a good opportunity for income round the year for rural youths, farm women and school dropouts.

"I am grateful and privileged to receive such kind of support resulting in increased farm income from fresh cut flower which is my dream come true"

Laldinthari

College Vaih, Siaha district, Mizoram

Mobile no:8730899662

"This kind of programme ICAR-IIHR NEH Programme have been a blessing to our family through KVK Siaha as we could plant a quality planting materials with confidence and hope to yield a quality harvest"

Nongia

New Colony-I, Siaha district, Mizoram
Mobile no:8730897316

"To witness the successful cultivation of Arka Amar is beyond my expectation. I am impressed with this technology intervention and look forward to continue fresh flower cultivation.

Beihropawngia

Meisavaih, Siaha District, Mizoaram
Mobile no. 7005731321

Gladiolus Varieties of IIHR

Arka Samrat a boon for doubling farmers income of North Sikkim

Sherryla Denzongpa,
SMS Horticulture, KVK, Mangan, North Sikkim

Farmers Details

Name : Mr. DadupLepcha

Village : Ringhim Village

Block : Mangan

District : North

State : Sikkim

Challenges:

- Lack of high yielding and disease resistant varieties in tomato.
- Unable to cultivate tomato in kharif season under open field conditions due to heavy rainfall and severe disease incidence.

Initiatives:

To resolve the above problems, faced by the farmers, the KVK, North Sikkim in collaboration with IIHR undertaken OFT's on evaluation of tomato variety Arka Samratin Ringhim Village in the Kharif season. After the successful performance of tomato variety Arka Samrat, demonstrations were conducted in an area of one acre in the year 2019-20 in the farmer's field in open field condition as well as in protected structures.

A series of demonstrations were conducted in the farmer's field for two successive years from 2018 to 2019. To address to the problem, the tomato variety Sandhya was replaced by high yielding disease resistant varieties of tomato Arka Samrat and Arka Rakshak from ICAR-IIHR, Bengaluru.

Impact

The varieties performed exceptionally well both in the open condition during rabi season and in protected conditions i.e under polyhouse and walk-in tunnels during kharif season. Field days and demonstrations were conducted with the active participation of State Horticulture Department officials to evaluate the performance of these varieties in the farmer's field. For horizontal expansion and replacement of other hybrid tomato varieties by Arka Samrat and Arka Rakshak varieties field visit and meetings were held to showcase the varietal performance of Arka varieties in the farmer's field. Seeing the performance in terms of yield potential and quality, the farmers were fully convinced to take up Arka Samrat in the kharif season of 2019-20.

Sl.No	Particulars	IIHR Variety	Farmers practice*
1	Variety Name	Arka Samrat	Sandhya
2	Season	Kharif	Kharif
3	Area cultivated in acres	1 acre	1 acre
4	Average price obtained per kg	Rs. 25/kg	Rs.25/kg
5	Yield obtained per acre	12.2 tonnes	8.1 tonnes
6	Gross cost of cultivation/acre (Rs/ac)	96715	74200
7	Net income per acre (Rs/acre)	2,08,285/-	1,28,300/-

Field photos

Tomato Cv. Arka Samrat in the field of Mr.DadupLepcha

Farmer Finds Success through Interventions of Arka Abhed and Arka Microbial Consortium (AMC)

Kripal Borah, Priyanka Amonge, Sanjoy Borthakur
KVK, Tinsukia, Assam

FARMERS DETAILS:

Name : Mr. Lakhindra gohain

Village : Dighal haku

Block : Habjan

District : Tinsukia

State : Assam

Challenges:

Mr. Gohain is a young progressive vegetable grower. He is used to grow seasonal vegetables like Tomato, Pumkin, Bottlegaurd, Cowpea etc. in an area of one acre. While doing farming he has faced the following problems:

- Unavailability of disease resistance variety
- Low yield due to pest and disease incidence

Initiative:

Mr. Gohain introduced to KVK, Tinsukia during 2018-19 in a training programme at his village Dighal Haku. After that training he came to KVK, Tinsukia for soil testing of his farm. He also raised his problems of farming among the KVK scientist. As a part of challenges faced by the farmers, KVK, Tinsukia identified the problems through soil testing, farmer-scientist interaction meetings etc. To overcome this problem,KVK, Tinsukia undertaken one demonstration on application of Arka Microbial Consortium(AMC) in the cultivation of tomato variety Arka Abhed in his farm at Dighal Haku village of Tinsukia District in an area of two kotha (0.13 acre) in the Rabi season 2019-20.

