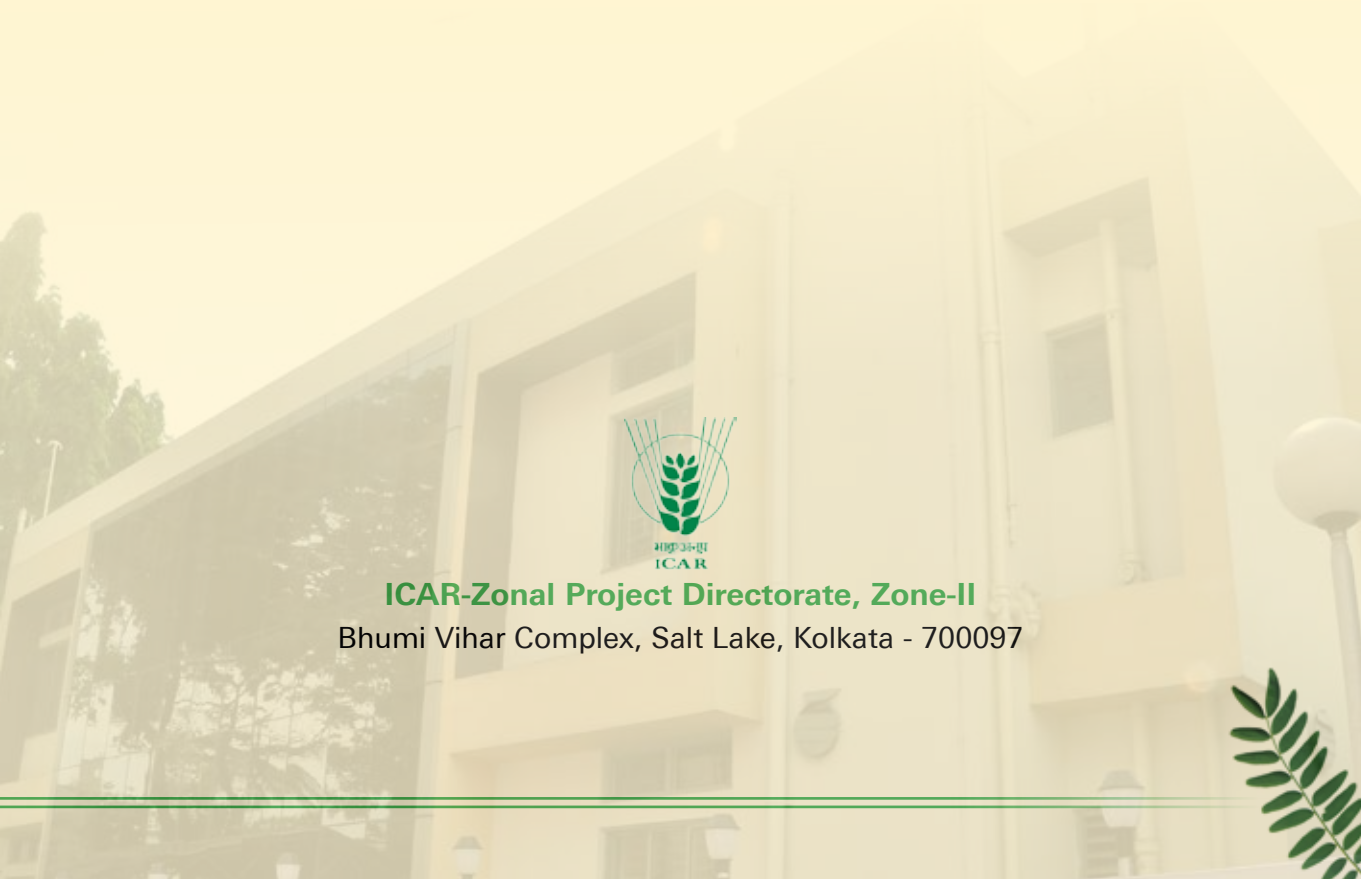
KVKs in Accelerated Growth of Agriculture in Bihar and Jharkhand

Team, Zonal Project Directorate, Kolkata



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MESSAGE

With 38 Krishi Vigyan Kendras (KVKs) established in Bihar and 24 KVKs established in Jharkhand, the roll out of KVKs is complete and each district in these two states now have KVK. As a first line extension system KVKs have brought in visible changes in agricultural production system. In terms of raising productivity, increasing seed replacement ratio, capacity building of farmers and extension functionaries, promoting improved varieties and technologies, dissemination of animal husbandry, fisheries and other allied technologies the KVKs have done commendable job. Value addition and post-harvest, empowering women in agriculture, promoting self help groups etc. are a few thrust areas of the KVKs. Through the process of assessment and refinement of technologies the KVKs have developed location specific technologies and also provided feedback to the State Agricultural Universities/ICAR Institutes about the performance of recommended technologies in the grass root level.

I am happy that ICAR-Zonal Project Directorate, Zone II has brought out a compilation " KVKs in Accelerated Growth of agriculture in Bihar and Jharkhand ". Impact created by KVK in all spheres of Agriculture and allied enterprises have been nicely captured. A few success stories given in the end adds flavor to the document. This would serve as evidence of how convergence of efforts at the field level could bring desired results.

I congratulate Zonal Project Director and his team for their efforts in bringing out this valuable document.

Dated the 27th August, 2014
New Delhi

(S. Ayyappan)

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FOREWORD

Krishi Vigyan Kendra as an innovative grass root level organization has been recognized nationally and internationally. As Science-based extension system, KVKs provide capacity building, on-farm validation, demonstration and dissemination of agro technologies for sustainable agriculture and rural development. The efforts of the KVKs have been to reduce the time lag between technology generation and technology adoption which is often attributed to slow pace of technology dissemination. Besides fulfilling the mandated activities, the KVKs have become important partners for the state development departments in achieving their set targets. Various other organizations also depend on KVKs either for human resource development programme or technological backstopping for their target clientele. The KVKs of Bihar and Jharkhand are actively participating in the agricultural development programmes initiated in both the states with tangible impact. Achievements made by the KVKs have enhanced the visibility of the KVKs at the national level as well. However, the contribution of KVKs has not been summarized in a single compendium so far which prevented the farmers, stakeholders and policy makers to understand the role and responsibility of the KVKs. Zonal Project Directorate, Zone-II has taken a timely step in highlighting the contribution of KVKs of both the states through a publication to meet the long felt need.

I appreciate the efforts of the Zonal Project Director and scientists of the Zonal Project Directorate who have made it possible to enumerate the contributions of the KVKs of Bihar and Jharkhand for the benefit of farmers and other stakeholders.

(A.K.Sikka)

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Preface

The pace of agricultural development to a great extent depends on effective convergence and linkage between research and extension systems. Krishi Vigyan Kendra at the district level plays the role of intermediary in translating research output into technological language for the convenience of farmers to adopt that practice. In the states of Bihar and Jharkhand, a system has been developed to make the KVKs partner of the state/ centre sponsored programmes towards agricultural development. Despite increase in the work pressure, the KVKs have shared the responsibility to help the development departments and other stakeholders in bringing desirable change in present agriculture of both the states.

The activities carried out by 60 existing KVKs (38 in Bihar and 22 in Jharkhand) in mandated and other areas have led to development of quality human resources, availability of technology, information and input support, women empowerment, marketing avenue, value addition, entrepreneurship development and most importantly enhanced visibility of KVKs.

The publication presents a briefof such accomplishments which will help the farmers to understand the benefit of scientific agriculture. At the same time, it will also be a support to policy makers to devise newer ways to partner with KVKs for the overall improvement of agriculture in the states of Bihar and Jharkhand.

Contribution and cooperation received from the Directors of Extension Education of Bihar Agricultural University, Rajendra Agricultural University and Birsa Agricultural University is duly acknowledged. Information provided by the hosts of NGO run and other KVKs has also facilitated in bringing out this publication for which the Zonal Project Directorate sincerely extend its gratitude. The guidance received from Indian Council of Agricultural Research is thankfully acknowledged.

(A. K. Singh)

Contents

KVKs in accelerate growth of agriculture in Bihar and Jharkhand

BACKGROUND

The state of Bihar is divided by river Ganga into two parts – the North Bihar with an area of 53.3 thousand sq. km. and the South Bihar with an area of 40.9 thousand sq.km. Besides the main Ganga stream, the state enjoys 14 river basins of Ghaghra, Gandak, BurhiGandak, Bagmati, KamlaBalan, Kosi, Mahananda, Karmnasa, Sone, Punpun, Kiul-Harhar, Badua and Chandan. All these rivers drain into the main Ganga stream. The six river systems from Karmnasa to Chandan, draining the southern part of Bihar originates primarily from Indian territories in the state of Bihar, Jharkhand and Chattisgarh whereas seven river systems from Ghaghra to Mahanandadrain North Bihar. Most of these river systems of North Bihar originate in Tibet and Nepal and hence, they are international rivers. Excess rainfall in Tibet and Nepal directly affects the flow of this river systems causing extensive flood in North Bihar and this has become a recurring phenomenon.

Agriculture is the backbone of Bihar's economy, employing 81% of the work force and generating about 42% of the State Domestic Product. The state with a geographical area of nearly 94.2 thousand sq.km has the natural endowment of fertile soil, good rainfall, plenty of water resources and agro-climatic conditions highly suitable for growing almost all types of crops and thrice in a year. In Bihar, agriculture is not only the source of livelihood but also it generates raw materials for the agro-based industries which has immense potential in the state.

On the basis of soil characterization, rainfall, temperature and terrain, the state is divided into three main agro-climatic zones. They are North West Alluvial Plains (Zone-I), North East Alluvial Plains (Zone-II) and South Bihar Alluvial Plains (Zone-III).

Zone-I: This zone comprises the districts of East and West Champaran, Gopalganj, Siwan, Saran, Sitamarhi, Muzaffarpur, Vaishali, Madhubani, Begusarai, Sheohar, Darbhanga and Samastipur. The zone occupies an area of 32,665 sq. km with average annual rainfall of 1234.7 mm. The land of this zone is alluvial plains that slopes towards the South East direction with a very low gradient. Vast areas of this zone gets flooded and becomes waterlogged during monsoon. The soil of this zone is mostly calcareous though in the Northern part soil with neutral, acidic or saline nature is found.

Zone-II: The zone comprises the districts of Purnea, Katihar, Saharsa, Supaul, Araria, Kisanganj, Madhepura and Khagaria which covers nearly 12% (20797.4 sq. km) of the total geographical area of Bihar. The average annual rainfall of this zone is 1382.2 mm. The area is full of streams with abandoned or dead channels of river Kosi. The frequent and sudden change of course has left small lakes and shallow marshes. Vast areas of this zone also remain waterlogged over a considerable part of the year.

Zone-III: This zone is situated in the South of the river Ganga and comprises the districts of Bhagalpur, Banka, Munger, Jamui, Lakhisarai, Seikhpura, Gaya, Aurangabad, Jehanabad, Nawada, Arwal, Nalanda, Patna, Bhojpur, Buxar, Kaimur and Rohtas. The total geographical area is 40,875.5 sq.km or 25.75% of the total area of the state. Average annual rainfall is 1102.1 mm. The soil of this zone is mostly medium to heavy textured throughout the depth of the profile. The general land slope is towards North and East, with gentle slope and moderate to low gradient.

Tal, Diara and Chaur Land: In the south of the natural levee of the Ganga, there is a vast stretch of backwater known as 'Tal (low order monsoon stream)' land extending from Buxar to Pakur of Jharkhand where most of the rivers and rivulets coming from the south get lost. The estimated area under Tal is about 1.00 lakh ha. In addition to the Tal land, the state has about 4.0 lakh ha of 'Diara land (saucer shaped flood plain of a river)' under flood plains of river Ganga and Ghaghra. The state has also about 4.0 lakh ha of 'Chaur land (remnants of river course)', which is highly suitable for fish farming. The Tal, Diara and Chaur land are inundated by water for varying periods, and are difficult to manage.

Land utilization pattern: As per census of 2002-03, about 61.18% of area is under cultivation. The percentage of fallow land is 6.75 against the corresponding figure for undivided Bihar prior to bifurcation was 42.77 and 16.02%, respectively. Consequent upon curving out of Jharkhand, forest area has dwindled to a meager 6.65% from 17.01%. The gross and net sown area in the state is 80.26 lakh ha and 56.38 lakh ha, respectively. The cropping intensity stands at 142%.

Operational holding: As 77% of the state's main workforce is employed in agriculture sector, the average size of operational holding in Bihar is only 0.75 ha against the national average of 1.41 ha (Govt. of India, 2005). The share of marginal holding having less than 1 ha each is as much as 82.9%. Marginal and small holding account for about 59.8% of the total operated area.

In terms of value of output of major crops in Bihar (Rs.3017) is a shade lower than that of all India (Rs.3576). Rice and wheat are the major crops of kharif and rabi seasons occupying nearly 3.7 and 2.1 million hectares, respectively. In addition, maize is cultivated in about 4 and 5 lakh (ha) during kharif and rabi season, respectively. Average yield of rice wheat cropping system is 1.45 – 2.19 t/ha, as against the production potential of 4.5 – 5 t/ha. Similarly, the average maize yield of the state is about 2.38 t/ha against its yield potential of 6 t/ha. Even though the state is rich in soil and water resources, the average yield of rice, wheat and maize are only about 32, 44 and 40 percent, respectively, of potential yield. Thus, there is a considerable scope to increase the productivity of rice, wheat and maize in Bihar. Alongside, the state has high potential for development of horticulture, intervention for production, processing, post-harvest management and marketing in order to avail maximum benefits under National Horticulture Mission operated in 16 districts of Bihar. The state also produces about 2.6 lakh tonnes of fish annually. There are about 2 lakh hectares of permanent water area and 1.2 lakh hectares of seasonal water area in the state. Besides, nearly 5 lakh hectares of paddy area are

under deep water condition which can be very well exploited for fisheries. The fisheries sector contributes nearly 1.85% of the state's GSDP.

