

NICRA

Technological Interventions by KVKs of Andhra Pradesh and Maharashtra



Zonal Project Directorate (Zone – V)

Indian Council of Agricultural Research

CRIDA Campus, Santoshnagar, Hyderabad – 500059

Andhra Pradesh, India

NICRA - Technological Interventions by KVKs of Andhra Pradesh and Maharashtra

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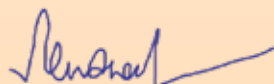
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FOREWORD

Climate change poses complex challenges like multiple abiotic stresses on crops and livestock, shortage of water, land degradation and loss of bio-diversity. There has been a significant rise in the frequency of extreme weather events in recent years affecting the productivity and income at the farm level and also impacting the availability of staple food grains at the national level. The ICAR has recently launched a National Initiative on Climate Resilient Agriculture (NICRA) project aimed at enhancing resilience of Indian agriculture to climate change. As a part of this initiative, extensive technology demonstrations of location-specific best-bet practices are being conducted on farmers' fields in 100 vulnerable districts of the country through Krishi Vigyan Kendras. I am happy that my colleagues of Zonal Project Directorate, Zone-V as part of NICRA have taken an initiative to publish a bulletin on "NICRA-Technological Interventions by KVKs of Andhra Pradesh and Maharashtra". The bulletin covers the initiatives of selected KVKs of Andhra Pradesh and Maharashtra to create awareness among the farmers about the impact of climate change on agriculture and allied enterprises and the location specific technological interventions made by the KVKs for climate resilience. The guidance and technical support extended by the Director CRIDA, PI and Coordinator of NICRA project, CRIDA, in implementing programme is thankfully acknowledged.

March 30, 2012


(N.Sudhakar)

Contents

Prologue	1
Technology Demonstration under NICRA.	1
Project Awareness Events	2
Technology Interventions	12
1. Foliar feeding of nutrients to cope with terminal moisture stress in pearl millet and soybean, Ahmednagar, Maharashtra	12
2. Utilization of barren lands for pigeon pea cultivation, Hiwara, Gondia, Maharashtra	13
3. Contingency crop plan for delayed onset of monsoon, Yagantipalli, Kurnool, Andhra Pradesh	14
4. Coping with pest problem in pigeon pea due to heavy rains in Khammam district, Andhra Pradesh	16
5. Farmers could realize higher returns by cultivating vegetables, Nalgonda District, Andhra Pradesh	17
6. Renovation of nala (drain) for proper channelization of rain water for supplemental irrigation for rabi crops, Amaravati, Maharashtra	19
7. Trenching and compartment bunding – an effective measure to control soil erosion, Nandurbar, Maharashtra.	20
8. Reduction in fish mortality during monsoon season by regular monitoring, West Godavari, Andhra Pradesh	22
9. Combating fodder scarcity during summer by silage making, Baramati, Pune, Maharashtra	24
10. Sowing with automatic seed drill for higher yield of groundnut, Anantapur, Andhra Pradesh	25

Prologue

Climate change impact on agriculture is being witnessed all over the world, but countries like India are more vulnerable in view of large population depending on agriculture, excessive pressure on natural resources and poor coping mechanism. Several models predict that rising temperature, increased climatic variability and extreme weather events could significantly impact food production in coming years. Hence it is of paramount importance to enhance the resilience of Indian agriculture to climatic variability and change. Keeping this in view a project, National Initiative on Climate Resilient Agriculture (NICRA) has been launched in February, 2011 by Indian Council of Agricultural Research (ICAR).

Technology Demonstration under NICRA

In order to deal with climate change in the right earnest, under technology demonstration component of NICRA, it has been planned to organize extensive demonstration of location specific best-bet practices (agricultural technologies/ package of practices contributing to climate resilience) on farmers' fields in 100 districts from different states of India. As a part of NICRA, 13 districts, six from Andhra Pradesh and seven from Maharashtra have been selected under Zonal Project Directorate, Zone- V to demonstrate the best practices for climate resilient agriculture. The technology demonstration component in the selected districts is being undertaken by respective Krishi Vigyan Kendra (KVK).

An inter-disciplinary team from KVK consisting of specialists from Agricultural Extension, Agronomy, Soil Science, Horticulture, Plant protection, Animal Science, Fisheries, Agricultural Engineering, Home Science was formed to finalize and implement climate resilient technology package at village level on participatory mode.