Impact:

Before intervention Mr. Gohain obtained tomato yield hardly about 1.2 ton/acre due to late blight disease. As arka abhed is a blight (Both early and late) resistance variety, he got a yield of about 4 ton/acre. Mr. Gohain is keen about organic cultivation of vegetables where he was using FYM and Vermicompost. Seeing his interest Mr. Gohain has suggested application Arka Microbial Consortium (AMC) consortium along with Vermicompost. This adoption not only reduces the disease incidence, but also improved soil helth. The result of the intervention is shown Table 1.

Table 1: Results of application of Arka Microbial Consortium (AMC) in the cultivation of tomato variety Arka Abhed during 2019-20

Sl No	Particulars	IIHR variety	Farmers practice*
1	Biofertiliser	Arka Microbial Consortium (AMC)	Cow dung
2	Variety Name	Arka Abhed	Hybrid variety
3	Season	Rabi	
4	Area cultivated in acres	0.13	
5	Average price obtained per kg	Rs. 15	
6	Yield obtained per acres	4 ton	1.2 ton
7	Gross cost of cultivation per acre (Rs./ac)	Rs.8000/-	Rs.5760/-
8	Net income per acre (Rs./ac)	Rs.52000/-	Rs.24240/-

Above table revealed that farmer made massive earning by adopting Arka abhed variety along with AMC.

Use of Arka Microbial Consortium

Harvesting of Tomato *Var.* Arka Abhed

Selling Arka Abhed at market

Received the "Innovative farmer" award

Certificate of "Innovative farmer" award 2020-21

Impact:

Before taking up the intervention, he used to cultivate vegetable inorganically which leads to detoriate soil health and causes low nutrient status. Owing to the factors of disease resistance variety Arka Abhed and AMC with Vermicompost and other organic management practices now he gets a good yield and has witness increased production of tomato of around 4 ton /acre. Seeing his success other farmers of three surrounding villages covering 15 nos of farmers get motivated to grow Arka Abed.

He was also awarded the "innovative farmer" award by IIHR, Bengaluru at National Horticulture Fare during 2020-21.

Triple Disease Resistant Tomato var. Arka Rakshak performed well with black polythene mulch in Sonitpur District of Assam

Angana Sharmah, KVK, Sonitpur

Name of the farmer : Mr. Munindra Phookan

Village : Punioni

Year : 2016-17

Area Covered : 0.26 ha

Challenges:

Tomato crop during rabi season is very much affected by both abiotic as well as biotic factors in Assam condition. Diseases like leaf curl virus (ToLCV), Bacterial wilt(BW) and early blight causing considerable yield loss up to 70% due to high relative humidity during December-January along with water stress leading to less yield of tomato and poor economic condition of small and marginal farmers. Also there was high incidence of weeds.

Initiatives:

Triple disease resistant tomato variety *Arka Rakshak* developed by IIHR, Bangalore was demonstrated in the field of Mr. Munindra phookan along with Black polythene mulch during rabi season. Seedlings were raised in pro trays and were cultivated in raised beds with 90cm x 60cm plant to plant and row to row spacing and with fertilizer dose recommended for Assam (FYM@10t/ha; N:P:K@75:60:60kg/ha.

Viewing all the problems and challenges faced by tomato farmers of the district, KVK Sonitpur with coordinated helped from the scientists of ICAR-IIHR, Bangalore, introduced a triple disease resistant tomato Var. *Arka Rakshak* in 2016-17 with a local check var. *Trishul.*Scientific interventions were made to tackle the existing challenges. KVK scientists assisted the tomato growers throughout the crop production practices, starting from seedling raising, raised bed prepation, installation of black polythene mulch, fertilizer application and weed control. The required inputs were supplied and regular visits to the demonstration fields by the KVK scientists ensured proper guidance to the farmers. For successful production of the crop, training programmes and field day were also organized to encourage the farmers in the entire Cultivation process and also to provide the opportunities for other farmers to witness the benefits of demonstrated technology.