Agriculture is at the core of the states' economy. The contribution of agriculture and its allied sector to the state domestic product was 35 percent in 2007-08. Although, this is a reduction from 48.5% in 1980, it remains amongst the highest in the country. During 1980-1992, agriculture and allied sector in Bihar grew at 1.6 percent per annum compared to the national average of 3.1 percent. In fact, it was the lowest among most of the states. However, since 1993, growth in Bihar's agricultural sector has accelerated. While the All India Agricultural GDP grows at 2.2 percent per annum between 1993-2003, the corresponding figure for Bihar was 2.7 percent which was next only to West Bengal and Andhra Pradesh.

Figures presented above adequately describe the poverty and low crop yields in Bihar. Hence, the goal of the agricultural production system is to maximize income of land owning and landless rural populace to improve their livelihood. It could be accomplished by increasing income of the land owning and landless rural population through increased production by enhancing productivity and intensity of farming, and by generating more employment in agriculture and other rural based production activities. Simultaneous care also needs to be taken to preserve the health of land, water and other natural resources, so that agricultural production system remains ever productive and sustainable. Area under fallow land needs to be progressively reduced providing assured irrigation and other services. Special attention also needed for Tal, Diara, Chaur and Saline areas to augment production of crop, horticulture, fisheries and other commodities.

Agriculture in Bihar: Agro-ecological situation of Bihar is quite favorable for production of various field and vegetables crops, fruits, livestock, fish, honey and other commodities. Bihar enjoys monopoly in production of litchi and makhana in the country followed by honey and aromatic and medicinal plants. Annual average rainfall in the state ranges from 1100 mm to 1400 mm in different agro-climatic zones of the state. Besides a vast potential of surface irrigation, the state has utilized ground water aquifer for irrigation purpose of about 43.47 lakh (ha) which is only half of exploitable ground water potential for irrigation. North Bihar constituting 56 % of area of the state is risk prone and about one third of area is normally affected by flood every year.Nearly 10 lakh ha of land suffers from water stagnation for three to four months. In 2007 about 215 lakh population of twenty one districts was adversely affected by flood and crops of an estimated area of 17 laks ha were destroyed due to this naturaldisaster. In 2008 the unprecedented flood of Kosi created havoc in more than 14 districts and destroyed kharif crops and assets worth of Rs.100 billion and large number of labours migrated out due to uncertainties of employment in agricultural activities.

Besides, *Tal*and *Diara* are also spread over 12.5 lakh hectares area which accounts for 20% of agricultural land in Bihar. The specific land situation is dominated by mono cropped and has specific problems of land, water and crop management. In pulses production, there is ample opportunity but area under pulses declined by three lakh hectares during last 15 years

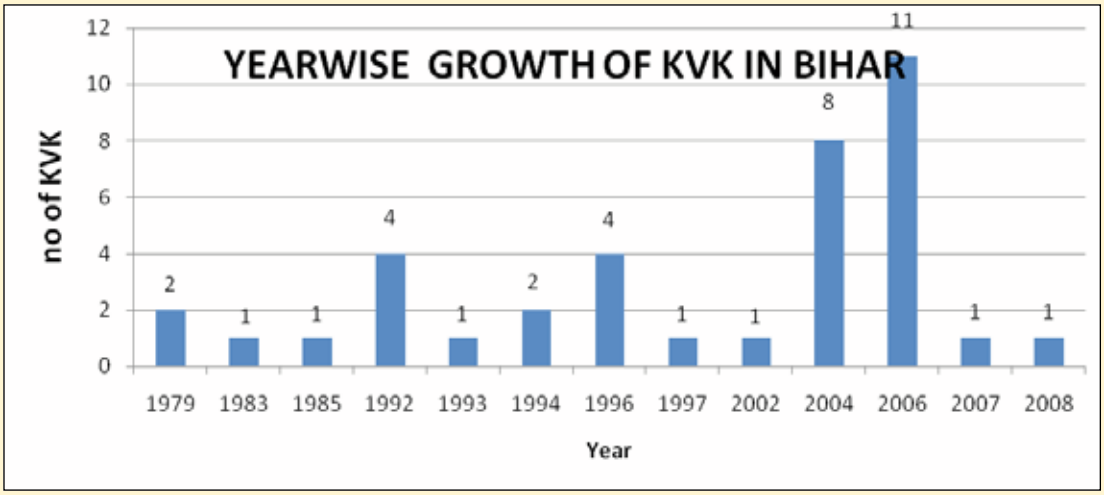
and pulse productivity remained stagnated during the last 10 years. Despite comparatively higher net profit in pulses production to wheat production, farmers prefer to cultivate wheat as less risk is involved in wheat production. Moreover, there is dearth of promising and pest- disease resistant verities of pulses in Bihar. Maize is only crop which performed well in Bihar, particularly the introduced winter maize. Winter maize is produced mainly for market purposes though fluctuation of price is a common phenomenon.

In Bihar, irrigated crop area (59 %) is higher than corresponding national average (42 %) but per hectare productivity of almost all crops is lower than national average. Despite comparatively high proportion of irrigated area, majority of farmers are not in position to irrigate their crops adequately and timely due to collapse of canal irrigation system.

In Bihar use of chemical fertilizer (156 kg/ha) is higher than national average (115 kg / ha) but farmers useimbalanced quantity of nitrogen (N), Phosphate (P_2O) and Potash (K), resulting poor response of crops to this nutrients. Poor response to chemical fertilizer might be due to deficiency of micro-nutrients, particularly zinc, manganese and sulphur in the soil.Assimilation of principal elements (NPK) in the crop getsrestricted due to this factor. Farmers are unaware of benefits of balanced use of fertilizers and deficiency of micronutrients in the soil.

YEARWISE GROWTH OF KVK IN BIHAR

The first KVK in Bihar was established in the year 1979. Over on period of 35 years. The state is having 38 KVKs as on date. Yearwise growth of KVKs in Bihar is presented graphically.

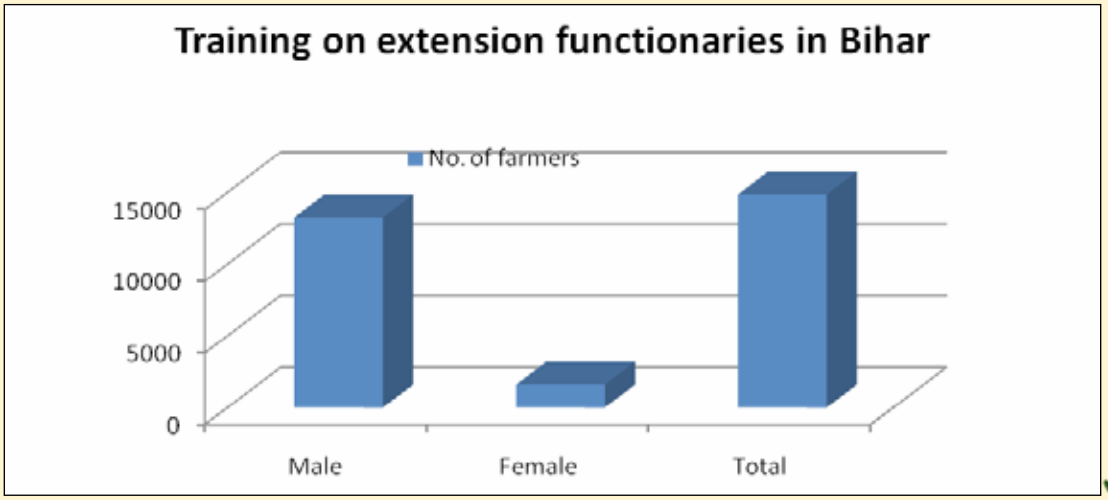


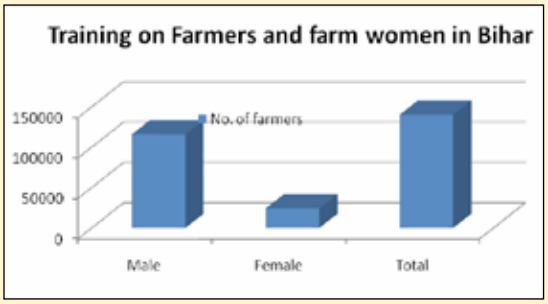
ROLE OF KVKS OF BIHAR IN TRAINING OF FARMERS AND FARM WOMEN, RURAL YOUTH AND EXTENSION FUNCTIONARIES

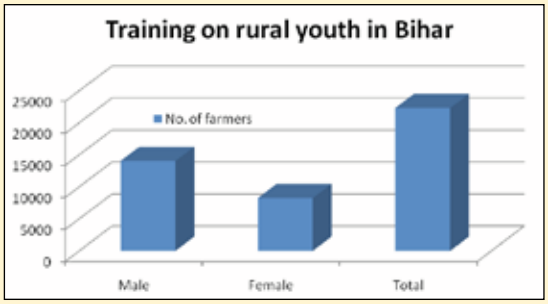
As a mandated activity towards human resource development, the KVKs of Bihar organized 5630 number of training programmesfor 177412 numbers of beneficiaries including practicing farmers, farm women, rural youths and extension functionaries during 2012-13. Farmers and farmwomen trained were 140280 in numberand courses offered were4154. In providing training to rural youths, 952 numbers of courses were offered for the benefit of 22281participants whereas 524 numbers of courses were organized for 14851extension functionaries.

Category	No. of Courses	Grand Total		
		M	F	T
Farmers & Farm women	4154	116030	24250	140280
Rural Youth	952	14025	8256	22281
Extension functionaries	524	13259	1592	14851
Total	5630	143314	34098	177412

Caste-wise participation in the training programmes shows that 15.8 per cent of the trainees were from scheduled caste category. The analysis further indicates that farmers of lower socio-economic status are increasingly approaching KVKs for their economic betterment through training. The major areas covered were integrated crop management,seed production, cropping system, integrated farming system, resource conservation technology, water management nursery management ,integrated pest management, rejuvenation of old orchards, gender mainstreaming through SHGs, integrated nutrient management, management of farm animals, livestocks feed and fodder production etc. Both on and off-campus courses were conducted by the KVKs as per the requirement of clientele.



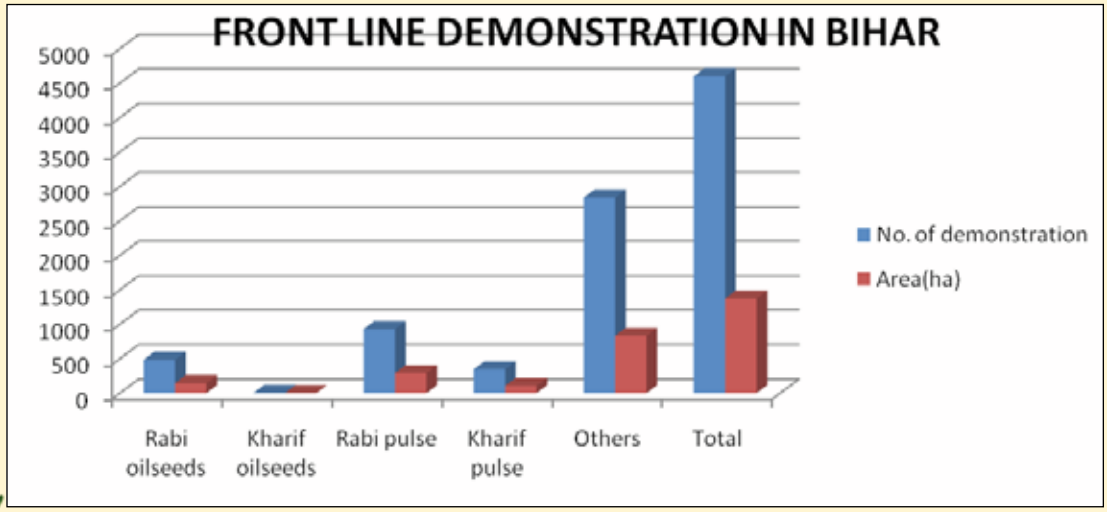




FRONT LINE DEMONSTRATIONS

In rabi season, 484 demonstrationson selected oilseeds were carried out by the KVKsfor an area of 144 ha. In pulse crops, demonstration was conducted in 291 ha with the participation of 928 farmers. In kharif, however,an area of 107 ha was brought under pulse crop demonstrationinvolving 346 farmers. In crops like paddy, wheat, vegetables etc. 2838 no. of demonstrations were conducted by the KVKs in 831 ha .The total number of beneficiaries were 4600 both in rabi and kharif season of 2012-13.

