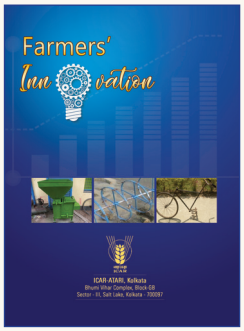
Farmers' Innovation

ICAR-ATARI, Kolkata
Bhumi Vihar Complex, Block- GB, Sector-III,
Salt Lake, Kolkata, West Bengal- 700097



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Foreword

Agricultural development enables agriculture and people to adapt rapidly when challenges occur and to respond readily when opportunities arise—as they inevitably will, because agriculture depends on various factors of environment as well as on socio-economic aspects which are continuously changing. Thus, agricultural development demands and depends on innovations and innovation systems. To address the challenges / difficulties arise due to farming under a wide range of ecological, climatic, economic and socio- cultural conditions, numerous innovations have been generated by farmers. Since the inception of agricultural development process, a number of farm innovations have been developed by the farmers which hardly have been documented and studied. In order to promote and popularize the farmer–led innovations, it is necessary to document and upscale them.

Therefore, it is immensely important to recognize and document the farm innovations for their further upscaling and outscaling. Integrated efforts of formal/ conventional technology generation accompanied with that of farmers' innovation system have to be worked out to achieve synergetic effect on farm productivity and profitability.

I appreciate the efforts made by the KVKs of Zone V in identifying good number of farm innovators and innovations. The present compilation of farmers' innovation is categorized in three different sections like farm machinery/equipment, process development and agricultural practices across Odisha and West Bengal. Hope this book will be a source of motivation for other farmers to derive suitable innovation to overcome the problems of farming.

Date: 01.11.2018

(S.S.Singh)

Preface

The challenges of today's world are bringing many pressures to bear on agriculture: population growth, the impact of climate change, the need to reduce greenhouse gas emissions in agriculture, rapid development of the emerging economy and growing instability associated with land, water and energy shortages. Agriculture also needs to produce more food for a growing population using a limited amount of farm land, while at the same time reducing its greenhouse gas emissions to avoid worsening climate change. It is the backbone of Indian economy, has been facing various challenges in recent years - lower productivity, resource crunch and erratic weather, all of these translating into lower returns.

This scenario heightens the critical role of innovation to make agriculture more competitive and sustainable. Innovation is the implementation of something new or improved (whether technology or otherwise) in products (goods or services), processes, marketing or organizational methods. In other words, it means applying ideas, knowledge or practices that are new to a particular context with the purpose of creating positive change that will provide a way to meet needs, take on challenges or seize opportunities. Such novelties and useful changes could be substantial (a large change or improvement) or cumulative (small changes that together produce a significant improvement).

The innovative farmers featured in this publication are role models who can inspire others and encourage them to innovate for agriculture. Their stories are a testimony of how young farmers are contributing for transforming agricultural value chains through their innovations. There is a need to identify such farmers–led innovations and understand the context in which those are applied. And their scientific validation in participatory mode makes it possible to communicate and mainstream them in on-schemes for wider adoption.

This booklet is a collection of efforts of farm innovators in the category of farm equipment/machinery (13), organic agriculture products (5) and agricultural practices (11) from the KVKs of Odisha and West Bengal. Hope this publication will help in bringing recognition to the farm innovators and they get inspired to try out non-conventional means to overcome their problems for making farming more profitable and sustainable.

Authors

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Background

A Farm Innovators Meet was organized on 24.03.18 at ICAR-Agricultural Technology Application Research Institute, Kolkata. Innovative farmers from Odisha and West Bengal participated in this Meet with their innovations. The programme was inaugurated by Dr. S. S. Singh, Director ICAR-ATARI, Kolkata. The Meet was also attended by Dr. K. K. Satapathy, Former Director, NIRJAFT and Dr. D. C. Nayak, Head NBSS&LUP Regional Station, Kolkata. The scientists elaborated the basic purpose of the Meet, types of innovations brought by the farmers and importance of such innovations in reducing the cost of cultivation and drudgery in agriculture and emphasized that farmer-scientist interaction is the essence of agricultural development process and such meet fosters the interaction process. They laid emphasis on the cross learning between farmers and scientists and stated that work in partnership was the need of the hour for better dissemination of technologies in the farmers' field. At the end, all the participating innovators were provided with participation certificate in recognition to their hard efforts in displaying various innovations in the form of farm tools, implements, organic and bio-pesticides, innovative shed net for off-season vegetable cultivation and various process demonstrations. Altogether 29 farm innovators took part in the Meet. The innovative farmers demonstrated their innovations in the stall and interacted with visitors, scientists, KVK personnel and fellow farmers.