Impact:

The result of the demonstration programme was eye opener to him and his fellow farmers. The profitability of triple disease resistant tomato variety cultivation attracted to Mr. Phookan and his fellow farmer, mostly because of the high yield, increased storage life and good return due to less pest and diseases attack. As a results of the KVK intervention, the farmers of the village have come forward for commercial cultivation of triple resistant variety *Arka Rakshak* and at present till 2022, area expansion under the technology has covered upto 6.6 ha (50 bigha) of land in nearby village including Amolapam, Napam and Juglani.

Parameters	Technology	Check(without mulch)
Average plant height (cm)	110.22	96.31
Average fruit wt (g)	87.00	60.10
Average yield/plant (kg)	7.2	3.0
Cost of production(Rs./ha)	1,44,000.00	1,31,540.00
Gross return(Rs./ha)	6,56,600.00	3,62,800.00
Net return(Rs./ha)	5,12,600.00	231260.00
Yield (q /ha)	656.6	362.8
B: C	4.6	2.75

Tomato variety Arka Rakshak- A boon to the Farmer of North Tripura District

Mr Abhijit Debanath[1], G. A. Atheequlla[2] and B. Balakrishna[2]
Senior Scientist & Head, KVK, North Tripura,
[2]Scientists, Division of Social Sciences and Training, ICAR-IIHR, Bengaluru

Farmers details

Name : Gouranga Nath

Village : Kalikapur

Block : Jubarajnagar

District : North Tripura

State : Tripura

Challenges:

Shri Gouranga Nath and farmers from his village were cultivating tomatoes since 20 years. But many farmers in the were not taking up tomato cultivation due to high incidence of diseases

Specific challenges faced by them were :

- Non-descript seed varieties with low yield and productivity
- High incidence of bacterial wilt, leaf culr virus & blight diseases
- High seed cost of private sector varieties

Initiatives:

Farmers were in very much need of a tomato variety, resistance for the above mentioned diseases. Accordingly, KVK Tripura in association with ICAR-IIHR, Bengaluru introduced Arka Rakshak in 2014-15.

Parameter	Tomato variety (Arka Rakshak)	Farmer practice (Chiranjeevi)
Avg fruit wt (g),	98.5	88.5
No of fruits/ plant	18.2	13.0
Bacterial wilt incidence (%)-	0.0	4.5
TLCV incidence (%)	1.5	9.6
Avg Yield (mt/ha)	55.50	46.2
Gross Cost (Rs/Ha)	95500	102500
Gross Return (Rs/Ha)	555000	462000
Net return (Rs/Ha)	459000	359500
B : C ratio	5.81:1	4.51:1

Impact: The variety performed very well in terms of yield, productivity and disease resistance. Farmers were very much convinced by the performance of this variety. After realizing higher yield and better price in the market for the Arka Rakshak tomato variety, he regularly cultivated and increased the acreage under this variety. Other farmers from nearby villages witnessed its performance and expressed much interest to take up the crop, owing to its disease resistance nature and high yield. More than 250 farmers benefitted from this variety.

Year	Technology	No of Villages	Area (ha)	Farmers adopted
2015-16 to 2019-20	Triple disease resistance Tomato var. - Arka Rakshak	9	26.0	250

Conclusion: Farmers were highly influenced by the performance of this variety. Horizontal expansion of this variety was witnessed in the neighboring villages. Farmers procuring this variety in large quantity from IIHR.

Photos of different cluster of tomato Arka Rakshak in the villages of North Tripura

Shri Gouranga Nath with the cluster of Arka Rakshak tomatoes in his field. Harvested tomato and packaging for marketing.

Success story of new whole pod edible dual purpose garden pea variety Arka Apoorva in North Tripura District

Mr Abhijit Debanath[1], G. A. Atheequlla[2] and B. Balakrishna[2]
Senior Scientist & Head, KVK, North Tripura,
[2]Division of Social Sciences and Training, ICAR-IIHR, Bengaluru

Farmers Details

Name : Sri Prasenjit Das

Village : Pekucherra

Block : Panisagar

District : North Tripura

State : Tripura

Challenges:

Shri Prasenjit Das is a progressive farmers, cultivates different types of vegetable crops including garden pea since 25 years. In the recent past, the incidence of powdery mildew among garden pea growers had made them difficult to take up the crop. This disease had also led to reduced yield and productivity in garden pea crop.