Crop	Bihar	
	No. of demonstration	Area(ha)
Rabi oilseeds	484	144
Kharif oilseeds	4	1
Rabi pulse	928	291
Kharif pulse	346	107
Others	2838	831
Total	4600	1374



OUTCOME OF FRONTLINE DEMONSTRATIONS:

Technology demonstrated	Crop	Impact of demonstration
Varieties of wheat namely, HD-2733, PBW-373, HD-2824, PBW 343,DBW 39 etc.	Wheat	22 to 28 % increase in yield over check
Varieties of paddy namely, R. Sweta,Prabhat,Kasturi, R. Bhagwati, S.SUB-1, Subhasini etc.	Paddy	10 to 20 % increase in yield over check
Varieties of maize namely, Saktimaan-4, QPM-1and other varieties of QPM series	Maize	28 % increase in QPM yield over check and 14 % increase in yield over check in the case of Saktimaan-4
Varieties of major pulses namely, Pant –4/ HUM – 16 & SML 668,Pusa –9, ICM (seed),Pusa Vishal etc.	Pulses	21-33 % increase in yield over check
Varieties of major oilseeds namely ICM (seed), R. Suflum, RAU, TS-17 & YAS-66-197-3	Oilseed	24.7-37 % increase in yield over check

✤ Seed replacement

Bihar agriculture is dominated by small land holders. About 96 % farm households have less than 2 ha of land and they own 67 % of agricultural land in Bihar. Marginal farmers constitute about 90 % of total farm holding and they own about 43 % of land in Bihar. Theprocess of agricultural development among these farmers mostly lags behind as they do not have resources for acquisition of modern agricultural technologies. Farmers of late have started using high yielding verities of seeds of principal crops like paddy, wheat, maize, pulses, oilseeds and vegetables crops. However, use of home grown seeds by around two third of the farmers is prevalentin Bihar. State govt. with the support of KVKsas well as state agricultural universities has initiated aggressive programme for popularizing use of quality seeds. This has resulted into replacement of local cultivar in paddy to the extent of 30 to 35 % through high yielding varieties and 20 to 22 % through hybrid.In wheat 60 to 70 % of local varieties have been replaced through high yielding varietiesand in maize, 20 to 25 % with composites. Most successful introduction has been observed in maize which is expected to replace 90 % of the local varieties through QPM. In cases of pulses and oilseeds, seed replacement rate was 25 to 30 % during the year 2011-12 and in vegetable 45 to 50 %. After adopting different new technologies like SRI method in wheat and rice, improved sugarcane cultivation method, balanced dose of NPK, wheat management practices, zero tillage method of sowing etc. has significantly improved the average yield of crops

✤ Horticulture Development

Bihar has an important place in area and production of fruits and vegetable in India. The state'sshare in area under fruits and vegetable in the country is estimated to 8.5 % (2005-06).Area under fruit and vegetable covers about 10 % of gross cropped area but generate income of about 50 % of total value of all the crops produced in Bihar. Bihar has monopoly in production of litchi andmakhanaas it produces 70 % of total litchiproduction and 80 % makhanain the country.Mango is also an important fruit crop in Bihar which is taken up in near about 1.4 lakh ha of land. Bihar constitutes about 7 % of area and 10 % production of mango in the country and per hectare mango productivity is higher in Bihar (8.75 tons / ha) than national average 6.14 ton/ ha. Bihar is also leader in banana production in the country and produces 5 % of banana on 4 % of banana area of the country. Potato is also an important horticultural crop in Bihar and the state ranks third in potato production and recently recorded highest yield per hectare in Nalandadistrict in the country. Bihar has much potential in potato production as well as vegetableslike cauliflower, cabbage, brinjal, tomato, lady's finger and cucurbits. Spices like chilies, turmeric, ginger and garlic are grown about 70 thousand hectares of land accounting for more than 10 % of total production in the country. The state has also great opportunity to cultivate medicinal and aromatic plants. In this context KVKs of Bihar are playing an important role inhorticulture developmentthrough providing quality planting material of 233500 in numbers to the state govt. Livestock has also important place in agrarian economy which generates about 16% of state gross demotic product in Bihar. In rural Bihar about 56 % of households have their bovine or goat / poultry in the backyard. In livestock production, milk is most important which constitutes 50 % of total value of livestock production in Bihar. Apart from these, the state has an area of 69 lakh hectares of pondand 3200 K.M. rivers. In addition,Bihar has one lakh hectare water bodies created by flood, wet land and water stagnation which could be utilized for fish production.Unavailability of quality fish seeds is the main reason behind non-adoption of scientific fish production technology in Bihar.

KVKs are playing an important role for the development of fishery sector through conducting training as well as assessing technologies for its adoption by the fish growers.

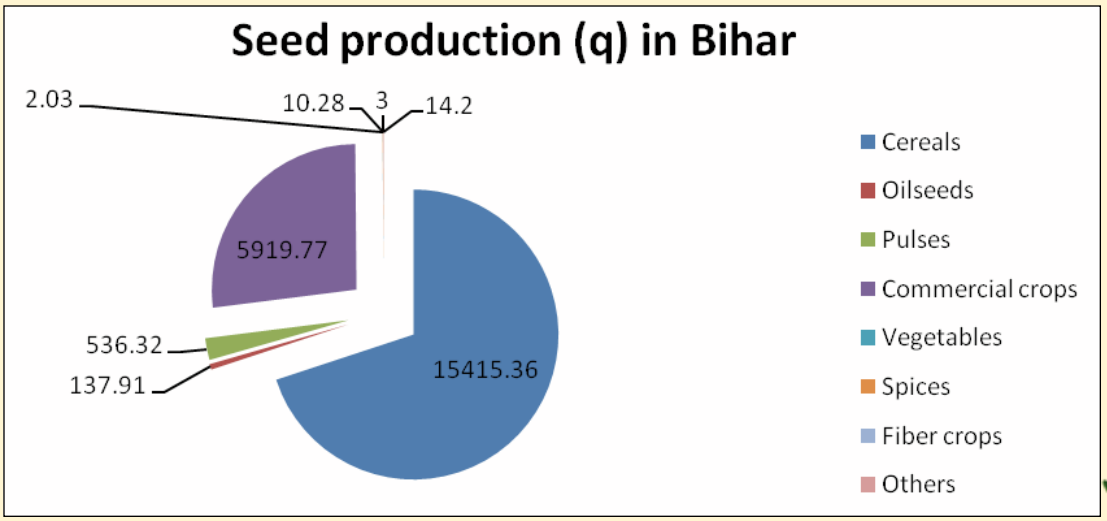
✤ Seed production

KVKs took up seed and planting material/production programe with the aim to improve the supply of quality seed and to enhance the seed replacement rate of this zone as well as to enhance the production and productivity of major cereals, pulses, oilseeds and other crops. During 2012-13, the KVKs of Zone-II produced 45002.99 q of seeds which were made available to 54721 number of farmers. This seed production had brought an amount of Rs. 697.0 lakhs as revenue to the KVKs. The KVKs of Bihar alone contributed to the extent of 22038.87q of seeds for an estimated value Rs. 2,85,33,594. Among all the crops, highest quantity (25421.98 q) of seeds were produced in paddy and varieties identified were MTU-7029, Sahabagi, Navin, Lalat, RajendraMasuri, Swarna Sub 1, MTU-1010, Anjali, BPT-5204, Abhishek, MTU 1001 and others.

For production of 7776.64 q of quality seeds of wheat, the varieties identified by KVKs were HW 2045, HW 2824, PBW 711, PBW-343, HD-2733, CBW-38, K-9107, HUW-468, K-307, PBW-43 etc. In oilseeds, mustard was the most important crop for seed production and 548.08 q of seeds were produced with the varieties like RajendraAnukul, PusaMahak, Rohini, RajendraSufalam, PusaAgrani, Shivani, B-9, PusaJaikisan, NDR 8501 and others. In pulse crops, varieties like Subrata, Maitree, HUL-57, PL-406, Arun, Jul-57, PL-4, DPL-62 and DPL-15 were selected by the KVKs for production of 578.4 q lentil seeds followed by pea (291.19 q), black gram (282.14 q) and red gram (234.73 q). The KVKs also included commercial crops like potato and sugarcane for seed production and an amount of 3184.57 q and 4573.38 q of seeds, respectively, were produced. In respect of vegetables seed production, KVKs included almost all the vegetables for seed production with highest produce in onion (66.52 q) followed by tomato (10.16 q). The details of seed production in the zone are given in the following Table to indicate the contribution of KVKs of Bihar in this sector.

Table: Production of seed by the KVKs (farm and village seed production)

Sl. No.	Crops	Bihar	
		Quantity (q)	Value (Rs)
1	Cereals	15415.36	24050821
2	Oilseeds	137.91	253906
3	Pulses	536.32	1813030
4	Commercial crops	5919.77	2213828
5	Vegetables	2.03	108200
6	Spices	10.28	37560
7	Fiber crops	3.00	24000
8	Others	14.20	32250
	Total	22038.87	28533594



✣ Planting materials

Apart from producing seeds, the KVKs also took up programmes on production of planting materials at a large scale considering the need of this zone in respect of vegetables, fruits, plantation crops, forest species and others. Total planting materials produced during the year was 12.97 lakhs in number which was equivalent to revenue of Rs. 82.79 lakhs. Among vegetables, the seedling production was considered for tomato, cauliflower, brinjal, chili, cabbage and capsicum etc. and in tomato, 253309 number of seedlings were raised, followed by brinjal (127440 number), cabbage (104897 number), chili (67411 number) and capsicum (5252 number). In fruit crops, highest number of sapling was prepared for mango (133326 number) followed by papaya (95719 number), guava (34280 number), litchi (19099 number), banana (6520 number) and others. Production of planting materials also included ornamental plants like Croton, Ashok, medicinal and aromatic plants, plantation crops, spices and condiments and forest species. The KVKs also produced planting materials of flower including marigold, tuberose, chrysanthemum and dahlia etc.

A comparative analysis of planting materials produced by KVKs of three states of Zone-II is presented below in the tabular form.

Table: Production of planting materials by KVKs in Bihar

Sl. No.	Crops	Bihar	
		Number	Value (Rs)
1	Fruit	245805	5709641
2	Vegetables	336347	235985
3	Medicinal and Aromatic	0	0
4	Forest sp	0	0
5	Spices	2	50
6	Plantation Crop	462	13233
7	Flowers	0	0
8	Ornamental	8215	181450
	Total	590831	6140359

With the technological support of State Agricultural Universities and guidance of Zonal Project Directorate vis-à-vis Indian Council of agricultural research, the KVKs of Bihar assessed a good number of technologies related to crop production, vegetable production, insect pest management, livestock rearing and other relevant areas. Technologies found suitable for adoption were handed over to extension mechanism and feedback sent to research organizations where need for modification was felt. This has resulted into putting such technologies in the farmers' field for the development of state agriculture. The process has definitely strengthened the ongoing efforts of state government in improving the agriculture scenario of the state of Bihar. Technologies which have found place in the large number of farmers' field are given below:

✣ System of root intensification method for rice cultivation

Different KVKs assessed the effect of SRI technique in ricecultivation. It was observed that the complete SRI technique produced higher yield along with higher net return in comparison to traditional practices. It was further observed that through this technique there was overall improvement in no. of tillers (per hill 30%) effective tiller per hill (25 to 30%), yield increase to the extent of 40% followed by 40% increase in net profit as compared to farmers practices along with saving of water and properweed management in rice crop. In SRI method 12 days old rice seedling is planted at a spacing of 25 cmx 25 cm against traditional transplantation of 30 days old seedling resulting in higher yield and higher return.

SRI method of Wheat cultivation

✣ Application of Zero tillage

The assessment of zero tillage in enhancing profitability of wheat and paddy cultivation followed by timely sowing of wheat conducted by KVKs led to out scaling the technology in the entire state in collaboration with line departments and ATMA. The result ofZero tillage has shown that 52% and 22% increase in yield in wheat and paddy, respectively, could be achieved over conventional system.

Pictorial View of OFT on impact of Seed rates through Zero Tillage Mechine

✣ Zero Tillage in Wheat Sowing

Introduction of vibrant Resource Conservation Technology (RCT), ZTT in Rice-Wheat dominated cropping system brought drastic change in wheat yield. KVK have introduced ZTT in year 2005 an little area of about 5 ha only and now it is being used in an area of about 1.00 lakh ha. It

not only reduced sowing cost up to a tune of about Rs.2500 /ha but also advanced the sowing by 12-15 days and increased yield up to 12% as compared to conventional method.Reduction in the cost of land preparation, seed, labour, weed management, irrigation etc. led to nearly 65% more income to farmers than conventional method.

✣ Sahbhagi – A Promising Rice Variety for Drought-Prone Areas

In a bid to cope up with scanty rainfall situation during onset of kharif, an improved drought tolerant and short duration paddy variety, Sahbhagi has been successfully introduced in drought prone districts of Bihar particularly in agro-ecological Zone IIIB. Due to erratic nature of monsoon drought is particularly frequent in rainfed uplands and shallow lowlands of Bihar. Average productivity is less than 1.5 t/ha in rainfed upland and less than 2t/ha under shallow lowlands. Introduction of Sahabhagi variety provided a yield advantage of 0.5 t/ha under moderate stress and 1.0 t/ha under severe drought conditions over traditional varieties of paddy and yielded at par with irrigated control condition. The variety is resistant to leaf blast and moderately resistant to brown spot and sheath blight.

✣ Rejuvenation of Guava Orchards

Decline in productivity of Guava tree takes place largely due to poor photosynthetic efficiency besides several other compounding factors including age of the tree, dense and intermingling branches, neglected and poor management of orchards etc. Penetration and interception of sunlight in the canopy is greatly affected due to this intermingling and overcrowding branches leading to low productivity. KVKs have taken initiative through FLD and training to rejuvenate the old plants in year 2012. Undesired and overcrowded branches are pruned so that open


canopy ensures better light penetration, improves photosynthesis and flowering capacity. Thus, productivity of Guava increased by 9.37% through various training and FLD in district. About Rs.50,000 /ha profit is being achieved by increase in yield.

✤ Green Manuring in Kharif Paddy

Indiscriminate dose and application method of chemical fertilizer in Rice-Wheat cropping system has started reducing soil productivity and health. To maintain the soil productivity and health addition of leguminous crop is being propagated among farmers which on incorporation in soil increase nutrient supply capacity, organic matter and microbial population and also neutralize pH. KVKs introduced green manuring (GM) in year 2010 through various training and FLD in districts. It was found that GM saves about 39 kg N in paddy crop. Due to increase in yield and soil health this technology could spread into vast area of paddy producing district.