Farm Equipment / Machinery

THREE TYNE CYCLE WEEDER

Name: Sri Rama Badamundi

S/O: Sri Gangadhar Badamundi

Village: Alama

G.P.: Ramagiri

Block: R. Udayagiri

District: Gajapati

Educational Qualification: U n d e r - Matriculation

Land holding: 5 acres

Problem/ challenge addressed

Agro ecological farming suitation-I (AES-I), Red loam soil, Low rainfall, Moderate elevation (300-500 m), and Moderate irrigation.

Implements are essential to address shortage of labour, reduce cost and drudgery engaged in weeding operation. This implement is mainly used for intercultural operation.

Description of innovative practice/ technology

Three tyne cycle weeder is used for weeding, hoeing and hedging operation. The weeder is fabricated with one wheel and two shaft attached with the wheel. The cutter is firmly fixed at appropriate inclination with the shaft. The parts of the equipment are locally available materials and can easily be assembled. This equipment can be easily operated with single manpower.

Practical utility

This equipment works 3 times better than manual labour with a capacity of weeding180-200 sqm per hour in comparison to human capacity of 50-60 sqm per hour. This equipment can be transported from one field to another field easily.

Source of information

Sri Rama Badamundi was inspired by the cycle weeder displayed at Gajapati Mahotsov which was a single tyne weeder.

Economic Profitability of innovative practice/ technology

For weeding with one hectare area about Rs. 5000/- is required (approx. 20 mandays) in conventional method whereas with 3 tyne cycle weeder the cost of weeding reduced to Rs. 1250/- (approx. 5 mandays), thereby reducing the drudgery and cost of labour too.

Potential: Acceptance level, horizontal spread of innovation and number of farmers' adoption

It has been accepted by the farmers of nearby villages. Farmers from his village and other adjoining villages visit him regularly to see the demonstration of this innovation. It has been appreciated by scientists from the KVK and officials of State Government/Line Department for its 3 fold higher capacity than single tyne weeder. This innovation also telecast in Doordarsan Odia.

LOW COST PADDY STRAW CUTTER FOR MUSHROOM CULTIVATION

Name: Mr. Sneharabinda Tripathy
S/O: Mr. Promod Chandra Tripathy
Village: Bentapur
P.O.: Kangula
Block: Angul
District: Angul-759132
Educational Qualification: B.Sc
Aadhar Number: 367342805528
Mobile No.: 8895816480/ 7008804186
Land holding: 7.5 acres

Problem/ challenge addressed

Agro-ecological situation: Rainfed upland

Agro-ecological farming system : Rice-Mushroom

Less income of Rs.130000/- from the sole rice production in 7.5 acres and less utilization of paddy straw motivate him to be a mushroom entrepreneur. Scarcity of labour is also a challenge for the entrepreneur.

Description of innovative practice/technology

This paddy straw bundle cutter is suitable to cut the whole straw bundle at a time (Height: 2'9", Girth: 2.5', Weight: 15 kg, Motor: 1 h.p., Ring Cutter-Diameter: 1')

Trolley is used for transportation of paddy straw bundles (Length:2' 10", Depth of tray:1', Two wheels with a galvanized tray and Handles to move)

Practical utility

Paddy straw bundle cutter: Paddy straw bundles can be cut in uniform size within less time i.e. 500 bundles/hr.

Trolley: Heavy bundles can be carried at a time with less drudgery and time for preparing two paddy straw beds (20 bundles/trip). It also helps to carry residual mushroom straw to his vermicompost unit.

Source of information

Initial idea from the KVK Scientists motivate him to prepare paddy straw bundle cutter with a series of modification in diameter of the ring cutter according to the straw bundle size for standardization of the implement.

Economic Profitability of innovative practice/ technology

Mr. Tripathy earned a net profit of Rs. 514600/- in 2016-17 and using this innovative technique a cost saving was Rs. 28500/- in 2017-18. BC ratio 1.45.

Potential: Acceptance level, horizontal spread of innovation and number of farmers' adoption

Mr. Tripathy extended training and guidance on mushroom cultivation to farmers in his locality and neighbouring area with demonstration of his innovation. One mushroom entrepreneur adopted this technology this year and others planned to adopt. KVK Scientists and Horticulture Department appreciated this innovation for its labour, time and energy saving properties.