The challenges faced by him were

- Severe disease susceptibility of the existing varieties, especially for powdery mildew
- Low yield of existing varieties
- High cost of seeds from private sectors
- Existing varieties have more fibrous pods, where only pod is edible

Initiatives:

Farmers were in very much need of a garden pea variety resistant to powdery mildew and high yielder, followed by dual purpose whole pod edible variety, where both seed and pod can be consumed. Initially Prasenjit Das cultivated dual purpose pea variety Arka Apoorva during the year 2017-18 and received much higher yield and good return compared to other variety. The cost of production is less due to low in seed cost of the Arka Apoorva from IIHR compared to other varieties.

Mr Prasenjit Das cultivated Arka Apoorva in the year 2017-18 and received much higher yield and good returns compared to other variety. He attributed the reasons to the success was, low seed cost, high yield, resistance to diseases and dual purpose nature of the produce.

Particulars	Particulars	ArkaApoorva
Days taken for germination	9.66 days	10.32 days
Germination (%)	86 %	78 %
Crop duration	94 days	94 days
Yield	11.5 mt/ha	9.73 mt/ha
Prdn. Per Ha	29121	34528
Gross income (rs.)	172500	145950
Net returns /Ha	143379	111422
B:C ratio	5.92:1	4.22:1

Impact:

After realizing higher yield and better price in the market for the variety, he regularly cultivated and increased the acreage under this variety. Other farmers from near by villages also expressed much interest to take up the crop, owing to the dual purpose of the variety and better market price for this variety. More than 80 farmers benefitted from this variety.

Year	Technology	Nos. of Villages	Area (ha)	Farmers adopted
2017-18 to 2019-20	whole pod edible dual purpose pea variety Arka Apoorva	5	16.0	80

Conclusion:

Farmers were highly influenced by the performance of this variety. Horizontal expansion of this variety was witnessed in the neighboring villages. Farmers procuring this variety in large quantity from IIHR. They desired the support of IIHR and KVK for taking up their own seed production.





Photos of different cluster of whole pod edible dual purpose pea variety Arka Apoorva in North Tripura District

Yardlong bean variety Arka Managala enabled handsome income to farmer of Zunheboto District in Nagaland

Mrs. Edenly Chishi, Chief Technical Officer, Horticulture
Dr. Rakesh Kumar Chaurasia, Principal scientist and Head, KVK, Zunheboto

Farmer details

Name of the farmer : Mrs. Aholi Sumi

Village : Lumami

Block : Akuluto

District : Zunheboto

State : Nagaland

Challenges:

Lack of high yielding and disease resistant variety of yard long bean. Farmers in these regions were earlier growing their local variety named Kuithi, which was giving less yield.

Interventions:

To address the above problem staff of KVK, Zunheboto in collaboration with ICAR-IIHR, Bengaluru had undertaken OFTs in kharif season. After successful performance of Arka Mangala variety of yard long bean two demonstrations were conducted in the farmers' field. After field visits and surveys, it was found that farmers' variety Kuithi was yielding very less.

Impact:

With the introduction of high yielding and disease resistant yard long bean variety Arka Mangala in an area of half an acre. The percentage of yield increase over farmer's variety was 61.12 %. The farmers were happy. Seeing its performance farmers in the nearby villages are cultivating Arka mangala yard long bean.

S.N	Particulars	IIHR variety	Farmers practice*
1.	Variety Name	Arka Mangala	Kuithi
2.	Season	Kharif	Kharif
3.	Area cultivated in acres	0.5	0.5
4.	Average price obtained per kg (in Rs.)	30	30
5.	Yield obtained per acre	3.3 tonnes	2.06 tonnes
6.	Gross cost of cultivation per acre (Rs./ac)	24,400.00	22,200.00
7.	Gross return per acre (Rs./ac)	99,000.00	60,180.00
8.	Net income per acre (Rs./ac)	74,600.00	37,980.00

* **Previous season**

Field Photos

Arka Mangala variety of Yard long been in the field of Mrs. Aholi Sumi

French Bean Variety Arka Anoop fetches high income in Central Bramhaputra Valley Zone

Sibani Das
Scientist, KVK, Nagaon, Assam

Farmers detail

Name : Mr. Abul Hussain

Village : Bengennati

Block : Aibheti

District : Nagaon

Challenges:

Low yield of existing varieties
Lack of availability of quality seeds, forcing to use of under script seeds which were sold loose in local markets
Susceptibility of local varieties to diseases like rust and bacterial blight

Interventions:

To address the above problem the staff of KVK, Nagaon in collaboration with ICAR –IIHR under took this OFT (Performance evaluation of French bean var Arka Anoop) in *Rabi* season during the year 2013-14 and 2014-15 .