✤ Zero Tillage in Lentil for Tal area of Bihar

Tal is a unique land situation of Bihar which is monocropped and only lentil is cultivated in rabi season. Clay soil of **Tal** area made it difficult to plough and if sowing is not completed within shortest possible time, soil becomes very hard due to fast loss of moisture. Being bowl shaped and situated behind the natural cleaves, drainage of water is dependent on evaporation only.

Zero tillage in sowing lentil promoted by KVKs has performed exceedingly well in **Tal** area which has been widely adopted by the farmers of **Tal** area in Bihar.

Paira cropping is dominant practice in Lentil cultivation in some of the districts of Bihar. In low laying area (commonly known as ahar) Lentil is sown after depletion of soil moisture in last week of October to November.In heavy clay soil large clods form during field preparation. Application of zero tillage has not only made it possible to cultivate lentil but also produced nearly 200% more yield.

✤ Direct Seeded Rice by Zero Tillage for Resource Conservation

Rice cultivation in Bihar during kharif is highly dependent on rain which delays nursery raising, transplanting and sowing of succeeding crop, Wheat. Moreover, rice being water-loving crop, yield is influenced by the availability of irrigation throughout growing period. Shortage of labour, particularly during land preparation and transplanting, further aggravates the problem and consequently cost of cultivation goes up. Direct seeding of rice through zero till-cum-seed drill is an effective means to overcome the problems of rice cultivation during moisture stress situation. The KVKs have successfully demonstrated the technology with reduction in water (15 to 20%) and labour requirement.Higher rice yield has also been recorded to the extent of 39 percent with enhanced profitability.

✤ Cultivation of Kharif onion for higher profitability

Heavy rain in pre- monsoon period followed by long dry spell during the monsoon period has been a common feature in last two years in most of the district of Bihar. The erratic climatic condition during the monsoon has forced the farmers to take another crop in fallow land or smaller portion of their main crop land. KVKs have conducted FLDs on Kharif onion. Introduction of this alternate crop in kharif by the KVKs has helped good number of farmers in getting adequate remuneration.

✤ Vermi-Compost

To minimize the use of chemicals in agriculture operations, KVKs put their efforts in producing bio fertilizer, bio agents etc. The

KVKs through its training and demonstration programme have involved young farmers in

vermi-compost based enterprise development followed by large scale production by the small farmers for its use mainly in vegetable crops. This has also resulted into effective utilization of farm waste / agricultural waste for the benefit of overall agricultural environment.

✤ Azolla culture

Presently a few KVKs namely Samastipur and Vaishali have introduced azolla culture for increasing rice production. Azolla culture fixes atmospheric nitrogen in rice field which results significant increase in rice yield. The dry azolla has been utilized for livestock also to enhance milk productivity.

✤ Papaya intervention

Papaya (*Carica papaya*) is a very important fruit crop grown commercially in Begusarai district. It is one of the best crops that flowers and fruits throughout the year.This is highly profitable to the farmers. But before the attempts made by KVK,the cultivation of papaya was almost nil in the district Begusarai. The farmers thought that papaya cannot be cultivated due to mobile towers and the gases emitted from oil refinery at Begusarai. This information came to the knowledge of KVK experts during the course of field visit .KVK Begusarai has made a special attempt for revival of papaya cultivation through the multifarious extension activities. First of all KVK did a diagnostic survey and collected the salient findings.

In view of the above, multifarious and close intensive extension activities were started by the KVK after the survey study and a full improved package of practices for the papaya cultivation was given to the 15 selected progressive farmers and these interested farmers were trained during the year 2009-10. After the training a feedback was collected and a source of good quality of gyanodioceious variety Red Lady-786 and Pan-2 was provided to them. A confidence about the success was built in them by KVK by maintaining regular contact.

Visit of Hon'ble Vice- Chancellor in Papaya field

✤ Initiative for fish seed production

Khagaria district has abundance of diversified aquaculture and fisheries resources consisting of Ponds and Tanks, Mauns, Chaurs and Rivers. Fish farmers of the district have to depend on the seed brought from West Bengal which have several constraints resulting in poor fish

production. These are smaller sized seeds, high mortality and disease susceptibility due to inbreeding and long distance of transportation, poor growth rate etc. Under the background KVK, Khagaria has initiated fish seed production through induced breeding of Indian Major Carps and Common Carps in hapa. As Khagaria is having high iron content in underground water, hapa breeding employing surface water is a viable option for fish seed production. Breeding of Common Carp, Rohu, Catla and Mrigal was successfully demonstrated to the fish farmers of the district.

✤ Drudgery deduction through women- friendly technology

Modification in winnower by KVK, Banka has been done for drudgery reduction and sizeable population of women have adopted this technology. Similarly, KVK, Bikramganj has introduced user friendly long handled sickle through OFT/FLD and training were given to farm-women to reduce the drudgery and achieve a saving of Rs. 314/Ha., i.e. 2 labour/ha in harvesting of paddy.

✤ Residue Management through better utilization of by-product

In the paddy bowl districts of the Bihar, mostly the medium and big farmers are using combine harvester to harvest their crop. After harvesting, they used to burn crop residue in open field which not only decrease soil health but also causes serious environmental problems. KVK, Rohtas has started massive awareness campaign among the farmers about the ill-effect of the burning of crop residue and encourage the farmers to utilize the crop residue for making vermin-compost.

✤ Backyard poultry for income generation.

To promote the backyard poultry farming among resource poor farmers. BAU has distributed chicks of Vanraja and Grampriya breed through the network of KVKs. The results of this programme has shown a positive impact in the income generation through egg and meat production.

✤ Bee keeping as a source of crop improvement & income generation

KVK, Jehanabad has trained the farmers and as a result 18 farmers taken bee keeping as enterprise as a source of additional income and producing 150-200 kg honey on average and earning Rs. 25000-40000 per year. KVK has been able to attract large number of rural youth towards this venture.

✤ Mushroom production as source of women empowerment

Oyster mushroom and milky white mushroom production through women group has change the scenario of rural economy in many districts of the state. The average production of oyster and milky white mushroom is about 510 quintal per annum. The average selling price of mushroom grown is Rs. 80 per kg. Women growing Mushroom are now becoming self-dependent and this has brought improvements in the living standards of the rural areas of the district. The socio-economic impact is such that the quality education of children and purchasing power of these village has increased significantly.

✤ Intercropping for Better Yield in Tal Area

Chick pea and pea when grown as sole crops produced low yield. But sowing of chickpea and pea at 2:1 and 3:1 in line was found a better crop geometry in terms of yield and net return. It is a suitable combination for Tal area of Bihar. In the state of Bihar, and drainage congestion which is commonly known as Tal area. A number of tributaries with their final destiny at Tal area contribute flow of excess water to this area. The Tal area is mainly (lengthwise) spread towards west to east. The northern side of the Tal area is blocked by the raised bank of the river Ganga flowing along direction of Tal area. During flood, the water level in the river Ganga exceeds the water level of Tal area. As a result, natural drainage water from tributaries joining the Tal and creates water logging. Residual moisture available in the soil after receding of stagnated water through evaporation only, is utilized by the farmers for growing chick pea and pea as sole crops. This has resulted in low yield as well as productivity of crops and Tal area, respectively.

✤ Higher Wheat Yield through SWI Method

System of wheat intensification (SWI) using 6kg seed/acre with ½ kg gur (molasses) and 4-5 kg vermin compost with cow urine soaked in about 12 I of water for 6 hand spread n jute bag after filtering and kept covered for 6h. Then the seed was sown in 20 x 20 cm spacing, 2-3 cm deep in dry seed bed, with 6 irrigation and vermicompost @ 5-6 kg/ac and DAP application. This practice increased the average yield of wheat than the traditional method of sowing and wheat sown with zero tillage (ZT). In SWI method, average yield was obtained nearly 59 q/ha whereas through ZT it was as high as 51 q/ha and in traditional method, 37 q/ha. In percentile term, the increase in yield was more than 59 percent over traditional practices and nearly 16 percent in comparison with ZT method.

✤ Drudgery-Friendly Technology for farm-women (Naveen Sickle)

Harvesting of standing crops by traditional sickle is very tedious and most of the work is being done by farm women. They get tired due to higher energy requirement in operating

unscientific designed of sickles. KVK introduced well designed women friendly sickle in year 2009 through OFT/FLD & training among farm-women to reduce the drudgery and achieve a

saving of Rs.314 /ha i.e. 2 labour/ha in harvesting the paddy crop. Presently 30% of paddy area is being covered by this women-friendly technology.

✤ Waste material management through vermi-composting

In Rice-Wheat dominating cropping system farmers used to burn crop residue in open field which not only decrease soil health but also causes serious environmental problems. Keeping in view, KVK started popularizingvermi-compost technology among farmers through training in year 2009 and succeeded to save waste materials upto a tune of 60 lakhs in conversion of vermi-compost from cow-dung. In preparation of one batch of vermi-compost in a unit of 10 pits (10' x 3' x 2.5') about 8 trolley cow dung is required which costs Rs. 6400 (Rs. 800/ trolley) in one pass of 70-75 days. In this way the unit can be used for 5 batches in a year and need Rs. 32000 cow dung annually. Replacing cow dung by agro-waste in 1:1 total saving of cow dung is Rs. 16,000/- year.

✤ KisanChapual

BAU had started the Kisanchaupal, an innovative step to revive the rich tradition of the villages. This scheme of the university was appreciated by ICAR. A total 928 KisanChaupal were organized in which 47355 numbers of farmers including farm women and extension functionaries participated. KVKs of BAU had organized technology week which has provided a platform to bring a number of stakeholders under a single umbrella. A total of 2319 number of farmers including farm women and extension functionaries participated.

ROLE PLAYED BY KVK TOWARDS AGRICULTURAL DEVELOPMENT IN JHARKHAND

Background:

Jharkhand as the 28th State of Indian Union got recognition on the 15th November, 2000. The state of Jharkhand, formerly a part of Bihar extends between 22 degrees North to 25.5 degrees North latitudes and 83 degree East and 87.75 East latitudes. The total geographical area of Jharkhand is 79714 sq.km surrounded by Bihar in the North, West Bengal in the East, Odisha in the South and Chattisgarh in the West. The state is located on an elevation of 300 to 610 msl and the climate ranges from dry semi humid to humid semi-arid types. Jharkhand is largely comprised of the forest tracks of Chhotonagpur plateau and SanthalPargana with total forest area of 23.32 lakh ha which covers 29.26 per cent of the geographical area of state and much above national average of about 18 per cent.

The state has 24 districts, 212 blocks and 32,260 revue villages to house a population size of 32988134 (census 2011). Distribution of population is rural and urban areas indicates that 25055073 persons live in rural area and the rest 7933061 in the urban areas. Of the total population, 70 per cent depends mainly agriculture and allied activities for their livelihood contributing about 15 per cent to Gross Domestic Product.

The state of Jharkhand comes under Agro-climatic Zone VII i.e. Eastern Plateau and Hill Region. This region is further divided into three zones namely, Central and North Eastern Plateau, Western Plateau and South Eastern Plateau zone. The state falls in zone 12 and 13 as per agro-ecological characterization of the country. Central North Eastern Zone is having highest total geographical area (4.1 m ha), net cultivated area (55%) and least forest area (13%) whereas South Eastern Plateau is having minimum total geographical area (1.3 m ha), 31.6 per cent of net cultivated area and 24.0 per cent forest area. The highest forest area is available in Western Plateau (33%) followed by 2.5 m ha total geographical area and 24 per cent net cultivated area.

Out of total 79.71 lakh ha of total geographical area, total cultivable land is 38.0 lakh ha but net sown area is 25.75 lakh ha. Current fallow and other fallow constitute 8.87 and 6.75 lakh ha, respectively whereas 5.74 lakh ha land is barren in nature. Land put under non-agricultural use is 6.87 lakh ha and cultivable waste land accounts for 2.74 ha. Irrigated land area is 3.007 lakh ha and the cropping intensity is 116 per cent. Annual precipitation in the plateau and sub-plateau region is 1400 mm on an average, of which nearly 83 per cent is received during June to September and the rest in remaining months. A number of perennial rivers and streams flow through the state and the important rivers are Damodar, Subarnarekha, KoelKaro, Barakar and Sankh. Natural forest and mineral reserves are the most important resources of this state. It ranks first in the production of coal, mica, kyanite and copper in the country.

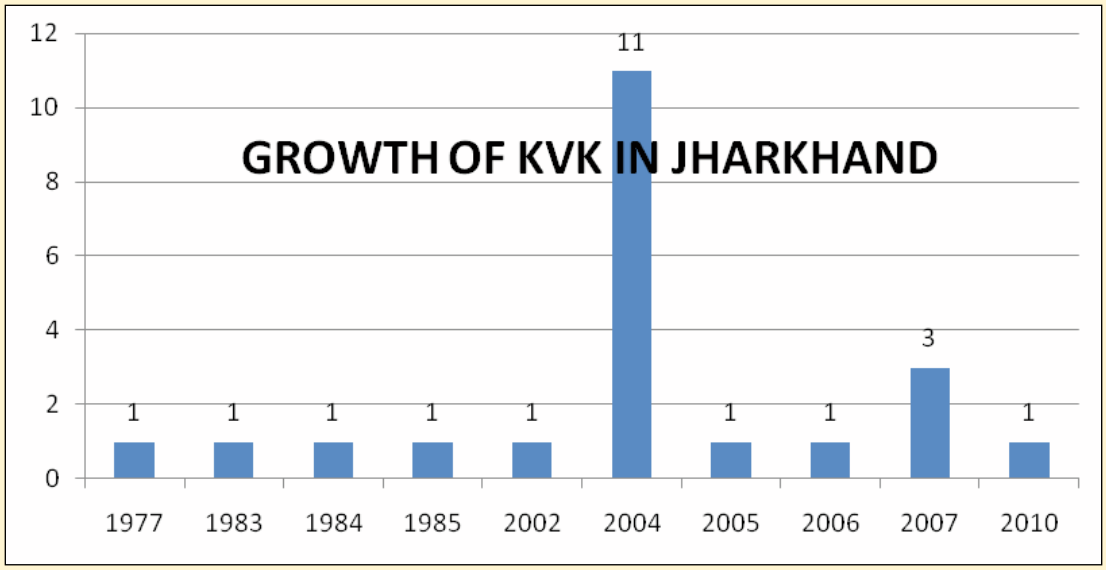
Granite gneiss and granite schists are the major constituents of developing soil in this region accountinh for 32.6 and 14.2 per cent, respectively. Soil salinity on flooding is an unknown problem in this region. However, problem of soil acidity (pH< 5.5) is quite acute which affects

4 lakh hectares of cultivated area. Sheet and gully erosion are the major causes behind loss of soil and plant nutrients as the land surface is uneven and undulating. This has resulted into severe erosion every year to the extent of 23 lakh hectares of land.