The villages have been selected based on vulnerability of its agriculture to climatic variability. The multidisciplinary team of KVK analyzed the constraints related to climatic variability based on secondary weather data, resource situation, farming systems and crop and livestock yields in the past few years. The major constraints of climatic variability identified in different districts include: water scarcity, recurrent drought (early, mid and terminal), heat wave, flood, pest and diseases of crop and livestock, fodder scarcity, poor access to quality seeds and critical inputs and farm machinery (timeliness and cost of access). The constraints have been analyzed and points of intervention are identified. The technological and institutional interventions for enhancing resilience of farming systems to climatic variability have been identified and finalized involving the major stakeholders (farmers, researcher and extension specialists) through brainstorming and focused group discussions.

PROJECT AWARENESS EVENTS

KVK, Anantpur, Andhra Pradesh

NICRA awareness programme was organized at Chamaluru village, Narpala Mandal on 13.05.2011. Sri.K.Samba Siva Rao, Joint Director of Agriculture, Anantapur and Dr.B.Ravindranath Reddy, Principle Scientist (Dry land Agriculture), ARS, Anantapur inaugurated the programme in the presence of Assistant Director of Agriculture, Tadipatri division, Mandal Development Officer, Mandal Agricultural Officer, Officers of district and Panchayatraj. Mr.Suryanarayana, President of the village explained about the



NICRA awareness programme, Anantapur

back ground of the village. Dr.M.John Sudheer, Coordinator DAATT centre, Anantapur, Dr.S.K.Krishnamoorthy, Programme Coordinator, Kalyandurg, Anantapur, Dr.Bhargavi, Senior Scientist ARS, Anantapur, Dr.S.B.S.Narasimha Rao, Senior Scientist (Agro meteorology), ARS, Anantapur, participated in the awareness programme. Press and media covered the entire event.

KVK Khammam, Andhra Pradesh

NICRA awareness programme was organized on 26.11.2011 at Nacharam village near Wyr. The programme was inaugurated by Dr.B.Venkateswarlu, Director, CRIDA. The Joint Director of Agriculture, Dr.K.Hema Maheshwar Rao, Associate Director of Research, RARS, Warangal, Dr.D.Vishnuvardhan Reddy, Deputy Director (Horticulture), Dr.B.Subba Rayudu participated in the programme. Two farmers, Mr.T.Venkateswarlu and Mr.D.Satyanarayana presented the general agricultural scenario of the village. They said that cotton, chillies and rice are the main crops besides plantation of subabul and cultivation of vegetables. The village is surrounded by 3 hamlets and total number of households



Director, CRIDA addressing the gathering

is about 600. They felt that emphasis on reviving check dams to enable better rainwater harvesting would bring drought resilience among the community. The Joint Director of Agriculture and Deputy Director of Horticulture enlisted different development schemes and requested the farmers to avail their benefit.

KVK Kurnool (Yagantipalle), Andhra Pradesh

Awareness workshop has been organized on 10th January 2012 at Yagantipalle. Dr.P.Gidda Reddy, Director of Extension, ANGRAU, Hyderabad, Dr.Padma Latha, Associate Director of Research, RARS, Nandyal, Dr.Sreenath Dixit, Principal Scientist & Coordinator NICRA, CRIDA and Dr.G.Rajender Reddy, Senior Scientist, Zonal Project Directorate, Hyderabad attended the programme besides representatives of the line departments. Weather station, vermicompost unit and the custom hiring center were inaugurated during the event. The dignitaries visited the sites of silage and recharging of the bore wells. The promotion of foxtail millet (*Setaria italica*), was a big success in NICRA village, where other crops of the region like cotton and sorghum failed.



Glimpse of participants

KVK Nalgonda (Gaddipally), Andhra Pradesh

Awareness programme was organized at Nandyalagudem of Atmakoor Mandal, Gaddipally, Nalgonda district on 29.05.2011.

Dr.B.Venkateswarlu, Director, CRIDA, Hyderabad launched the project in presence of Dr.G.Gopal Reddy, Secretary of Sri Aurobindo Institute of Rural Development, Dr.Ch.Sreenivasa Rao and



Dr. B. Venkateswarlu, addressing during awareness event

Dr.B.Sanjeeva Reddy, Scientists from CRIDA, Mrs. Deva Karuna, Mandal Revenue Officer, Mr. Syam Sundar Reddy, Assistant Director of Agriculture, Mr.Ramachander Naik, Assistant Director of Agriculture, Mr.Madhava Reddy, Assistant Director of Sericulture, Mr.Yadagiri, Assistant Director of Horticulture and other Officers of Line Departments. About 300 farmers and farm women participated in the programme. A series of programmes were organized like Kala Jathara (cultural programmes), exhibition on medicinal plants, vermi-compost, biofertilizer and biopesticide units. Press and Media covered the entire programme.