Krishi Vigyan Kendra, Nagaon in collaboration with ICAR-IIHR intervened in all the technologies followed by the farmer starting from selection of high yielding variety, pest and disease attack encountered during the crop growth etc. The required inputs were supplied and regular visits to the demonstration fields by the KVK scientists ensured proper guidance to the farmers. For successful production of the crop, training programmes were also organized to encourage the farmers in the entire cultivation process and also to provide the opportunities for other farmers to witness the benefits of demonstrated technology.

Impact

S.N	Particulars	IIHR variety	Farmers practice
1.	Variety Name	Arka Anoop	Local var
2.	Season	Rabi	
3.	Area cultivated in acres	0.3	0.2
4.	Average price obtained per kg	Rs 30-40.	
5.	Yield obtained per acres	120 quintals/ha	94 q/ha
6.	B.C ratio	3.3	1.4

Conclusion :

Seeing the performance of crop, neighboring farmers too convinced that Arka Anoop was a better choice in terms of yield and less incidence of diseases

Field Photos

Photo of Arka Anoop at different stages in Mr Abul Husssain's field

Tomato variety Arka Rakshak improved livelihood of Nalbari district Farmer, Assam

Homeswar Mazumdar,
Scientist, KVK, Nalbari, Assam

Farmers Details

Name : Md Mumtazil Islam

Village : Loharkatha

Block : Barkhetri

District : Nalbari

State : Assam

Challenges:

Lack of high yielding, bacterial wilt and leave curl resistant varieties in tomato

Interventions:

To address the above problems, KVK, Nalbari in collaboration with ICAR- IIHR had undertaken demonstration on cultivation of tomato variety Arka Rakshak in Loharkatha in an area of one acre in *Rabi* season in the year 2019-20.

As a part of challenges faced by the farmers, KVK identified the problems through participatory rural exercises, farmer-scientist interaction meetings etc. Accordingly, we convinced the farmer about the potential of this particular variety. He agreed and taken up cultivation in the *rabi* season of 2019-20. The results of the intervention are depected in the table below.

Impact

S.N	Particulars	IIHR variety	Farmers practice*
1.	Variety Name	Arka Rakshak	Nayak
2.	Season	*rabi*	*rabi*
3.	Area cultivated in acres	1 acre	1 acre
4.	Average price obtained per kg	10/-	10/-
5.	Yield obtained per acres	20 MT	16.8 MT
6.	Gross cost of cultivation per acre (Rs./ac)	46400/-	51200/-
	Net income per acre (Rs./ac)	1,53,600/-	1,16,800/-

Field Photos

Field Demonstration of Arka Rakshak Tomato

Arka Abhed : a potential and high yielding variety in Kamrup District of Assam

Dorodi Priyom Duarah[1], Dhirendra Nath Kalita[2], Manoranjan Neog[3] and Atheequlla G.A[4]
[1,2] Krishi Vigyan Kendra, Kamrup, [3]Directorate of Extension, Assam Agricultural University, Jorhat
[4]Division of Social Sciences and Training, ICAR-IIHR, Bengaluru

Challenge:

Lack of suitable multiple disease resistant varieties, low yield, poor quality, less shelf of Tomato.

Tomato is an important commercial vegetable crop in Assam. Farmers of Kamrup district faced major issues in tomato like late blight disease, low yields due to heavy and uncertain rain during rabi season, coupled with hail storms. Tomato farmers were facing problems due to climate change which led to outbreak of pest and diseases, drought situation, heavy rainfall, hailstorm etc. So there was a great demand for tomato varieties which are disease resistant, majorly for blight, bacterial wilt and improved yields.

Initiatives:

Mr. Banamali Choudhury is a progressive farmer from Kollapara, Mirza of Kamrup district, Assam. He is basically vegetable grower who cultivates traditional vegetables, high value vegetable crops including exotic ones in his farm of 4.62 acre. He is an experienced tomato grower both in field and polyhouse condition. KVK , Kamrup has introduced Arka varieties of tomato under IIHR- NEH component *i.e. Arka Abhed, Arka Rakshak, Arka Samrat an Arka Apekshya.* Among all varieties, Arka abhed is one of the best solution in Assam, As higher yielder, Arka Abhed reaches the farmers' demand providing bumper production, attractive skin colour and good quality with market demand, long shelf life and multiple disease resistant properties. Kamrup district faced hailstorm during February month of 2022. Only Arka Abhed survived in that adverse climatic situation and other varieties failed.