Food security situation in the state of Jharkhand is very precarious. In spite of being bestowed with huge natural resources, 40 per cent population of the state live below poverty line. World Food Programme mapping has listed the state as one of the lowest in the ladder of development indicators. According to National Survey II, about 2 per cent of population suffer from acute and chronic hunger and 10 per cent from seasonal food insecurity. Nearly 70 per cent population depends on small farmland less than 1 hectare size. Hence, stabilizing agriculture for small and marginal farmers'alongwith looking for livelihood option in the state is one of the greatest challenges which should be addressed with utmost seriousness and sincerity.

YEAR-WISE GROWTH OF KVK IN JHARKHAND

There are 23 KVKs in the State of Jharkhand of which 16 are operating under the control of BAU, Ranchi and 7 belonging to different NGOs, ICAR Institute and District Administration. Four KVKs, namely, Ranchi, Hazaribag, Deoghar and West Singhbhum are working in the State since long time. However, remaining 19 KVKs are relatively new. The year-wise growth of KVKs in Jharkhand is presented graphically.



The KVKs through their mandated activities namely, technology assessment, technology refinement, demonstrations, trainings and extension activities as well as production of critical input like seeds, planting materials, etc. have played a very significant role in agricultural development in respective district technology-wise details are as follows:

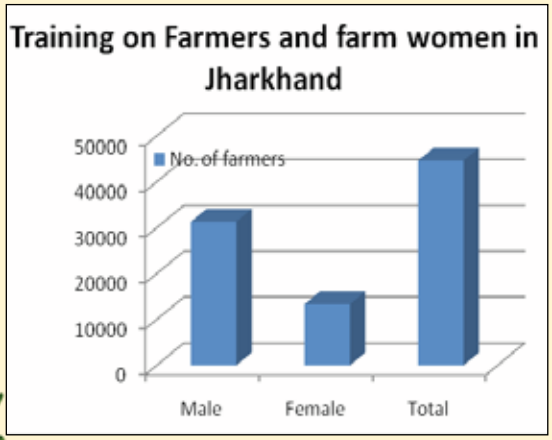
In the State of Jharkhand, as a whole 2263 numbers of training programmes were offered to 59801 beneficiaries during 2012-13. Farmers and farm -women trained were 44623 in

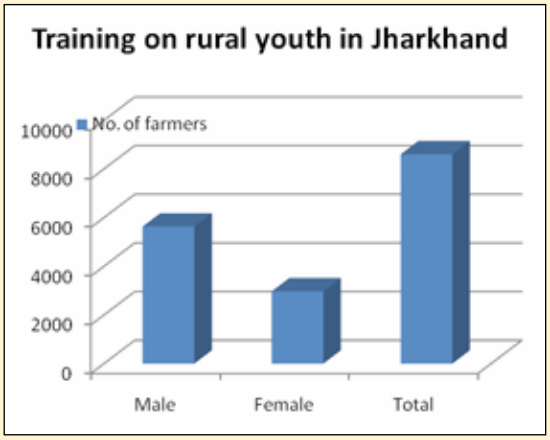
number covering 1589 courses. Rural youth trained were 8604 during the period covering 410 number of courses. While extension functionaries were trained through 264 number of courses involving 6574 beneficiaries.

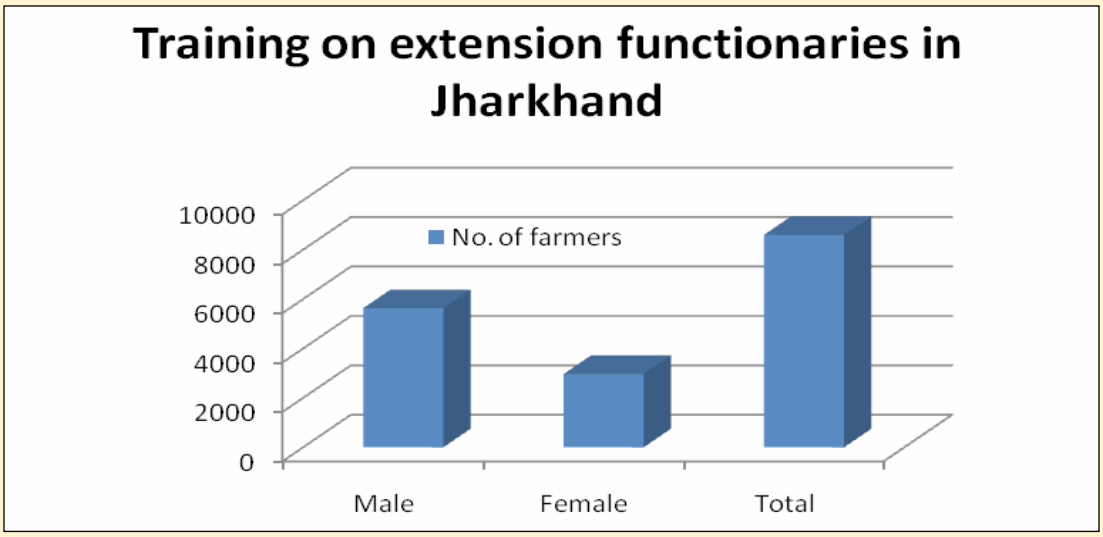
State	Category	No. of Courses	Grand Total		
			M	F	T
JHARKHAND	Farmers &Farm women	1589	31300	13323	44623
	Rural Youth	410	5635	2969	8604
	Extension functionaries	264	5633	941	6574
	Total	2263	42568	17233	59801

Caste-wise participation in the training programmes shows that in Jharkhand the participation of farmers including farm women from schedule tribe category was to the extent of 39 per cent but from schedule caste category it was 24.9 per cent. The analysis indicates that farmers of lower socio-economic status are steadily approaching KVKs for their betterment through training. The major areas covered were integrated crop management ,seed production, Soil and water Conservation, Soil fertility management, cropping system, Integrated farming system , resource conservation technology, water management nursery management ,integrated pest management, rejuvenation of old orchards, gender mainstreaming through SHGs, integrated nutrient management, management of farm animals, livestock feed and fodder production etc. Both on and off-campus courses were conducted by the KVKs as per the merit and requirement of course content.

In Jharkhand 1121 demonstration covering 162 ha in rabi oilseeds, 253 demonstration in 59 ha in kharif oilseeds were conducted. In both rabi and kharif pulse, Jharkhand took the lead with 314 and 710 demonstrations, respectively. The total area coverage in rabi was 47 ha and kharif 148 ha, in pulses. In crops like paddy, wheat, vegetables etc. 2484 demonstrations were made in 589 ha .The total number of beneficiaries were 4882 in rabi and kharif season 2012-13.

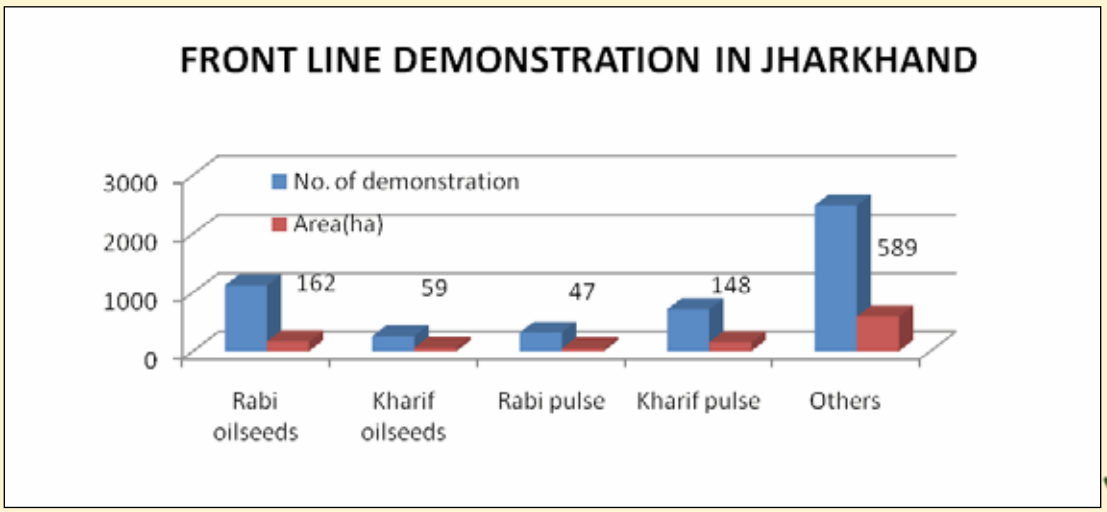






3.2.1.1 State-wise frontline demonstration conducted in Jharkhand 2012-13

Crop	Jharkhand	
	No. of demonstration	Area(ha)
Rabi oilseeds	1121	162
Kharif oilseeds	253	59
Rabi pulse	314	47
Kharif pulse	710	148
Others	2484	589
Total	4882	1005



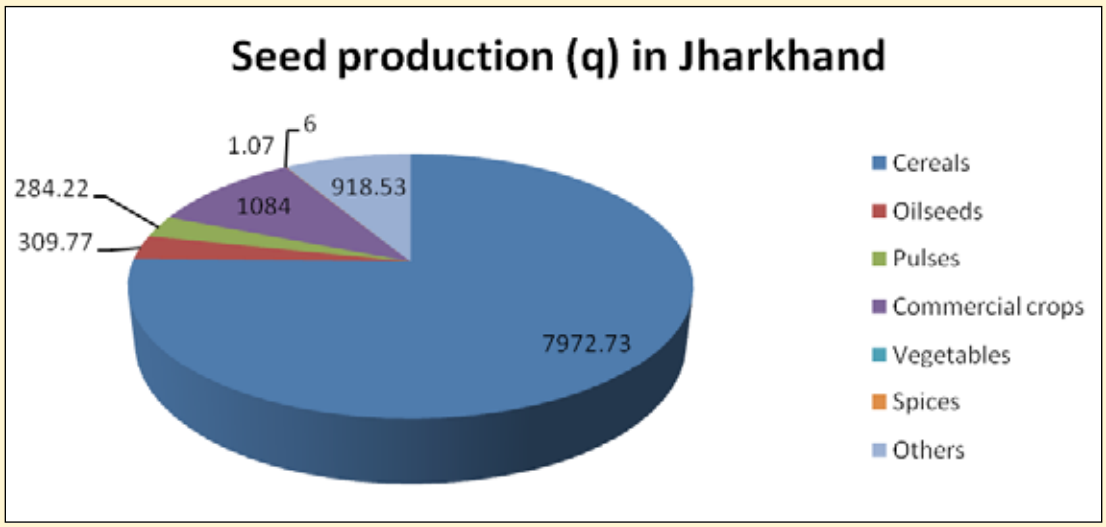
✣ Seed production

Availability and accessibility of quality agricultural inputs at an affordable price are the pre-requisites for the development of agriculture. Production of quality seed, the most important agricultural inputs needs to be augmented for the state of Jharkhand to bring desired change in present agricultural scenario. However, inadequacy of quality seeds prevented the state to enhance the seed replacement rate in cereals, pulses and oilseeds. In the beginning of XI Five Year Plan, seed replacement rate of paddy was recorded at 25% followed by maize (22%), lentil (20%), wheat (18%), gram (18%), green gram and red gram (15% each), urad and ground nut (14% each), niger (12%), linseed (10%) and mustard (7%). Considering the need to produce more quantity of quality seeds, the KVKs of Jharkhand took up seed production programme both at KVK farm and mobilizing the farmers to go for participatory village seed production programme. Arrangement of seed certification and initial tie up to go for village seed production programme on participatory mode. However, in some cases sale of seed produced by the farmers could not be assured affecting the farmers' morale and subsequent disillusionment. The KVKs in most of the cases made their own arrangement to dispose of the produced seeds by the farmers. The state of Jharkhand needs to have its strong Rajya Seed Nigam who can enter into bug-back arrangement with the farmers before the start of the season to encourage the farmers to grow more seeds. The KVKs of Jharkhand in the process of producing seeds of major cereals, oilseeds, pulses, vegetables etc. both at KVK farm and farmers' fields achieved a quantity of 10576.31 q of seeds to make it available to the farmers of the state. As per the prevailing market rate, the value of produce is worth Rs.1.77 crore.