COST EFFECTIVE STRAW CUTTER FOR MUSHROOM GROWER

Name: Pankaj Kumar Newta
S/O: Basanta Kumar Newta
Village: Kempsada
Block: Sadar
District: Keonjhar-758001
Age: 26
Educational Qualification: B.Com
Aadhar Number: 580249328286
Mobile No.: 8280007579

Problem/ challenge addressed

Straw cutting for mushroom cultivation is very laborious and time consuming. By adopting this technology cutting of straw is easier and less labour intensive.

Description of innovative practice/ technology

This special cutter is used for cutting the straw easily to save time and labour against normal cutter, as well as for making oyster mushroom straw bundle. This cutter is made up of steel blade, fitted in a table with 1HP motor. This cutter is used for production of paddy straw mushroom under poly house in winter. The temperature and humidity is maintained by using thermo-hygrometer. Sand beds are made for maintaining humidity.

Practical utility

It reduces drudgery, labour and time. Nearly 80-85% labour wages can be minimized by using this straw cutter. As the cost of the machine is Rs. 11000/-, it can be afforded by marginal and progressive farmers. By using the machine the farmer is able to prepare 7 times more straw bundles for mushroom cultivation in a day.

Source of information

Integrated information from internet, discussion with scientists of KVK and his own idea.

Economic Profitability of innovative practice/ technology

Method	Cutting of starw/day	Labour cost/ day (Rs.)	Cost for 3000 bundles (Rs.)	Saving (Rs.)
Manual	400 bundles	200	200x7 labour=1400	
Machine	3000 bundles	200+ 210 (diesel cost)	410	990

Machine cost = Rs. 11000/-
Saving of Rs. = 356000/- per annum (Approx.)

Potential: Acceptance level, horizontal spread of innovation and number of farmers' adoption

This machine is widely appreciated and accepted by mushroom growers of adjoining districts of Odisha. The officials from Line department, ICAR and OUAT scientists visited his mushroom unit and appreciated the innovative idea. At present this machine has been adopted by 5 farmers. The farmer is already in the process of patenting this machine.

POWER TILLER OPERATED PADDY THRESHER

Name: SushantaNaik
Village: Ghantamal
P.O.: Jhirlapalli
Block: Kolabira
District: Jharsuguda
Age: 60
Educational Qualification: Matriculate
Mobile No.: 9777468457
Land holding: 5.0 acres

Problem/ challenge addressed

Threshing of paddy is very expensive using paddy combine harvester for small and marginal farmers. Also they have to depend on the availability of harvester on the peak time of harvesting. At the same time labour shortage is also another problem faced by the farmers.

Description of innovative practice/ technology

This paddy thresher is made up of wood and it has on an average weight 3.0 quintal. It is drawn by power tiller for threshing of paddy. This wooden implement is attached with a wooden shaft along with a hinge which is connected to the power tiller during threshing.

Practical utility

The thresher can be made with locally available materials. It is simple and easy to operate. It is useful for small and medium farmers who face acute labour shortage for manual threshing.

Source of information

Own practical idea

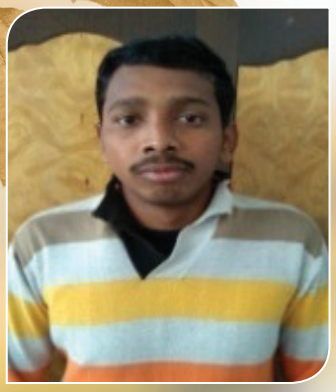
Economic Profitability of innovative practice/ technology

By using this implement, labour cost was reduced to fifty percent as compared to manual practice. Also, the cost of operation was reduced to forty five percent as compared to combine harvester.

Potential: Acceptance level, horizontal spread of innovation and number of farmers' adoption

The power tiller operated paddy thresher developed by Sushanta Naik is cost effective as compared to combine harvester. This equipment is well adopted by other farmers of neighbouring villages in the local farming situation.

COMBINED PLANTER, WEEDER AND EARTHING UP IMPLEMENT



Name: Shyamal Sarkar
Village: Batasurkuthi
P.O.: Sahebganj
District: Cooch Behar-736168, W.B.
Aadhar Number: 8506 9117 2500
Mobile No.: 8158946437

Problem/ challenge addressed

Difficulties in planting, weeding and earthing up during cultivation of garlic, maize and potato encouraged the cultivator to fabricate a very simple indigenous low cost implement that can serve planting, earthing up and weeding very precisely with the help of only one labour.