Mr. Choudhury has been experienced with Arka varieties of tomato since 2018. In last 3-4 years, major disease like late blight has emerged and caused devastating problems for tomato farming in Assam. Subsequently cost of cultivation has also gone up due to high labour wages. Farmers were also finding it difficult to cope up with the raised input cost and other related problems.

To mitigate these problems, KVK, Kamrup initiated OFT, FLD and demonstration under IIHR NEH component of the technology "varietal performance of Arka varieties of Tomato varieties in early rabi,late rabi and Kharif season" from 2018 to 2022. As progressive farmer, Mr. Choudhury has successfully cultivated Tomato as early rabi, late rabi and kharif under Bamboo based polyhouse to catch the higher price in the market. As earlier, he used to cultivate tomato in only Rabi crop. He was unable to cultivate the profit oriented crops due to lack of the technical knowledge of the variety selection with multiple disease resistant *i.e.* early blight, late blight, leaf curl and bacterial wilt for year round production of tomato. He came contact with KVK, Kamrup and discussed about the tomato

cultivation. He was advised about the improved tomato production technology developed by ICAR-IIHR Bengaluru with Arka Abhed in early rabi, late rabi and Kharif season. Keeping these suggestions in view, Mr. Choudhury decided to cultivate tomato in a planned manner in area of one acre to fetch the market demand and supply. He transplanted the tomato seedlings on raised beds in field condition with adequate water facilities in Rabi and under bamboo based polyhouse in Kharif season in one acre. He has followed recommended package of practices in Assam as per suggestions given by the SMS, Horticulture. He used to visit KVK, Kamrup frequently for suggestion and frequent visits were also made by the KVK scientists to the demonstration plot. Arka Abhed has vigorous growth and less disease incidence during rainy season in Assam also.

Impact

He started harvesting of Tomato after 60 days after planting and harvested average 28.78 tons per acre and sold @ Rs. 20.00 per kg. This resulted in a total income of Rs. 5.76 lakh per acre. Total cost of cultivation for tomato was 1,20,000 per acre. Thus , he earned a net return of Rs. 4.56 Lakh per acre with 4.8 BC ratio. Farmers of Kamrup district were highly impressed by the result of IIHR Arka varieties of tomato. Farmers from the neighbouring villages were satisfied with the performance of Arka Abhed with bumper yield, year round crop, late blight resistant, good keeping quality (>15 days), attractive skin colour, good cooking quality, survive even after hailstorm. Therefore Arka abhed become most popular and renowned variety of tomato in major vegetable growing pockets in Kamrup district of Assam

Photo 1: Tomato variety Arka Abhed cultivation in farmers field

Photo 2: Tomato variety Arka Abhed survive after hailstorm in farmers field

Photo 3: Adoption and horizontal expansion of Arka Abhed in Farmers field of Kamrup district

Table: Economics of Tomato cultivation

Demo. Yield (Tons/Acre)			Yield (Check)	% Increase	Gross Cost (Rs/Acre)	Gross Return (Rs/ Acre)	Net Return (Rs/Acre)	B:C:R (GR/GC)
High	Low	Average	Tons/Acre					
33.46	20.25	28.78	14.97	48.6%	Arka Abhed: 1,20,000 Farmers Practice: 70,000	Arka Abhed: 5,76,000 Farmers practice: 1,47,900	Arka Abhed: 4,56,000 Farmers Practice: 77,900	Arka Abhed: 4.8 Farmers Practice: 2.11

Photo 4: Monitoring and visit to farmers field from the KVK

Success of Arka Abhed in areas affected by Bacterial wilt and Late blight- An answer to the problems of Tomato farmers in Assam

Dr. Sudeshna Baruah, Dr. Supriya Sonowal and Dr. D. Sharmah, KVK, Dibrugarh, Assam

Challenge:

On the bank of river Burhidihing, there is a huge belt of tomato cultivation in the village of Dihingthan, Barbarua block, Dibrugarh district, Assam. Almost 8-9 years back, the villagers of this village learnt the cultivation practices of tomato from a farmer from Nagaon district. After successful cultivation of tomato for 2-3 years, looking at the commercial benefit from tomato cultivation, most of the farmers in that village were eager to learn and practice this commercial cultivation of tomato. This practice has been proved to be a very profitable venture for the whole village. But few years back, since around 2018-19, the tomato cultivation in the region is facing the problems of bacterial wilt and blight diseases which is increasing higher every year. In the year 2019, as per the report of the villagers and Area Extension Assistant from District Agriculture Department, Krishi Vigyan Kendra, Dibrugarh had visited the area and suggested possible management practices for the diseases.