KVK Srikakulam, Andhra Pradesh

Dr.P.Gidda Reddy, Director of Extension, ANGRAU inaugurated the awareness programme on 24.12.2011 at Sirusuwada village, Kotturu Mandal in presence of Dr.Sreenath Dixit, Coordinator, TDC-NICRA, Mr.A.Bairagi Naidu, Former Member, MPP (Mandal Pradham Parishad), Mr.Vasudeva Rao, Agricultural Officer, other local members and NGO representatives, block level officers of the Department of Agriculture and Officers of the District and



Glimpse of participants at awareness event



Providing contributory tarpaulins



Providing contributory superior breeding ram

Panchayatraj. Mr.Bhaskara Rao, Former President of the village inaugurated the Custom Hiring Centre for farm implements. Almost all the households of the village participated in the awareness programme. A series of activities viz., de-silting of tank, providing superior breeding rams and tarpaulins on contributory basis, release of booklets and bulletins on climate resilient agricultural practices followed. Press and media covered the entire event.

KVK West Godavari (Undi), Andhra Pradesh

NICRA awareness programme was launched at Matsyapuri village on 25.10.2011. Dr.B.Venkateswarlu, Director CRIDA and Dr.K.Suryanarayana, Associate Director of Research, RARS, Maruteru, Sri A.Satyanarayana, Assistant Director of Agriculture, Bhimavram, Mr. M.Yani Sardus, Agriculture Officer, Veeravasaram, block level officers of the Department of Agriculture, Officers of the



PC, KVK, Dr. P. Israel addressing NICRA awareness programme



NICRA farm implements, Undi, West Godavari, AP

District and Panchayatraj, village Panchayat and all the households of the village participated in the programme. A series of activities were conducted as a part of the awareness programme viz., inauguration of manually operated weather station and custom hiring centre for farm implements.

KVK, Ahmednagar, Maharashtra

Awareness programme was inaugurated by Dr.Ramchandra Sabale, Former Head of Department, Meteorology, Mahatma Phule Krishi Vidyapeeth, Rahuri, Maharashtra on 26th March 2011 at Nirmal Pimpri village in presence of Mr. Anilkumar Gahawate, District Superintendent, Agricultural Officer, Ahmednagar, Mr.Arun Bankar, Taluk Agricultural Officer, Rahata, Mr.Suryakant Nirmal, Director, Ganesh Cooperative Sugar Factory, Ganeshnagar, Mr.N.T.Nirmal, Member, Panchayat Samiti, Rahata, Mr.Dnyandev N. Ghorpade, Sarpanch, Nirmal Pimpri and Mr.Garade, Gramsevek, Grampanchayat, Nirmal Pimpri. More than 350 people participated in the event. Dr.Ramchandra Sable briefed about the changes in climate, its effect on agriculture production and suggested some technologies to overcome the situation.



Dr. Ramachandra Sabale, addressing the participants

KVK, Aurangabad, Maharashtra

Dr.R.R.Chole, Director, Extension Education, Marthwada Agricultural University, Parbhani inaugurated NICRA awareness programme on 29th of August 2011 at Shekta village, Gangapur Taluk. He addressed the farmers and briefed about the importance of climate change in Agriculture. Dr.N.G.Patil, Scientist, NBSS & LUP, Nagpur was the chief guest of the meeting and he explained the importance of soil moisture and how to conserve it.



Dr. R.D. Ahire, PC, KVK, Aurangabad, briefing about the project

KVK Pune (Baramati), Maharashtra

NICRA Awareness programme was launched at Jalgaon K.P, Baramati Mandal, Pune, on 12th May 2011. Dr.K.P.R.Vittal, Former Director of National Agricultural Institute on abiotic stress management, launched the project in presence of Mrs.Sunandatai Pawar, Mr.Hingane Vishupant, Director, Agricultural Development Trust, Baramati, Dr.Karle, Agricultural Officer, Baramati, Mr.Ingle, Sarpanch and other local members of Village Panchayat. Almost all the households of the village participated in the event. A series of activities viz., de-silting of tank, in situ soil moisture conservation,



Mr. Sunandatai Pawar addressing the participants

providing of Theileriosis vaccination and mineral mixture for crossbred animals, release of booklets and bulletins on climate resilient agricultural practices followed the inauguration. Press covered the event and published in Sakal Daily News Paper, Pune.