Description of innovative practice/ technology

A piece of scrap corrugated tin is framed with 1/2" wide wooden stick. The corrugated tin is pierced at 6" (row to row) x 4" (plant to plant) (depending upon crop spacing) distance and bamboo twigs are inserted into the pierced whole and tightened with screw with corrugated tin. This system helps to place the garlic cloves/maize seeds at proper distance, depth and line. The distance between row to row and plant to plant is adjustable depending upon the crop. The lower end of the wooden frame is made to attach two sets of wooden pegs at different heights with sharpened ends which are used for earthing up (longer one) and weeding (shorter one). These two structures are detachable and fitted with the frame with nut and bolts. Two long handles are fixed one at the upper end and another at lower end of the frame to draw the implement in the field. This implement can be drawn by a single labour for the purpose of planting, weeding and earthing up of crops.

Practical utility

This implement helps the farmers to place seeds at proper depth, distance and line with minimum labour force. The labour is very scarce particularly during the rabi season. A single labour can do the weeding and earthing up several lines at a time by this implement thereby reducing the cost of labour for the cultivation. The cost of fabrication of the machine is only Rs. 300/-.

Source of information

Own practical idea

Economic Profitability of innovative practice/ technology

By using this combined planter, weeder and earthing up implement 2-3 mandays are less required per bigha which in turn saves Rs. 900-1000/- per bigha. The cost of the machine is only Rs. 300/-, which is very cost effective for small farmers.

Potential: Acceptance level, horizontal spread of innovation and number of farmers' adoption

This equipment was adopted by 20 farmers of 4 villages. The machine is portable and can easily be replicated. Farmers from neighbouring villages are adopting this technology as it is multi-functional in this farm situation and field condition.

Name: Abubakar Siddik
Village: Barpak
P.O.: Dhumpur Balasi
Block: Cooch Behar-I
District: Cooch Behar-736134
Aadhar Number: 7464 9751 941
Mobile No.: 9593748366

Problem/ challenge addressed

The small and marginal maize growers cannot always afford maize sheller for shelling the maize cobs and in most of the cases maize are shelled by the family members only by hand that creates severe drudgery. As well as while shelling with the mechanical sheller, the grains are cracked and sold at less market price.

Description of innovative practice/ technology

In order to cope with the drudgery in maize shelling a simple motorized maize sheller was fabricated using 0.5 HP motor fitted with a shaft with ball and bearing through a pulley. The two hand maize sheller designed by the farmer was fixed at the two ends of the shaft. The whole system was fixed on a wooden platform.

Practical utility

This machine can be utilized for easy maize shelling without cracked or broken grains as well as the said machine is used for winnowing rice grain when fitted with a small fan at one end of the shaft.

Source of information

After observing the process of functioning of a mechanical maize sheller, the farmer fabricated this machine using own intellect.

Economic Profitability of innovative practice/ technology

Generally 30 mandays are required to shell maize cobs manually for 1 acre (Rs. 300/manday) whereas only 9 mandays are required to shell maize cobs with this machine, which in turn fetches a profit of Rs. 6300/- (Approx).

The market price of maize shelled through this machine is always Rs. 200/- to Rs.300/- which is more than maize shelled by mechanical maize sheller.

The cost of fabrication of this machine is Rs. 5000/- with benefit cost ratio of 3.5.

Potential : Acceptance level, horizontal spread of innovation and number of farmers' adoption

This machine has been able to create tremendous impact amongst the neighbouring farmers which prompted him to fabricate 3 more machines of the prototype which are being used by the farmers of the neighbouring villages on hiring basis @Rs. 300/- per acre.

ZERO-TILLED MAIZE SEED PLANTER

Name: Abubakar Siddik
Village: Barpak
P.O.: Dhumpur Balasi
Block: Cooch Behar-I
District: Cooch Behar-736134
Aadhar Number: 7464 9751 9417
Mobile No.: 9593748366

Problem/ challenge addressed

In the fragmented land holdings of small and marginal farmers the zero-tillage machine cannot be operated properly and all the small and marginal farmers do not have the access of hiring zero-tillage machine for sowing maize seed in zero-tilled condition. Moreover, the uniformity in the depth of seed sowing and distance between the seed often cannot be maintained properly due to lapses of malfunctioning of the rotor of the machine. This problem is more evident in the corners and sides of the plot which requires engagement of additional manpower to fill in the gaps which also requires additional cost to be incurred by the farmers. In addition to this, consumption of maize seed by the birds in zero-tilled maize field is a menace as observed by the farmers which significantly reduces the plant population thereby reducing yield.

Description of innovative practice/technology

A piece of iron pipe measuring 4" long and 2" in diameter is welded with a 3"x3" iron plate perpendicularly at the middle of the pipe dividing the pipe in 2" at both sides of the plate. The plate attached perpendicular to the pipe prevents the pipe to go deeper thereby help maintaining proper and uniform depth for seed sowing. One side of the pipe is fitted with a heavy handle made up of bamboo or wooden stick.