Table: Production of seed by the KVKs (farm and village seed production)

Sl. No.	Crops	Jharkhand	
		Quantity (q)	Value (Rs)
1	Cereals	7972.73	13884229
2	Oilseeds	309.77	1423730
3	Pulses	284.22	1831830
4	Commercial crops	1084.00	411600
5	Vegetables	1.07	32000
6	Spices	6.00	6000
7	Fiber crops	0.00	0
8	Others	918.53	174500
	Total	10576.31	17763889

The achievements of KVKs of Jharkhand have also substantiated the ongoing efforts of the Govt. of Jharkhand in enhancing the seed replacement ratio which stands at 34-37 per cent in paddy, 30-32 percent in maize, 22-25 per cent in paddy, 30-32 per cent in maize, 22-25 per cent in lentil, 20-25 per cent in pea, 20-22 per cent in wheat, 16-23 per cent in red gram, 18 per cent in niger, 12-20 per cent in mustard and 12-17 per cent in ground nut. In most of the cases, the KVKs concentrated its efforts in producing the seeds of those varieties which are suitable to varied agro-ecological situation of the state and have considerable demand in the market. Paddy varieties identified were MTU-7029, Sahabagi, Navin, Lalat, RajendraMasuri, Swarna Sub 1, MTU-1010, Anjali, BPT-5204, Abhishek, MTU 1001 and others. For wheat, the varieties identified by KVKs were HW 2045, HW 2824, PBW 711, PBW-343, HD-2733, CBW-38, K-9107, HUW-468, K-307, PBW-43 etc. In oilseeds, mustard was produced with the varieties namely, RajendraAnukul, PusaMahak, Rohini, RajendraSufalam, PusaAgrani, Shivani, B-9, PusaJaikisan, NDR 8501 and others. In pulse crops, varieties like Subrata, Maitree, HUL-57, PL-406, Arun, Jul-57, PL-4, DPL-62 and DPL-15 were selected by the KVKs for lentil seed production.



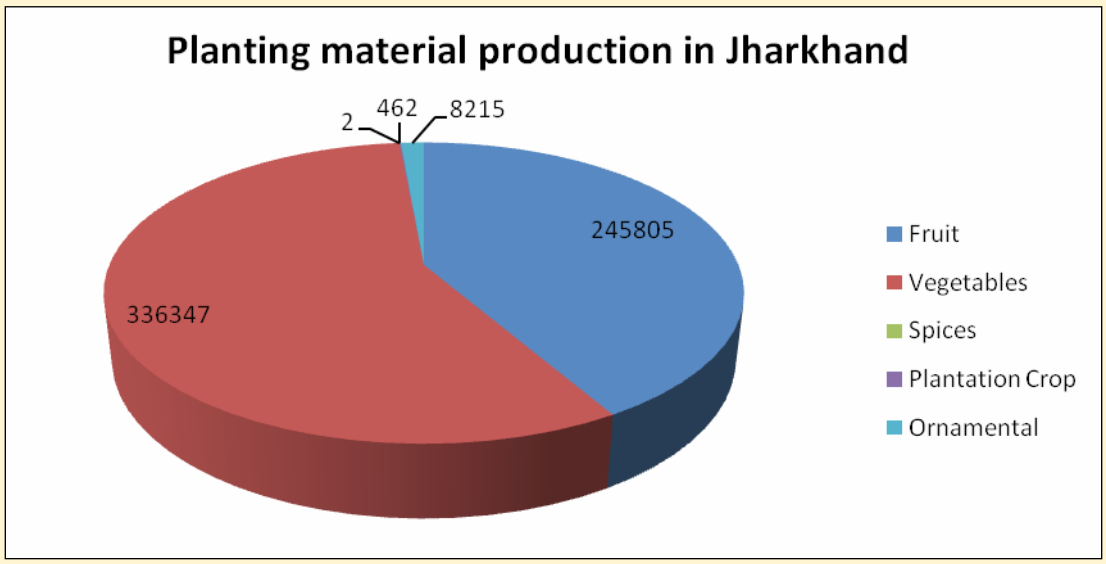
✤ Planting materials

In the state of Jharkhand, per capita availability of vegetables is only 132 gms per day (Jharkhand State Agricultural Development Plan 2008-2013) which is one of the inherent causes behind severe nutrition and food deficiency. In spite of having favourable climatic and related conditions, the state lacks in producing required quantity of fruits, vegetables, medicinal and aromatic plants, spices and condiments and others. The KVKs of Jharkhand took up programmes on production of planting materials at a large scale considering the need of the state in respect of vegetables, fruits, plantation crops, forest species and others. Altogether 14.57 lakh numbers of planting materials could be produced by the KVKs during 2012-13 which was equivalent to revenue of Rs.59.87 lakh. Among vegetables, the seedling production was considered for tomato, cauliflower, brinjal, chilli, cabbage, capsicum etc. In fruit crops, sapling

was prepared for mango, papaya, guava, banana, litchi and others. Production of planting materials also included ornamental plants like Croton, Ashok, medicinal and aromatic plants, plantation crops, spices and condiments and forest species. The KVKs also produced planting materials of flower including marigold, tuber rose, chrysanthemum, dahlia etc.

Table: Production of planting materials by KVKs

Sl. No.	Crops	Jharkhand	
		Number	Value (in Rs)
1	Fruit	245805	39079
2	Vegetables	336347	81124
3	Medicinal and Aromatic	0	3500
5	Spices	2	300
6	Plantation Crop	462	0
7	Flowers	0	1350
8	Ornamental	8215	20395
	Total	590831	145748



✣ SRI

SRI technology in rice production has been implemented by the Govt. of Jharkhand to increase rice productivity and reduce cost of seed which will increase income from paddy cultivation for the farmers. The KVKs of Jharkhand joined hand in popularizing the technology through demonstration since 2010-11 in an area of 136.55 hectares. The success and popularity of

the technology inspired both state Government and KVKs which led to cover an area of 2400 ha by the KVKs and 65270 ha through the efforts of State department up to 2013-14. The KVKs demonstrated SRI technology in Dumka, Gumla, Hazaribag, Ranchi and West Singhbhum though other KVKs demonstrated the technology in farmers of concerned KVK district to adopt the technology.

✣ Zero Tillage Technology

As a proven resource conservation technology particularly in wheat cultivation, zero tillage technology has been implemented by the KVKs in an area of 3951 hectares through its demonstration programme. Besides ensuring timely sowing of wheat, the technology has reduced the cost of cultivation to the extent of 12-15 percent. Requirement of less quantity of seed, irrigation and less number of manpower have led to reduction in overall cost of cultivation vis-à-vis higher return from cultivation of wheat per hectares. The technology is steadily gaining popularity in the state though high cost and availability as well as repairing facility sometimes come on the way of its adoption by the farmers. The contribution of KVKs of Jharkhand has accelerated the overall pace of the technology dissemination in the fur-flung areas of the state.

✣ Hybrid Rice Production

For a food deficit state of Jharkhand, hybrid rice production is an appropriate step taken by the State and Central Government. It has been proposed to bring 25 percent of paddy cultivation field under hybrid rice production and the states like Bihar, Jharkhand, Uttar Pradesh and Chattisgarh have the potential to take up this venture. In the state of Jharkhand around 3.5 lakh hectares are put under hybrid rice cultivation. Alongwith state department, the KVKs are also extending support to line department through conducting demonstration on hybrid rice in the farmers' field. The varieties identified by the KVKs include ARISE 6444. PHB-771 etc. The demonstration conducted by KVKs has shown promising results which has motivated the farmers to go for this technology. However, availability and price of quality hybrid send of rice is a bottleneck against fast spread of this technology.

✣ Area Expansion Under Rice Variety Sahbhagi

In Jharkhand, rainfed rice is frequently affected by moisture stress, prolonged dry spell, erratic precipitation and drought. During the year of severe drought, more than 70 percent cultivable land remains fallow or farmers take non-cereal crop during kharif. This has resulted into less production of rice, the staple food crop for the people of Jharkhand. In coping up with the situation, the KVKs took up demonstration programme since 2010-11 with a new rice variety, 'Sahbhagi', having the trait of drought tolerance and responsiveness to favourable condition. The demonstration programme carried out so far in a total area of 611.0 ha by the KVKs of Jharkhand namely, East Singhbhum, Gumla and West Singhbhum has provided a yield advantage of 0.25 t/ha under moderate stress and 0.5 t/ha under severe drought condition over the existing varieties. The variety flowers in 70-80 days, intermediate in stature (85-90 cm), non-lodging with 5-8 effective tillers per plant and possesses long bold grains. It is also

resistant to leaf blast and moderately resistant to brown spot and sheath blight. The taste of the grain is also liked by common rice eaters. The KVKs in collaboration with line departments are in the process of demonstrating the verity in more number of farmers' field.

✤ Development of IFS Model

Integrated farming systems are based on the integration of crops and livestock into production systems that, through best management practices, maintain a high level of soil fertility and productivity, and seek to replace external inputs of energy, agro-chemicals and labour with on-farm resources and natural biological cycles and process. In this systems incorporation around vegetable crops, orchards, pastures, forage crops and animals is made to make it a productive, stable and sustainable one. The components are not thrown together randomly but rather, integrated because they are mutually compatible and complementary. Another advantage of integrated farming systems is the selection of crops into creative crop rotations that can effectively achieve the following:

- Minimize insect and disease problems
- Minimize energy requirements
- Minimize the need for chemical fertilizers and pesticides
- Maximize vegetative cover to control soil erosion and protect the environment
- Minimize risks from climatic and economic fluctuations

For small and marginal farm holders of Jharkhand who frequently came across weather aberration, shifting from cropping to farming systems is an essential requirement to safeguard the livelihood of the farming community. Keeping the postulate into consideration, the KVKs of Jharkhand have developed integrated farming systems in the KVK farms as well as in the farmers' field to demonstrate the advantage of integration of various component into a single system. Based on the existing systems, the KVKs have developed cereal, horticulture, livestock, fishery and orchard based farming systems where a number of components are scientifically integrated to act as natural crop insurance. In this process, an area of 235.0 ha has been brought under IFS in the state and significant combination has been made by KVK West Singhbhum, East Singhbhum, Ranchi and Gumla. Development of integrated farming system has encouraged small and marginal farmers to produce food, feed, fodder, fibre, fuel etc. on a small piece of land. Such kind of farming is producing seasonal migration than do arable farming systems which do not include animals. Through the integration of multi components/ enterprises in farming systems, wastes from one operation or sub-system is used as input for other sub-system/enterprise which reduces the risks as well as cost of production, improves soil fertility, provides balanced nutrition and enhance holistic yield as well as income.

✤ Production of vermicompost

As a step towards increasing area under organic farming, reducing the use of chemicals in agricultural operations and creating employment as well as income generating opportunity

for the rural youths, production of vermicompost at the farm level has been given priority in the state of Jharkhand. The KVKs of Jharkhand have also taken up the mission of producing vermicompost by the farmers through adequately human resource development and input support. Almost all the KVKs of this state are actively engaged in mobilizing the farmers to go for production of vermicompost and so farm the KVKs ensured the production of 101180 q of vermicompost through the trained farmers. The KVKs also made available low cost pit of 86907 farmers of the state for its sustained use in producing vermicompost. In a number of cases arrangements for vermin and marketing of produce have also been made by the KVKs.

✤ Direct seeding of rice

Delayed monsoon/scanty rainfall is frequently experienced in Jharkhand which prevents preparation of paddy nursery bed, transplanting and finally reduces paddy yield. The situation of paddy cultivation in upland is more acute. To overcome moisture stress situation in upland, direct seeding of rice is a proven method of paddy cultivation to substantiate loss in paddy to a certain extent. In the process the KVKs of Jharkhand have so far advocated to bring an area of 156982.0 ha under direct seeded rice to give respite to the small and marginal farmers of the state.

✤ Livestock rearing

The state of Jharkhand is having high potential in prospering livestock sector with assured scientific knowledge of rearing, improved foundation stock and regular vaccination. Among the livestock reared, pig, goat and poultry at the backyard level can create opportunity to provide employment to seasonally employed rural farmers and supplementary income to improve their living standard. In assessing the feasibility of large scale backyard livestock rearing, the KVKs have provided the knowledge of scientific livestock farming with T&D breed of pig, Black Bengal goat and Divyayan Red/Vanraja/Gramapriya poultry breeds. Alongwith scientific management, the KVK have also provided low cost housing made with locally available resources, low cost feed made with local ingredients and large scale vaccination camp at regular interval. The effort of KVKs has not only empowered the farm-women of the state, T&D breed of pig has been immensely popular in Purulia, Birbhum and Bnakura districts of West Bengal also.

✤ Promotion of appropriate crop varieties

Varied farming situation of Jharkhand calls for selection of appropriate crop with desired duration, method of cultivation etc. The KVKs of Jharkhand are involved in finding out such crop varieties that can successfully be grown in irrigated, rainfed and drought condition. The effort of the KVKs has led to identification of following crop varieties for different farming situation of the state.

Rice varieties for upland and medium land: The KVKs put their efforts in promoting a number of rice varieties for upland and medium land situation like Anjali, Vandana, Birsa Vikas Dhan-101 and Birds Vikas Dhan-110. The performance of the varieties promoted in the districts of

Bokaro, Chatra, Dhanbad, East & West Singhbhum, Lohardaga, Latehar, Dumka, Hazaribag, Ranchi and Gumla districts has shown an increase in productivity to the extent of 72-80 percent with more than 30 percent profitability. In most of the districts, expansion of area under the promoted varieties has also taken place to nearly 30 percent.

In medium land situation, the introduced varieties namely, Naveen, Sahabhagi, Abhishek and Lalat have recorded 25-35% more productivity with 30 percent profitability. In almost all the districts, nearly 50 percent of land has been brought under the varieties.