KVK, Nandurbar, Maharashtra

Dr.A.T.Kumbhar, District Collector addressed the participants and the members of Village Risk Mangement committee on 24th June



Nandurbar District Collector addressing the participants

2011, at Umarani, Akarani taluk and briefed the ongoing activities under NICRA. District Development Manager, NABARD, Lead District Manager, Mr. Krishnadas Patil, Chairman of KVK, Nandurbar and other officials from line departments also participated in the programme. During the event, 400 animals were vaccinated against different diseases in collaboration with department of Animal Husbandry.

TECHNOLOGY INTERVENTIONS

I. Foliar feeding of nutrients to cope with terminal moisture stress in pearl millet and soybean, Ahmednagar, Maharashtra

Nirmal Pimpri Village is mostly rainfed and main source of irrigation is bore wells. Soybean and Pearlmillet are the major crops grown in kharif and the average rainfall is 450 mm. The rainfall received during 2011 was only 278 mm. There was delayed onset of monsoon due to which crops were sown in the second week of July. After sowing, dry spell of 27 days occurred at initial vegetative growth to flowering stage. Due to dry spell at critical crop growth stages, KVK convinced the farmers to spray N:P:K (19:19:19) on the foliage



Bajra crop with foliar spray and cycle hoeing



Soybean crop with foliar spray and cycle hoeing

of the standing crop @ 0.5 percent. The NPK was provided to 5 farmers to spray in 30 ha of area. It helped the farmers to minimize the effect of terminal drought on the crop yield. The grain yield of pearl millet crop with foliar spray under demonstration, was 1839 kg/ha while the yield with farmers practice was 1550 kg/ha. Similarly in soybean with foliar nutrient spray, the grain yield was 1675 kg/ha as compared to the yield of 1275 kg/ha with farmers practice.

II. Utilization of barren lands for pigeon pea cultivation, Hiwara, Gondia, Maharashtra

Village Hiwara is drought prone with undulating and slopy lands where water stagnates due to heavy rains. Farmers grow pigeon pea but many times crop failed due to wilt disease. Hence farmers kept their land fallow for quite a long time. To bring back his land under cultivation, KVK convinced the farmer Mr. Gyneshwar Narayan Pagrware to grow wilt resistant variety of pigeon pea, PKV Tara by dibbling the seed by using ridge and furrow method of sowing. The technological intervention helped the farmer to obtain 1000 kg/ha of grain yield. Farmers of Hiwara village expressed their willingness



PKV Tara-pegion pea on waste land



Mr. Gyneshwar Narayan Pagrawar with KVK staff

to grow PKV Tara variety of pigeon pea in their fallow lands under ridge and furrow system.

III.Contingency crop plan for delayed onset of monsoon, Yagantipalli, Kurnool, Andhra Pradesh

Desi Cotton is the major conventional *khari*f crop in red soils of Yagantipalle village, where annual average rainfall is around 567mm



A visit by farmers and scientists



KVK staff with farmer in his foxtail millet field

with erratic and uneven distribution. During 2011, monsoon has set in 1st week of August and farmers could not take up sowing of cotton crop in time. Therefore KVK has introduced Foxtail millet (*Setaria italica*) variety SIA-3085 as a contingency crop in 40 farmers' fields covering 16 ha. The selected variety is drought resistant with short duration (75-85 days), non-lodging and suitable for rain fed and

irrigated conditions with good cooking quality of grain and better fodder quality. After the sowing of crop, there was no rain for about 1.5 months. The crop was subjected to moisture stress during critical growth period in 1st week of September and rainfall was received during 2nd week of September. The grain yield obtained was 1885 kg/ha. The farmers, who have grown jowar crop in the month of August, lost the whole crop due to moisture stress while the farmers who grew Foxtail millet were happy with its performance.