Practical utility

This implement is used to sow maize seed in zero-tilled condition at uniform depth and distance. After putting seed, the hole is covered with fertilizer mixed with cow dung. This technique prevents the seeds to be consumed by the birds. The technique offers uniform depth, quantity and proper utilization of fertilizers in very small fragmented pieces of land of marginal farmers.

Source of information

Own idea

Economic Profitability of innovative practice/ technology

By using this technique the cost of labour reduces to great extent. As the seeds are sown in line, the yield of maize increases by 20-30% as compared to broadcasting technique, thereby increasing the net profitability by Rs. 20000/-

(approx.) per hectare. Also the quality of cobs are good, which fetch high market value.

Potential: Acceptance level, horizontal spread of innovation and number of farmers' adoption

The success of Abubakar Siddik drew farmers from the neighbouring villages and districts to his field. About 30 farmers of 5 villages adopted this portable implement. His work was appreciated by the Officials and scientists of Line Department and KVK Coochbehar.

GERMINATION BOX FOR VEGETABLE SEED GERMINATION DURING WINTER SEASON

Name: Manas Kumar Kundu
Village: Ghagarpara
P.O.: Khanakul
District: Hooghly-712406
Age: 32
Educational Qualification: Matriculation
Aadhar Number:
Mobile No.: 8641919467
Land holding: 1.0 acre

Problem/challenge addressed

Early cultivation of bitter gourd, ridge gourd and other cucurbit crops give high profit to the farmers, but due to low temperature in winter season farmers face problem of seed germination.

Description of innovative practice/ technology

In common practice farmers generally germinate their wetted and treated seeds by putting those in heap of dry paddy straw after wrapping with bamboo leaf and cloth. But in this condition seed takes more time to germinate and germination percentage is also less due to low temperature. In this innovation, Mr. Kundu placed seeds on wet cotton in plate and the plate was kept inside the germination box which was designed and made by him. During the winter season, the box temperature is risen through kerosene lamp which can be regulated manually. To measure the temperature inside the box one thermometer is inserted into the box from outside. The measurement of the box is 1ft x 1ft x 1.5ft (length x width x height) and it is made with hard paper board of which the lower side is made by metal sheet. Top of that box can be opened to place the seeds when as required. In the middle portion of the sheet, there is a chamber (made by metal cane) for placing the kerosene lamp from outside. The box is placed on wooden stand.

Practical utility

He is applying this innovative idea for better germination of seeds of vegetable crops like pumpkin, snake gourd, ridge gourd, bitter gourd and cucumber during winter season because of less germination of seeds due to low temperature in ambient condition.

Source of information

He got the idea from text book and newspaper.

Economic Profitability of innovative practice/ technology

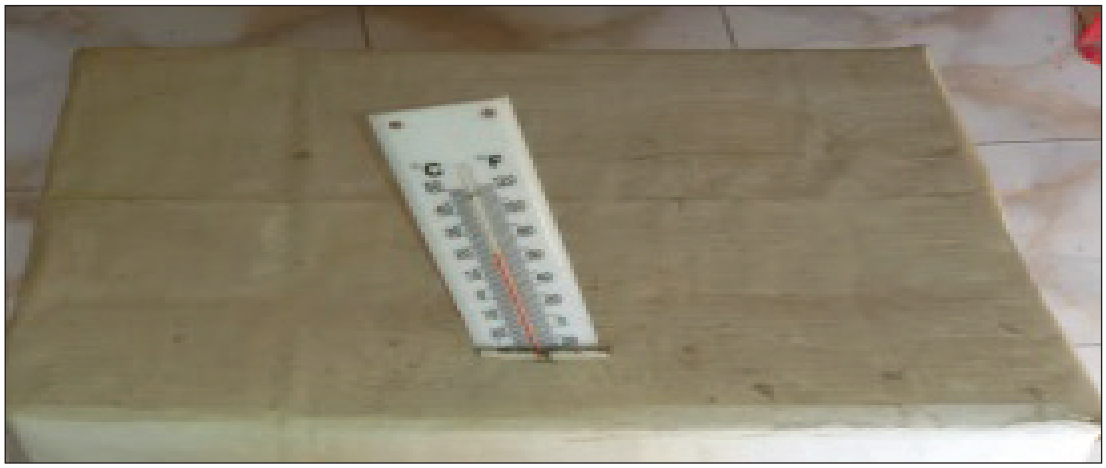
Cost of innovative box: Rs. 1500/-

Total cost of cultivation of cucumber per ha using this technology: Rs.169500/-. Net return per ha using this technology: Rs. 215250/- with benefit cost ratio of 1.26.