In wheat, introduced varieties like K-9107, DBW-14, DBW-17 and DBW-39 for normal sown irrigated condition in the districts of West Singhbhum, Giridih, Palamu, Sahibganj, Jamtara, Ranchi, Saraikela, Pakur and Garhwa helped in enhancing wheat productivity to the extent of 30-35 percent followed by 25 percent profitability. Area expansion has also taken place by 20 percent under the identified varieties.

In pigeon pea, the varieties like ND-1, Asha, Malviya, Birsa Arhar-1 and ICPH-2671 introduced by KVKs in the districts of Bokaro, Dhanbad, Lohardaga, Latehar, West Singhbhum, Giridih, Palamu, Sahibganj, Dumka, Ranchi, Garhwa, Hazaribag, Godda, Gumla and Koderma have shown an increased productivity of 60-70 percent. The performance of the varieties also helped in bringing more areas (30%) under the varieties with profitability of nearly 30 percent.

Sizeable marginal and barren land in the districts of Dhanbad, Bokaro, Giridih, Latehar, Lohardaga, Saraikela, East & West Singhbhum, Godda, Gumla, Hazaribag and Ranchi could be brought under Niger cultivation by the KVKs with introduction of varieties BN-1, JNC-6 and Puja. Nearly 10-12 percent of the existing barren land is now occupied through niger cultivation with increased productivity and profitability to the extent of 45-50 and 20 percent, respectively.

✤ Lac cultivation

Lac rearing and cultivation is a traditional occupation and important source of income for thousands of poor tribal families. However, the potential of lac cultivation has not yet been tapped to provide the desired benefit to the tribal. The KVKs of Jharkhand have introduced lac cultivation technology like improved breed of Rangini and Kusumi, insect-pest and disease management, processing etc. in the districts of Palamu, Lohardaga, Chatra, Bokaro, Saraikela, East Singhbhum and Gumla. The KVKs also imparted training to the lac rearer and exposed them towards scientific lac cultivation practices at IINRG, Ranchi. The effort of the KVKs helped the tribal farmers to enhance the profitability to the extent of 60 percent with adoption of scientific practices.

✤ Multi-layer vegetable cropping system :

Farmers of the Nipania village (Godda Block) have been cultivating cucurbits since long by making a structure of bamboo and thread (locally called machan) during rainy season to spread the vines. In this way the land below the machan was lying vacant. GVT-KVK, Godda has demonstrated the cultivation of Elephant Foot Yam (EFY) (var.-Gajendra-1) below the

Multilayer (EFY+Bitter gourd)

Sole cropping of EFY

cucurbits spread over machan for maximum utilization of all the resources. Three cucurbits viz. ridge gourd, bottle gourd and bitter gourd were grown along with EFY. The maximum C B Ratio 1:4.1 were recorded in case of EFY+bitter gourd while in case of sole cropping of bitter gourd it was only 1:1.6. This technology has spread in 16 acres in the district.

✤ Protein security through pulse cultivation on bund:

Adoption of the practices like selection of short duration variety of pigeon pea (var.-Nirmal-2), quality seeds, optimum crop geometry (60x20 cm) under paired row system. This practice has been demonstrated by GVT-KVK, Godda due to prevalence of low land in Godda Block. Pigeon pea cultivation was difficult because of water logging in main field. Therefore, the

demonstration was conducted to grow pigeon pea on the bund of rice field. Presently in about 1025 ha of land has been brought under this type of cultivation. Pigeon pea sown on bund of rice field, seed rate (1 kg/ha) resulted good plant population, seed yield (96 kg/ha), straw yield (5.2 q/ha) and net profit of Rs 6620/ha. Besides, the net profit it has been found useful to fulfill the need of pulses for household consumption, fuel and compost. It also served as fencing against grazing animals.

✤ Inter cropping of mango based sugar cane:

Generally, farmers do not take any type of crops in the orchard in our district. During the training programmes KVK Godda has suggested to take inter crops in between the space of mango plants to get additional yield of crops from orchard. It has been observed that during

Pigeon pea on bund

Sole cropping of Paddy

the 1st year of orchard establishment their LER was approximately 1 while it was about 1.2 in 4th year of orchard and after 8 years it was about 1.4. The space utilized by mango plant after 8 years is 35% and rest of the area is covered by sugar cane. In sole mango orchard the total yield of mango fruit was obtained 85 q/ha while in case of inter cropping with sugar cane the yield of mango fruit was recorded 92 q/ha because of regular application of manuring and watering. Beside the mango crop the farmer also harvested 482 quintal of sugar cane in one hectare area. Presently, more than 1000 acres of newly established mango orchards is intercropped with sugar cane.

OTHER INITIATIVES BY THE KVKs OF BIHAR AND JHARKHAND

✤ Brown manuring

Pre-germinated paddy seed (@25 kg/ha) was broadcast along with *sesbania*(@30 kg/ha) in soil after giving one shallow ploughing one-fourth of 75% recommended N (80 kg ha^{-1}) and 75% recommended P and K (40 kg ha^{-1}) were applied as basal. No herbicide was used before sowing. Half of the 75% recommended N was applied after 45 days after sowing (DAS) and rest was applied at 70 DAS. Herbicide 2,4-diethyl ester was applied two times, one after 30 DAS and another at 45 DAS. Sesbania was fully destroyed 55 DAS. Water management was done in conventional manner. It was found that productivity increase due to brown manuring was marginal (1.3 %) which may not speak in favour of brown manuring over conventional method of cultivation, but when benefit-cost ratio is considered, brown manuring was found to be much more effective over conventional method in diminishing cost of cultivation (B : C ratio of 1.15 as compared to 0.74 in conventional). The main reason for diminished cost of cultivation was less due to reduced fuel requirement for main field preparation. Also the labour requirement was less in brown manuring (152 nos.) as compared to conventional (170 nos.) Practice. Brown manuring has another advantage in regards to soil quality preservation and remediation. In conventional rice cultivation puddling has to be done to break down soil aggregates, reduce macro-porosity, disperse the clay fraction, and form a dense zone of compaction (*i.e.* 'plough pan') at depth. In addition to facilitating transplanting, puddling serves several functions including weed control and reduction in deep percolation losses of water.

Parameters	Paddy cum daincha	Control
Plant height (cm)	119.2	98.9
Test weight (g)	24.6	19.6
Grain yield (kg/ha)	4950	4380
Cost of cultivation (Rs./ha)	20125	25950
Gross return (Rs./ha)	49500	43800
Net retun (Rs./ha)	29375	17850
B:C ratio	2.46	1.69
Yield increase (%)	13.0	-

Paddy cum daincha has been demonstrated in an area of 25 ha in Bihar and 35 ha in Jharkhand

Paddy cum daincha seeder recorded Avg. 4950 kg/ ha yield which was 13.0 % higher yield as compared to local check (Jaya).

✤ Women empowerment

Contribution of women in Indian agriculture is well recognized though benefit sharing is not uniform in most of the cases. Considering the need of the household, the farm women remain engaged in income generating activities sacrificing their leisure period. The farm women either individually or in group mobilize scanty resources for the economic betterment of their families. The KVKs of Bihar and Jharkhand have contributed towards socio-economic economic empowerment of large number of farm women. The major initiative has been providing adequate knowledge and skill in agriculture as well as post-harvest technology including value addition, backyard livestock rearing, poultry rearing, handicrafts making, mushroom cultivation, vermicompost production etc. In addition, the KVKs formed very good number of self-help groups on various enterprises alongwith providing support to SHGs formed by other organizations. In the process, visible changes in the economic condition of the farm women have been observed.

✤ NICRA Activities in Bihar and Jharkhand

Eleven KVKs of Bihar and Jharkhand with the climatic vulnerability of the district are engaged to carry out the various activities under NICRA which are mentioned as:

S. N.	State	District	Climate vulnerability
1	Bihar	Saran	Flood/Drought
2		Supaul	Flood/Drought
3		Buxar	Flood/Drought
4		Nawadah	Drought
5		Aurangabad	Drought
6		Jehanabad	Drought
7	Jharkhand	Koderma	Drought
8		Palamau	Drought/Heat wave
9		East Singhbhum	Drought/Heat wave
10		Gumla	Drought
11		Chatra	Drought/Heat wave

I. Natural Resource Management through in-situ moisture conservation, land shaping & RWH, green manuring, 5% model of irrigation, crop residue management, aerial vegetable cultivation, bunding of field, BBF, soil conservation, soil test based nutrient application, micro irrigation techniques, compost pits, construction/renovation of new water harvesting and recycling structures, farm ponds/ checks dams/tank roof water harvesting tank wrer carried out by the KVKs of Bihar and Jharkhand. Some of the salient achievements of NRM activities are mentioned hereunder:

1. Improving the Resilience of Poor Farmers by Reclaiming Cultivable Wastelands at Nawada, Bihar. The cluster of villages Vidyasagar & Gadimajhila, Nawada is predominantly

inhabited by Rajvanshi and Ravidas communities. The undulated lands are located in the fringe areas of forests and not cultivated despite being fertile. These were completely unprotected from grazing animals and rainwater harvesting and storage structures (*ahars*) could not convey water due to their higher elevation. The cultivable fallow was brought back into crop production by motivating the community to participate in reclaiming the lands by bunding and leveling. About 15 ha was planted with pigeon pea during *kharif* leading to a harvest of 10,000 kg of pigeon pea worth Rs.3,50,000/-. For the first time, the farmers of these villages could realize such a harvest and this helped them to appreciate the worth of their land.

2. De-silting of irrigation channels for coping with water. The time required for irrigating one ha was brought down to 4.8 hr from 8 hr. This resulted in bringing 4 ha additionally under

paddy. This generated an additional 600 man days of work. It also saved enough water to provide one supplementary irrigation of 5 cm over 15 ha. The additional 4 ha brought under paddy could yield about 10 t worth of Rs. 1.0 lakh.

3. Water security by renovation of abandoned open wells. So far, 28 wells have been renovated in this cluster of villages. The villagers are very happy with this intervention, as it has ensured them drinking water availability even in the midst of summer. The drainage line has also been developed leading to safe disposal of water. This has improved hygiene around the wells. In all, the well renovation intervention has been very well accepted by the villagers.




4. Renovation of *Ahar around* 100 ha area was brought back into cultivation.


5. Sand Bag Check Dam - a story of success against fitting climatic variability at Gumla. Low cost temporary structure was made on river of 50 meter length.Huge quantity of water reserve for supplemental and drinking (Animal) purpose.Water table has risen by 44% followed by area expansion under off-season vegetable cultivation in 10.0 ha, summer paddy cultivation in 10.0 ha, wheat cultivation in 50.0 ha and safe harvesting of standing paddy from 30.0 ha during acute scarcity of rainwater. Monocropping has turned into double and in some cases multiple cropping in the village




6. Replication of intervention of temporary low cost water harvesting structure. Huge available water not utilized properly. Inclined to cultivate double or multiple crop in more than 30 ha. Ensuring the paddy seed production in 10 acre of land which helped in sustaining the seed bank



✤ Overall Rainwater harvesting and use of water promoted in Biha and Jharkhand

Total Number	Storage capacity (cu m)	Protective irrigation potential (ha)
425	857020	835 ha of land

II. Demonstration under **crop production module** *viz.* introducing drought and flood tolerant paddy varieties, advancement of planting dates of crops, community nurseries for delayed monsoon, location specific intercropping systems, brown manuring, promotion of pulses utilizing post-monsoon rainfall, integrated crop/pest/disease management, growing vegetables as contingency crop was conducted. The area and number of farmers were benefitted by this kind of demonstrationwere mentioned as:

Technology demonstrated	Area covered	No. of farmers covered	% increase
Drought tolerant vars. Viz. Sahbhagi, Anjali, A 404, Naveen, Abhishek	185	899	16.8 – 150.5
Flood tolerant vars. Viz. Swarna Sub 1, Sabita	64	23.5	22 – 33.5
Advancement of planting dates for wheat, lentil, mustard	53.4	246	31 – 231.5
Staggered community nurseries for paddy, brinjal, cauliflower, tomato*	19.3	85	11.3 – 24.3
Location sp. Intercropping	48.3	321	55.5 – 134.6
Crop diversification	88.4	534	26.0 – 68.8
Brown manuring	25.0	95	12.2-16.0

* One of the important interventions has been the promotion of community nursery for paddy as an approach to contingent availability of seedlings during drought or flood in the NICRA adopted village(s). Seedlings were raised by sowing of seeds at 15 days interval in three stages and farmers were allowed to take the seedlings as much as they could transplant depending upon rainfall conditions


III. Livestock and fisheries demonstration programme breed up-gradation, balanced feed & fodder management through mineral mixture, feed blocks & silage making, azolla feeding, breed animal health management through deworming and vaccination, improved shelters for animals, fish pond cleaning and fish farming; pig farming; clean milk & fodder production.

Improved cross ventilated Poultry, Dairy and Goatary shed. Improved Poultry shed with well ventilated system reduced mortality rate.Improved sheds in shady area reduced heat stressand also increased milk yield.



IV. Institutional intervention through seed bank, fodder bank, commodity groups, custom hiring for timely operations, community nursery raising, irrigation, collective marketing climate literacy through a village level weather station and awareness camp were organized. Jay Prakash VCRMC constituted at KVK Nawada, Bihar generated maximum amount (Rs. 96972) in the bank account of VCRMC and got National Award of best performing VCRMC in 2012-13.

✤ ICT in agriculture

Use of information and communication tools in agriculture though comparatively a new venture, the KVKs of Bihar and Jharkhand have applied number of such tools in reaching farming community with technology and other backstopping of far-flung areas. Kisan Mobile

Advisory Services, Kisan Chaupal, Farmers' Portal are few such tools which are being extensively used by all the KVKs of these two states. All the KVKs are having registered mobile number of more than 10,000 farmers for providing advisory services in the event of delayed rainfall, scanty rainfall, drought, flood etc. Contingent crop planning in adverse climatic situation is made available to the farmers through ICT tools alongwith other communicating measures.