Initiatives:

After the visit, training was conducted by Krishi Vigyan Kendra, Dibrugarh, targeting the farmers facing the disease problems in their fields. The training included the disease identification procedures, post occurrence management, prophylactic measures and long term management practices. This training also was an informative one about the available disease resistant varieties. The farmers were found more interested about the management practices rather than adopting the disease resistant varieties like ArkaRakshak and Arka Abhed. Later on, Krishi Vigyan Kendra, Dibrugarh formulated an on farm testing program in the tomato growing areas affected by Bacterial wilt and blight on Performance evaluation of Tomato var. Arka Abhed in Dibrugarh District. Three farmers from the village of Dihingthan were initially selected for the programme in the year 2020-21. That was the time the farmers under the program realized the benefit of growing resistant varieties. But, the year was certainly ended unfruitful with the 2nd phase of lockdown for stopping the spread of Covid-19 pandemic. The farmers faced crop loss due to unavailability of market and labour in the late harvesting time of crops. They could only harvest the crops twice in some plots. But, within that period only the farmers realized the performance of Arka Abhed tomato as compared to the available market hybrids.In the following year, *i.e.*in 2021-22, total targeted farmers in the village for the 2nd year of on farm testing of Arka Abhed were four. As the Krishi Vigyan Kendra started the program, there were around 7-8 more farmers who wanted the seeds of Arka Abhed for commercial cultivation. Through Krishi Vigyan Kendra, Dibrugarh, they procured 150gram more seeds for commercial cultivation. In the coming year, Krishi Vigyan Kendra, Dibrugarh is planning a large scale FLD to popularize this successful variety in the tomato growing areas of the district.

Key result/insight/interesting fact:

The success of the intervention could be visible from the rate of disease incidence. The bacterial wilt occurrence in the farmer's practice hybrid variety was 8.83 to 12.5% while the test variety Arka Abhed didn't show any such symptoms. On the other hand, there was a high incidence of late blight in the commercial hybrid varieties (38-76.5%) whereas not a single plant in the Arka Abhed plot was found dead, proving to the farmers that they can now have an alternative way of fighting with the crop loss.

Impact:

The tested technology was initially tried in an area of 0.4 ha, within a year it was horizontally spread to 2.4 ha of land in the village. The farmers in the village have accepted the technology (Arka Abhed) as a replacement to the popular commercial hybrids that are prone to fungal and bacterial diseases like Bacterial wilt and late blight.

Lessons Learned:

The program carried out consecutively for two years was a successful one. Initially, it was difficult to convince the farmers for adaption of a new variety. Awareness program and training in this regard helped to convince a few farmers for the program. After only 1 year of successful implementation, 300% farmers were convinced to adopt the technology. And after two years of success, it is can now be converted to FLD.

Supporting Quotes and Images

Mr. Rupeshwar Das, Farmer, Dihingthan: The variety is resistant to the major diseases, our farmers are very much willing to grow this variety in all the areas we have under tomato.

Mr. Ratneshwar Gogoi, Farmer, Dhaman: The variety is very much profitable and is productive. Considering the disease resistant quality I woud like to try it in the late kharif season to cultivate a n off season crop.

Mr. Pranib Das, Reporter, North East News (Local news Channel), Dibrugarh : I came here to cover the success of this new tomato variety, and I am happy to see that this variety really worked in resisting the deadly major diseases of tomato. It will be helpful for other tomato growing farmers as well.