Net return per ha without this technology: Rs. 120000/- which fetches a profit margin of Rs. 95000/-(approx.) per hectare.

Potential: acceptance level, horizontal spread of innovation and number of farmers' adoption

It is highly acceptable technology for early crop of cucurbits. It is very newly developed innovation and is now at initial stage of adoption. The innovation has a potential for scaling up winter vegetables where germination percentage is low. Farmers from the neighbourhood accepted and in the process of adopting the technology.



FOUR ROW PORTABLE SRI MARKER – A LOW COST INNOVATION FOR SUSTAINABLE AGRICULTURE

Name: Sri Tapan Kumar Ghosh
S/O: Late Sri Narayan Chandra Ghosh
Village: Bishnubati
P.O.: Sattore
P.S.: Sattore
Block: C. D. Block, Bolpur
District: Birbhum-731236, West Bengal
Aadhar Number: 587969512426
Mobile No.: 9614057093

Problem/ challenge addressed

It is an absolute necessity of marking the exact points in the Paddy plot where the transplantation of seedlings would have to be performed to ensure proper rows and spacing, and weeding for SRI Techniques of Paddy Cultivation.

Marking the plot before transplantation to ensure proper rows and spacing, and weeding are necessitating development of appropriate implement.

Description of innovative practice/ technology

Transplanting at wider spacing (10 x 10 inches or 25 cm x 25 cm) allow enough sunlight to reach the leaves of each rice plant thus reducing competition for water, space and nutrients resulting in the spread of roots and healthy growth of plants (the distance can be increased depending on soil fertility). Preparation of the main field in SRI is the same as in conventional method. Field should be evenly prepared and there should not be standing water in the field during transplantation.

In SRI method, seedlings are widely spaced (10 inches x 10 inches or 25 cm x 25 cm) and only one seedling is transplanted per hill (3-4 seedlings per hill in conventional system). SRI method can accommodate only 16 hills /sq m as against 33-40 hills/ sq m in conventional method. Uniform spacing is also required for easy weeding by implements. To maintain uniform spacing, different methods can be employed.

Small pegs can be tied to a rope at 25 cm or 10 inch distance and by using this rope row after row transplantation can be done. Different types of "Markers" are being developed for this purpose. These markers need to be run over the prepared field lengthwise and width wise. Transplanting at the marked intersection gives the required 25 cms x 25 cms spacing. Some of the newly developed markers draw 8 rows and columns simultaneously. These markers need to be pulled at an even pace for proper marking. To have the lines straight, it is advisable to tie a rope and pull the marker alongside the rope. For smooth transplantation, field operations like bunding, levelling and marking with marker should be completed a day before the transplantation.

Technology Details: -

- ★ Adjustable Plant Spacing of Paddy Seedlings (25 cm X 25 cm and 30 cm X 30 cm) can be marked using the Innovative Portable SRI Marker.
- ★ In case of 25 cm X 25 cm Plant Spacing – 4 rows of Paddy Seedlings can be marked.
- ★ In case 30 cm X 30 cm Plant Spacing – 3 rows of Paddy Seedlings can be marked.
- ★ This Innovative SRI Marker is light weight, made of locally available GI pipes and iron rods.

★ The Innovative SRI Marker (4 Rows) is easily dismountable and transportable.

★ This is a very low cost implement, costing only Rs. 2400/-.

★ The maintenance cost of this implement is also low.

★ The Working Efficiency of the Innovative Portable SRI Marker is 0.3 – 0.4 ha per day (8 hours).

★ The Cost of transplanting 1 ha area using this implement is Rs. 2730/- (cost of labour and seeds).

★ Cost of transplanting 1 ha area in traditional method is Rs. 6300/- (cost of labour and seeds).

Practical utility

A. Economical Considerations - This Innovative Portable SRI Marker is a very low cost locally made implement costing about Rs. 2400/- only. This implement is a labour and time saving device. In traditional method 40 labours are required for transplanting paddy seedlings, while using the Innovative SRI Portable Marker only 18 labours are required. It is also of utmost importance that in the traditional method 7.5 kg of paddy seed is required while using this implement only 1 kg of paddy seed is required for 1 ha of paddy fields. It is to be noted that the cost of transplanting 1 ha area using

this implement is Rs. 2730/- (cost of labour and seeds); while the cost of transplanting 1 ha area in traditional method is Rs. 6300/- only (cost of labour and seeds). The savings using this innovative implement is Rs. 3570/- which is higher than the actual cost of the implement i.e. Rs. 2400/- only. So this innovative portable SRI Marker is highly economic and viable in the field level functioning.