IV. Coping with pest problem in pigeon pea due to heavy rains in Khammam, Andhra Pradesh

The annual average rainfall in the Gangula Nacharam of Bhadrathanda village is around 1039 mm and during 2011 it was only 805 mm. The important crops grown in this village are paddy, cotton, chillies, pigeon pea etc. The farmers are growing pigeon pea varieties like LRG 30 and other local varieties with the onset of monsoon. Due to heavy rains farmers are facing problems like wilt and pod borers



Farmer with LRG 41 variety of pigeon pea in his field



A field visit by scientists & farmers

(*Maruca sp* and *Helicoverpa sp*) during Nov-Jan because of which crop yields are low. KVK demonstrated cultivation of pest & disease resistant variety of pigeon pea LRG 41 in 10 farmers' fields in *kharif* 2011. The grain yield of variety LRG 41 was 21.25 q/ha while other varieties could yield only 16.25 q/ha. The farmers are selling the harvested LRG 41 seed for sowing in the next season by the fellow farmers.

V. Farmers could realize higher returns by cultivating vegetables with drip irrigation system, Nalgonda, Andhra Pradesh

High intensity, unseasonal and un-even distribution of rainfall, intermittent dry spells and declining water table are some of the problems experienced by the farmers in the Nandyalagudem and Boring tanda villages. In spite of such unfavorable situation, farmers were growing paddy and suffering crop loss. Due to recurring losses farmers are hesitating to continue with agriculture. At this stage, KVK gathered the farmers prior to onset of monsoon, conducted training programmes on vegetable cultivation and convinced them to take-up vegetable crops with drip irrigation system and arranged



Drip irrigation system



Tomato crop under drip irrigation

for the supply of improved varieties of vegetable seeds on 50 percent subsidy through the Department of Horticulture, and drip irrigation system at 90 percent subsidy through Andhra Pradesh Micro Irrigation Project (APMIP). Vegetable cultivation started with the onset of monsoon in the above villages and farmers could realize very good returns from *kharif* harvest itself. One of the trainees, Mr

G. Hankla of Boring tanda transplanted tomato on 22nd of July 2011 in his field and started harvesting and selling of tomato fruits from 2nd week of September to 4th week of November 2011. During this period he harvested 10.8 tons of tomato in 0.3 ha of area and got an income of Rs 37,640, whereas during 2010 he got net income of Rs 3,750 through paddy grown in the same field. He realized an additional net income of Rs.33,890 due to cultivation of tomato crop with drip irrigation system.

VI. Renovation of nala (drain) for proper channelization of rain water for supplemental irrigation for *rabi* crops, Amaravati (Durgapura), Maharashtra

Takali village falls under western plateau and hill region of Maharashtra. The soils are medium to deep black and it is mostly a rainfed area with average annual rainfall of 1050 mm. During 2011-12 rainfall received was only 875 mm. More than 75 percent of rainfall was received during June to August months which caused huge runoff and soil erosion. There was an old nala (drain) which drains the runoff rainwater through a catchment area of 800 ha into a series of cement plugs for supplemental irrigation during



Old Nala (drain) before renovation



Nala (drain) after renovation

water scarcity in *rabi* months. But the drain became narrow and its storage capacity was reduced due to silt deposition. During the rainy season, the rainwater used to over flow through the drain and submerge nearby fields and damage the crops. KVK, initiated “Nala Trenching” work during the month of April 2011 and excavated the deposited silt which resulted in the safe disposal of runoff rainwater into cement plugs and made it available for supplemental irrigation of *rabi* crops during 2011 and also saving kharif crops in 2011.

VII. Trenching and compartment bunding – an effective measure to control soil erosion, Nandurbar, Maharashtra

Village Umarani is situated in the Satpuda ranges where the soils are shallow, prone to moderate to severe soil erosion. It receives an annual rainfall of 813.2mm. The frequency of intense rainfall (> 60 mm/day) is 2.5 as decadal average. The top productive layer of the soil has been deteriorating day by day causing decrease in productivity of soil. Soil and water conservation measure of making trenches with compartmental bunds across the slope has been under taken on 69 farmers’ fields covering 35 ha of area prior to monsoon to prevent the soil erosion and sustain the productivity of



Trenches and compartment bunds

cultivable soil. The trenches of 2x5x0.4 m size were made across the slope in May 2011. Each trench was separated by 1 foot of un-dug soil. The soil removed was used to make the bund along the trench to reduce the speed of run-off water, allow the eroded soil to deposit in the trenches and for percolation of rain water. In each field one stone outlet was made to let out excess water, if any, out of the field. There was high intensity rainfall of 58 and 86 mm on 6th and 19th July 2011 respectively. The top soil carried by the water was deposited in



Stone outlet



Trench filled with eroded top soil

the trenches. 11.5- 21.2 m³/acre of fertile top soil had been saved by making trenches. The details of soil trapped in the farmers fields are given below.