✤ Value addition

Abundance production of vegetables, mushroom, fruits etc. in both the states is effectively utilized for value addition to provide additional income and employment to the farm women as well as prevent the spoilage and avoid market glut. The self-help groups are mainly trained for value addition and marketing of their produce in the brand name of KVK/host organization. Large scale value addition in the districts of Gumla, Godda, Dumka, Palamu, Ranchi, Hazaribag, Giridih, Muzaffarpur, Patna, Rohtas, Araria, Kisanganj, Banka, Bhagalpur, Saran, Munger, Purnea, Gaya, Nawada and others by the farm women under the guidance of concerned KVKs has helped the farm women in earning average monthly income to the range of Rs.5000-15,000. Marketing arrangements with state organ like Jharcraft by the KVKs has ensured additional income on a regular basis.

1. Success Story on Bee-keeping

Shri Radhakant Giri is one of the most successful farmers who through hard work and strong determination has reached a position where he has not just earning a good livelihood but also helped other farmers becoming self-reliant.

Shri Giri belongs to a very small village Bhat Boreya, Block-Burmu, Dist-Ranchi. It was very difficult for him to manage his livelihood. The economic condition of his family was very poor and didn't allow him to do further studies so he left study after completing intermediate and started business. Shri Giri was decided to make his future in honey production and taking the business to new heights. Initially he was not success in this business and the production was not satisfactory due to Indian bees and lack of knowledge. In the meantime he heard about training institute i.e. Ramakrishna Mission Ashrama situated at Morabadi, Ranchi where rural youth are trained in agriculture and allied subjects free of cost for self-reliance. Immediately he got admitted in motivational course of 45 days at Ramakrishna Mission Ashrama, Divyayan Krishi Vigyan Kendra, Morabadi, Ranchi in 1997. Then after he took admission in special training course of honey bee keeping because honey business

was his ancestral business. After completion of training he started his business with two boxes of Italian bees. During this time he faced a lot of problems but the emotional support from his family has strengthen him more to perform in difficult time.

Today Shri Giri is running his business very effectively with 55 boxes of honey bees. Being high quality of honey he is supplier of reputed company like Dabur and Kashmir Apiary. He never faced any problem for marketing of his product. He is not marketing of quality honey but also bee colony and get much profit from them. Now he also involved in production of cereals, vegetables , fruits and milk in scientific way. To extend his learning and knowledge he completed master training course from Central Bee Research Training Centre, Pune in February 2012. Now he is one of the many unforgotten successful farmers towards whom every farmer should look upon as role model and learn from what he did. He has been honoured by the former President of India Her Excellency Dr. (Mrs.) Pratibha Patil in November 2007

2. Borax: Boon for cauliflower growers in East Singhbhum

In East Singhbhum district cauliflower is grown as mid & late season crop and cultivated in all over the district. The soil of the district is 77% acidic & its pH varies from 4.1 to 7.3. Cauliflower crop acts as indicator plant for boron deficiency and it is immobile in acidic soil, therefore deficiency symptoms first appear on its vegetative parts like browning of curd and hollowness in stem part. Continuous and intensive cultivation of vegetable in same field also responsible

for boron deficiency in soil and sometimes rotting and browning of curd head goes to an extent of 70 to 80%. Since, establishment of KVK, East Singhbhum the scientists observed that farmers used to spray pesticide, other chemicals or growth hormones to overcome of this problem however, the attempts failed.

Keeping this in view a OFT was conducted in 10 farmer's field during 2006-07, after

getting satisfactory results in application of borax in spray @ 15 kg/ ha (Yield 203.20 q/ha and 10% rotting) as compared to soil application of borax @ 10 kg/ha (Yield 194.20 q/ha and 15% rotting) & control (Yield 153.20 q/ha and 40% rotting). To judge the efficiency of borax in minimizing the menace, it was verified through Front line demonstration in Patamda, Jamshedpur, Ghatsila, Dhalbhumgarh and Potka block during 2008 and 2012.

The result indicated increased production and productivity that might be possible only due to decreased browning and rotting of heads of cauliflower. Field days (5 nos) were also organized for its wider dissemination. The farmers were convinced of application of borax in spray @ 15 kg/ha twice, first after 20-25 DAT and second 40-45 DAT sowing for its effective result. Through FLD, 115 farmers of different blocks of East Singhbhum district are now practicing borax application in their cauliflower fields and are benefited. The browning & rotting of curd was also observed negligible. The curd colour, firmness was also found better. On an average 375 q/ha (*var.Barkha*) yield was observed in borax sprayed field as compared to 195 q/ha in control. The net return was found to be around Rs. 1,12,500.00 per ha, where as benefit cost ratio was 2.50. Now other farmers of the nearby villagers & other block farmers are also adopting this practice. As borax is available in local market therefore farmer are not facing any difficulty in procuring this.

3. Sri Ramdeep Singh

Sri Ramdeep Singh, Son of Late Chattar Singh of village- Ranbigha, P.O.-Uttrain, Block-Konch of district Gaya is a progressive farmer having 5.0 acre of land. By traditional method of cultivation, he was managing his own hold necessity any how. He came in contact with K.V.K.'s scientist to know the improved and how agricultural techniques to enhance the production and income. He was neglected to adopt diversified agriculture. He has established guava orchard in 2.0 acre of land and earned approx 1.8 lakh p.a. with inter cropping the turmeric, ginger and elephant foot yarn. He also produce Paddy and Wheat in 2.0 acre of land and earning Rs. 80000/- p.a. Under diversified training, he

also produce flowers (marigold, Rajanigandha, gladiolus) spiur, organic vegetables, Onion, Potato and sugarcane earning together. He also developed 60 bed vermicompost unit earning net income almost Rs. 200000/- per year. For increasing his income, he developed a small dairy unit which has 4-6 milch cow and earning Rs. 60000/- p.a. He has established drip irrigation system in his guava orchard and adopting improved package and practices in supervision of KVK scientists. Apart from these, he is also having important agricultural tools and machines for small inter-cultural operations. Overall, he is earning about 5-6 lakh p.a. from all enterprises. He is curious, energetic and believes in adopting new technologies.

4. Sri Awdhesh Kumar

Sri Awdhesh Kumar, Son of Sri Ram Briksh Prasad of Manpur Pehani in Manpur block of Gaya district. He has approximately 1.5 ha land and he used to cultivate cereals and vegetables crop but his income is not up to his requirement. Then he came in contact with the KVK, Manpur, Gaya and adopted Modern Farming System. He also started to keep two dairy cattle to increase his income and for home. He started commercial broiler farming having 500 broilers. As demand of milk and broilers in Gaya is more needed. He earned more profit is less land in dairy and broilers. Now, he had 4 cattle and 2000 broilers per batch. His income increased upto Rs. 3-4 lakh. Now, he is giving more effort to increase his dairy and Poultry business upto 10 cattle and 5000 broilers per batch.

5. (T & D) breed of pig become popular among landless farmers

Krishi Vigyan Kendra, Chatra trained a number of rural unemployed youth in a bid to make them successful entrepreneurs, however, the outcome was not so encouraging. The situation changed when Sri Praksh Purti come in contact with KVK along with five farm women for training on improved pig farming. Their interest in pig farming was traced back to their traditional occupation. Rearing pigs was very common in their community and breeding and rearing techniques were familiar to them. They had left it in the past due to low income or no income from this enterprise because of low yielding desi breed having slow body growth , less number of piglets and occurrence of diseases and mortality.

KVK scientists designed and imparted training on improved pig rearing during the year 2008.

After training each person was provided with 4 piglets of Tamworth, Desi (T&D) breed (3 female and 1 male). Scientists followed up the training with frequent visit and technical advice. This helped built up of confidence in them. After six month they were sent for advanced training at pig farm of Birsa Agricultural University, Ranchi. The success story of pig farming was widely covered by the local press and Prakesh purti and his team became fwell known in the district as successful pig rearers. Purti's team also supply (T&D) breed piglets to pig rearers of the district. District animal husbandry department & ATMA recommended and incorporate in her action plan for large scale dissemination of breed (T&D) among the pig farmers. Now a days, 56 rural youth of the district started pig farming as commercial ventures and they earn Rs. 80,000/year.

Awarded farmers of Bihar

Sl No.	Name and Address	Name of the Award	Awarding agency	Area of recognition
1	**Sri Dilip Kumar Singh** Vill: Mehaddiganj Block: Sasaram Dist.: Rohtas, Bihar Contact No.: 08986372988	Jagjivan Ram Abhinav Kisan Puruskar 2012-13	Conferred by Indian Council of Agricultural Research, New Delhi	Organic vegetable farming
2	**Smt. Shanti Devi** Vill : Naran Block: Nokha Dist.: Rohtas, Bihar Contact No.: 09430228381	Krishi Karman Award 2011-12 from President of India	Conferred by Ministry of Agriculture, Government of India	SRI Rice cultivation
3.	**Sri Santosh Kumar** Vill : Shekhwara Block: Bodh Gaya Dist.: Gaya, Bihar Contact No. 09801672245	Jagjiwan Ram Abhinav Kishan Award 2011-12	Conferred by Indian Council of Agricultural Research, New Delhi	Dairy farming
4.	**Smt. Jaya Devi** Vill: Sharadhi P.O.: Bangalawa Block: Dharahara, Dist. Munger, Bihar Contact No.: 09955088417	Green Lady Award 2011 Real Hero Award 2012 Kishan Prerna Samman 2012	Conferred by Government of Bihar, CNN-IBN & Reliance Foundation, and Mahindra & Mahindra Co. Ltd.	Mobili-zation of women and Poultry and Goat rearing
5.	**Smt. Bandana Kumari** Vill : Mehra Block: Katoria Dist.: Banka, Bihar Contact No.: 07549593203	Mahindra Samridhi Samman 2012	Conferred by Mahindra & Mahindra Co. Ltd.	Mushroom Production

6.	**Sri Nawal Kishore Singh** Vill: Dumarawan P.O.: Dumarawan Block: Pakaribarawan Dist.: Nawada, Bihar Contact No. 08294691795	Sixth national Grass-roots Technological In-novators Award 2011-12	Conferred by Department of Science and Technology, Govt. of India	Ethno-Veterinary practices
7.	**Sri Sudhanshu Kumar** Vill: & P.O. Nayanagar Dist. Samastipur, Bihar Contact no. 09934917017	Jagjivan Ram Abhinav Kisan Puruskar 2010-11	Conferred by Indian Council of Agricultural Research, New Delhi	Fruit Cultivation
8.	**Sri Dinanath Singh** Kalyanpur, Madhubani Barauli Dist. Gopalganj, Bihar Contact No. 09939724531	Best Fish Farmer Award 2011-12	Conferred by Central Inland Fisheries Research Institute (ICAR)	Fish Farming

Awarded farmers of Jharkhand

Sl No.	Name and Address	Name of the Award	Awarding agency	Area of recognition
1.	**Sri Surendra Kumar Yadav** Vill: Sahsaul Block: B Kothi Dist.: Purnea, Bihar Contact No. 09771721997	Best Progressive Farmer 2011-12 & Sarvottam Puraskar 2011-12	Conferred by Bihar Agricultural University, Bhagalpur & NABARD	Vermin composting
2.	**Sri Sadanand Mandal** Baridih, Hansdiha, Sariahat Dist. Dumka, Jharkhand Contact no. 09431130454	Sarwashreshth Krishak Puruskar 2010-11	Conferred by Department of Agriculture, Government of Jharkhand	Scientific farming practices
3.	**Sri Kashi Nath Mahato** P.O.: Kumir, Block - Patamda, Dist.: Dhanbad, Vill: Churda, Jharkhand Contact no. 09939158025	Prasar Bharti Award 2010 & Progressive farmer award 2010	Conferred by Ministry of Information and Broadcasting, Government of India and Government of Jharkhand	Vegetable cultivation

4.	**Smt. Shakuntala Devi** Vill: Serka Block: Bishunpur Dist.: Gumla, Jharkhand Contact No. 09334326522	SARAS MELA award 2011	Conferred by Ministry of Rural Development Govt. of India (CAPART)	Empower-ing Women
5.	**Sri Abhay Kr. Singh** Vill: Bundu P.O.:Petarwar Block- Petarwar Dist. Bokaro, Jharkhand Contact No. 009431324678	Best SRI Farmer award 2011-12	Conferred by District Agricultural Department, Bokaro, Government of Jharkhand	Rice cultivation
6.	**Sri Srimant Mishra** Vill: Rakhdih P.O. Kumir, Birra Patamba Dist. East Singbhum, Jharkhand Contact No. 09955472243	Mukhya Mantri Kisan Puraskar Yojna 2010	Conferred by Government of Jharkhand	Vegetable cultivation
7.	**Sri Vijay Kumar** Village : Basadih Panchayat : Indra Block : Churchu Dist. Hazaribag, Jharkhand Contact No. 09204703360	Best farm entrepreneur 2012	Conferred by Birsa Agricultural University, Ranchi	Botanical Pesticide
8.	**Sri Lambodar Darwe** Vill: Ghortopi P.O.: Thekcha ghogha Dist.: Dumka, Jharkhand Contact No. 09801311847	Best Farm Innovator AWARD 2012	Conferred by Birsa Agricultural University, Agrotech Kishan Mela, Ranchi	Developed mechanical device for lifting water from river
9.	**Sri Ramshewak Dangi** Vill. & P.O. - Gidhour, Block : Gidhour, Dist.: Chatra, Jharkhand Contact No.: 09430194586	Best Vegetable Farmer	Conferred by District Agricultural Department, Government of Jharkhand	Vegetable seedling production