B. Environmental Considerations- Through the SRI Method, Sri Tapan Kumar Ghosh is giving irrigation for SRI Paddy plots - 16 nos. each on average of 5 cm i.e. total 800 mm; whereas in the traditional paddy cultivation method Sri Ghosh generally gives 12 irrigation. each on average of 10 cm i.e. 1200 mm and for seedbed of traditional plots - 6 nos. irrigation each on average 10 cm i.e. 600 mm, i.e. total 1800 mm. Thus a huge quantity of ground water to the tune of 1000 mm will be saved through the adoption of SRI Method of Boro Paddy cultivation. Thus this innovative low cost farm machinery also helps to preserve environment and can act as an innovative conservation technology.

C. Cost of Innovative SRI Marker: It is very low cost, locally made implement and costs nearly Rs. 2,400.00.

Source of information

He got the information from Rathindra Krishi Vigyan Kendra, Birbhum.

Economic Profitability of innovative practice/ technology

Difference between transplanting of paddy seedlings through SRI Method with the use of 4 Row SRI Innovative Marker and transplanting of paddy seedlings through traditional method without the use of 4 Row SRI Innovative Marker –

Transplanting Using SRI Marker	Traditional Transplanting
Man Days Required – 18 / ha	Man Days Required – 40 / ha
Requirement of Paddy Seeds – 1 kg	Requirement of Paddy Seeds – 7.5 kg
Cost of Transplanting / ha (Labour + Seeds) – Rs. 2,730.00	Cost of Transplanting / ha (Labour + Seeds) – Rs. 6,300.00

From the above table, it is to be noted that the cost of transplanting of Paddy seedlings for 1 ha area using this implement is Rs. 2,730.00 (cost of labour and seeds); while the cost of transplanting of Paddy seedlings for 1 ha area in traditional method is Rs. 6,300.00 only (cost of labour and seeds). The savings using this innovative implement is Rs. 3,570.00 which is higher than the actual cost of the implement i.e. Rs. 2,400.00 only. So, BC Ratio is 1.56. This innovative portable SRI marker is highly economic and viable in the field level functioning.

Potential: Acceptance level, horizontal spread of innovation and number of farmers' adoption

A. Sri Tapan Kumar Ghosh already made available the 4 Row SRI Marker to 50 numbers of farmers of own village free of cost for demonstration purposes and it has proved to be the key factor for converting 98.84 acres of traditional paddy fields to SRI Paddy field in adjoining farm fields of his village.

B. Farmers of the neighbouring Mala village are cultivating paddy through SRI method inspired by the Innovative SRI Marker of Sri Tapan Kumar Ghosh and making use of the basic principle of SRI Marking system for seedling transplantation in 65.90 acres of land.

C. National Rural Livelihood Mission (NRLM) named "Anandadhara" of Govt. of West Bengal has approached Sri Tapan Kumar Ghosh for fabrication and supply of 100 numbers of the Innovative 4 Row SRI Marker.

PORTABLE ZERO TILL SEED CUM FERTILIZER DRILL MACHINE

Name: Dinabandhu Pal
S/O: Late Sudhakar Pal
Village: Warsihpur
P.O.: Bananabagram, P.S.: Ausgram
District: Purba Bardhaman
Aadhar Number: 3544 1867 7925
Mobile No.: 7699870386, 7585077664
Land holding: 2 acres

Problem/ challenge addressed

The area is mainly lowland and there is heavy loss of paddy crop due to inundation of water. But if paddy is sown early with zero tillage machines, crop can withstand submergence for 3-4 days. But there is no custom hiring centre available in the locality.

Description of innovative practice/ technology

These conditions compelled the farmer to innovate portable zero seed cum fertilizer drill manual machine for paddy and potato cultivation and is suitable for small and marginal farmers. It can be drawn by hand as well as by bullock.

This portable machine is made of materials like wood, ply, rubber band, nuts, iron rod, iron blades etc. which are easily available in the vicinity and anyone can make a replica of the same very easily.

A modification in the portable Zero till drill was made by attaching three iron blades in the bottom portion. This when dragged in well tilled soil, makes ridges which are suitable for potato planting.

Practical utility

The zero till seed – cum – fertilizer drill has replaced mono-cropping system of rice cultivation where field remained fallow during *Rabi* season due to uncertainty of rain and lack of irrigation infrastructure in the locality. One crop subsequent to kharif paddy, like pulse or mustard, can be sown in the residual moisture of the field during rabi season. The machine can sow 2 acres of land in just 4 hours. The technology not only saved energy but also helped in enriching the soil health by improved soil organic carbon (SOC) status due to no-till of soil. The growth and yield parameters in paddy & mustard are better in no tillage than conventional tillage due to timely sowing and presence of residual soil moisture after rice harvesting. It reduces the cost of labour for seed placing, intercultural operations like weeding, manuring, plant protection measures, irrigation, cost of fertilizers. No-till technology typically provides cost savings in soil preparation because there is no need to plough or cultivate the soil before sowing. It also maintains physical & biological health of soil.