Large scale cultivation of Tomato var. Arka Abhed

Harvested fruits at mature stage

OFT on Arka Abhed variety of Tomato

Vegetable Cropping System With off Season Tomato Var. Arka Rakshak In Hilly Terrain of Aizawl District, Mizoram

Dr. Santosh Kumar[1], Dr. Jotish Nongthombam[1], Dr. K. P. Chaudhary[1], Mr. Lalvensanga Pachuau[1], Atheequlla G.A[2], B Balakrishna[2]

[1]KVK, CAU, C.V.Sc & AH, CAU, Selesih, Aizawl, Mizoram

[2], Scientists, ICAR-IIHR, Bengaluru

Farmer's Profile

Name	:	Mrs. Lalrinpuii
Age	:	44
Address	:	Saikhamakawn Village, Tlangnuam Block, Aizawl, Mizoram
Mobile no	:	7640060827
Aadhar no	:	673518861874
Land holding	:	1.5 acre

Challenges:

The development in agriculture was hindered by lack of quality seeds & scientific knowledge on systematic cropping system. Further, existing high incidence of pests, diseases and weeds amplified the constraindts faced by the farmer. These constrains are drastically affected her cropping intensity leading to low yield of crops and the income.

Initiatives:

High yielding variety seeds of tomato Cv. Arka Rakshak which is a triple disease resistant variety developed by IIHR, Bangalore was demonstrated in Mrs. Lalrinpuii field during off season. She raised nursery in the polyhouse and then was cultivated during off season in terrace condition with 50cm x 50cm plant to plant and row to row spacing and Integrated Nutrient management with Arka vegetable special micronutrient were also implemented. The designed intervention includes timely production of healthy seedlings under polyhouse, irrigation from Jalkund (micro water harvesting structure), off season cultivation of tomato Var. Arka Rakshak, that can result in better yields for fetching higher price for the farmer. The details are as follow:

Viewing all the problems and challenges faced therein, with coordinated help from the subject experts of KVK Aizawl. Arka Rakshak was introduced and also scientific interventions were made to tackle the existing scenario.

The details are as follow:

1. Off season cultivation of tomato var. Arka Rakshak with Integrated Nutrient management along with Arka Special Micronutrient were also implemented.
2. A polyhouse of 5x8m dimensions is constructed in the field with critical inputs and technical know-how from the subject experts of KVK, Aizawl which immensely helped in timely and sufficient production of healthy seedlings.

3. Nursery raising is done under protected polyhouse system with mini sprinklers. The same structure was again utilized for production of tomato var. Arka Rakshak for additional income.

4. A jalkund (micro water harvesting structure) of 5x4x1.5 m dimensions, holding a capacity of 27,000 litres was constructed on the upper part of the field. Rain and runoff water is harvested into the jalkund during monsoon and utilized for irrigation of crops during the winter season through gravity fed micro-irrigation system (drip & sprinkler).




Arka Rakshak tomato under the polyhouse.

Outcome and Economics

Crop	Before intervention (Avg. of two years)			After intervention (Avg. of two years)		
	Cropping period	Avg. Yield (Kg/acre)	Income (Rs.)	Cropping period	Avg. Yield (Kg/acre)	Income (Rs.)
Tomato	Oct – Feb	9400	1,13,000	2nd fortnight April – 1st fortnight Aug.	14400	2,13,000
Tomato under polyhouse.	-	-	-	November to March	3.1 q/50m^2 4	24,500
TOTAL			**1,13,000**			**2,37,500**

Impact:

Before the intervention, generally, local leafy vegetables were cultivated during the summer season and the fields were left uncultivated during the winter season which led to a low income of the farmer. However, after the interventions were adopted, she got yield increase of 40-60%. There is no more shortage of quality & healthy seedlings through timely production in the polyhouse. She could also fetch higher price of the farm produce because of the off season cultivation especially tomato which was fetching almost double the price than during the normal season. Her works and efforts were appreciated by fellow farmers and are ready to adopt the interventions in their field. And further a total of 44 farmers learning her benefits have come forward for advisory help to KVK Aizawl, CAU (I), Mizoram regarding the details of the technology. Becoming a model for her fellow farmers, to a total of 66 farmers have replicated the technology covering a total of 5 villages which has lead to earn her a fame and popularity among the farming community. Inspired by her success and contribution to her farming community local News channel LPS and Doordarshan National, Aizawl, Mizoram interviewed her which was telecasted in the their respective channels.

Interviewed by the local news channel (LPS) and Doordarshan National, Aizawl, Mizoram for her contribution to the local farming communities.

Arka

ICAR-IIHR

ICAR-Indian Institute of Horticultural Research

Hesaraghatta Lake Post, Bengaluru-560089, India

ISO 9001-2015 Certified

Phone : +91-80-23086100, Fax : +91-80-28466291

Email: director.iihr@icar.gov.in Website: www.iihr.res.in