Soil trapped in the field due to trenching cum bunding:

S.No.	Name of the farmer	Area in acre	Soil trapped m ³ /acre
1	Shri. Boka Nagarya Pawara	1	21.20
2	Shri. Shivala Lala Pawara	1	18.75
3	Shri. Kalshya Nerabya Pawara	1	16.85

VIII. Reduction in fish mortality during monsoon season by regular monitoring, West Godavari, Andhra Pradesh

The farmers of Matsyapuri village are practicing aqua culture and they were incurring heavy losses due to sudden mass fish mortality during monsoon season. Farmers used to think this is because of some disease and applied medicines for the fish without any effect. At this stage KVK scientists created awareness among the fish farmers that fish wander near the surface of water due to increased water P^H (> 8.5), reduced dissolved oxygen levels (< 5 PPM) or accumulation of ammonia in the pond water. When the weather is



Recycling pond water to improve dissolved O₂ levels

cloudy or rainy, fish wander near the surface of water and die; it is an indication of reduced dissolved oxygen levels (< 5 PPM) in the fish ponds. Fish wander near the surface of water due to suffocation. At this stage immediately dissolved oxygen levels need to be increased to minimum 5 PPM and above by applying prescribed chemicals or changing water or turning (recycling) water. For this water quality monitoring kits were supplied to 20 farmers of around 40 ha of fish pond area during Aug-Sep 2011 and conducted method demonstrations on checking and maintaining fish pond water



Mixing chemical to increase dissolved O₂ levels

quality on daily basis. The farmers started adopting the technology and there was no report of mass mortality till date during rainy and cloudy weather conditions, in the fish ponds where quality of water is maintained. Mass mortality of fish in the fish ponds was reported where the above technology was not used.

IX. Combating fodder scarcity during summer by silage making, Pune (Baramati), Maharashtra

Sharadanagar is a drought prone village. During *Rabi* plenty of green fodder like maize, jowar, sugarcane tops etc is available. However during summer months, there will be severe fodder scarcity. Keeping this in view, demonstrations and trainings on silage making were undertaken in 3 farmers' fields. The silage will be ready to use within 45 days and it will be available to feed the livestock during summer months.



Fodder for mixing silage

X. Sowing with automatic seed drill for higher yield of groundnut, Anantapur, Andhra Pradesh

Chamaluru village of Narpala mandal falls under southern part of Andhra Pradesh where climate during summer is extremely hot, soils



Filling silage pit with chopped fodder and additive mixture

are predominantly red and average annual rain fall is 522 mm. The major climatic vulnerability faced here is drought. Ground nut is one of the major crops in the area which is sown during the 1st week of June. Total rainfall received during 2011-12 was 482 mm. Generally, farmers sow groundnut by dibbling with the bullock drawn desi plough, adopting a seed rate of 145 kg/ha. In this method, seeds are not placed at proper depth, unevenly distributed, damaged by birds or insects which result in poor crop stand and low yield. KVK has



Sowing groundnut with Ananth seed drill

introduced sowing with tractor drawn Ananth groundnut planter, an automatic seed drill in 5 farmers fields (5 ha) on 24th July 2011 using improved groundnut variety, K6 (drought resistant, tolerant to sucking pests with around 110 days duration) with 120 kg/ha seed rate. The crop was harvested in 1st week of November. Sowing with Automatic seed drill gave 24 plants /m² and 1055 kg/ha pod yield, where as ground nut sown with farmers practice gave only 18 plants /m² and 711 kg/ha pod yield. There was realization of higher pod yield of 48 % by sowing with automatic seed drill than farmers practice. Keeping this advantage in view, seed drill was kept in village custom hiring centre for farm implements under NICRA project.

Details	Use of Automatic Seed Drill	Use of Bullock drawn Seed Drill
Placement	Automatic at 3 cm depth	Hand dibbling at uneven depth
Distribution of seeds	Uniform	Not uniform
Seed rate in kg /ha	120	145
No of plants /m ²	24	18
Pod yield kg/ha	1055	711



30 days old groundnut crop sown with Ananth Seed drill