Source of information

Own idea

Economic Profitability of innovative practice/ technology

Cost of cultivation of paddy was lowered by Rs. 21000/- per ha. Yield of paddy increased from 5.0 t/ha to around 6.1 t/ha which gave an additional profit of Rs. 15,000/-. Thus, net profit was around Rs. 36,000/-.

Potential: Acceptance level, horizontal spread of innovation and number of farmers' adoption

Twenty two (22) farmers in the neighboring villages of Nabagram, Guskara and Mahata have taken the machine on custom hiring for very meagre amount and transplanted their fields in the past year. Two of them devised the machine for future use. This innovation is likely to become popular among the small and marginal farm community.

KURO JHARA MACHINE (BROKEN RICE SEPARATING MACHINE)

Name: Mr. Binoy Krishna Dey
S/O: Nityananda Dey
Village: Kamarthuba, Block: Habra
District: North 24 Parganas, West Bengal
Age: 67
Educational Qualification: Class VIII
Aadhar Number: 7340 7443 9514
Mobile No.: 09434136051, 03216-211078
Land holding: 0.7 acre (own) & 3.01 acres (leased)

Problem/ challenge addressed

Habra block of North 24 Parganas district has large number of Rice Mills that process huge quantity of parboiled rice. Therefore, huge amount of paddy husk (*tush*), broken rice (*khud*) and rice bran (*kuro*) are produced and these are used as fuel in rice mill as well as in household. Due to scarcity of labour separation of broken rice from rice bran/husk is not possible for the farmers as well as rice mill owners also. As a result large quantity of broken rice is being lost round the year.

Description of innovative practice/ technology

Considering these facts, Mr. Binoy Krishna Dey developed a new type of machine for separating broken rice from rice bran/husk.

It is operated by a 2HP motor fitted with a hopper and a shaft that regulate the quantity of husk to be supplied. A blower is fitted in a two sides open chamber (front & back) that passing the air with husk between two plates fitted in front of chamber from where husk comes out and the broken rice is deposited in the base and collected through a sloping tray.

Practical utility

Mechanization of farm operations, which aims at achieving timeliness of operations, efficient use of inputs, improvement in quality of produce and safety and comfort of farmers and reduction in loss of production of farmers.

Source of information

Own practical idea

Economic Profitability of innovative practice/ technology

Price of the machine is Rs. 9800/- per piece. He produced 100 nos. of machine per year. Annual turnover is about Rs. 10.0 lakh.

Potential: Acceptance level, horizontal spread of innovation and number of farmers' adoption

This machine is popularly used in whole North 24 Paragans district as well as other districts of West Bengal. Apart from this he also sells it in Jharkhand, Uttar Pradesh, Bihar and Tripura states. He got the patent right of this machine.

Name: Barun Saha
Village: Arjunpur
P.O.: Tilan, P.S.: Tapan
District: Dakshin Dinajpur
Age: 58
West Bengal-733127
Educational Qualification: Madhyamik
Mobile No.: 8967625113
Land holding: 4 acres

Problem/ challenge addressed

Huge production loss due to infestation of weed. The grass cutter is used to control weed.

Description of innovative practice/ technology

This is very simple machine costing only Rs. 300/- and looks like an iron. The machine is fitted in an wooden stick and the length is generally 5 feet but sometimes length depends on the height of the person working with the machine. The grass cutter is fitted with the top of the iron shaped wooden structure. Grass cutter is made of iron. The entire machine is fitted in a wooden stick for smooth operation. It works very rapidly, saves time and money and is also eco-friendly.

Practical utility

More than 30 to 35% yield loss occurs due to huge infestation of various weeds. Instead of using various chemical herbicides, using of this grass cutter is very much beneficial from environmental as well as economical point of view.

Source of information

Self idea

Economic Profitability of innovative practice/ technology

For weeding 2 bighas of land 15 labours are required for 2 days whereas in case of using grass cutter only four labours are sufficient for one day. Thus, the cost of labour is reduced to Rs. 1200/- from Rs. 4500/- by using this implement. BC ratio is 5.19.

Potential: Acceptance level, horizontal spread of innovation and number of farmers' adoption

Potential Acceptance level: 77

Horizontal spread of innovation: 18

The grass cutter is widely accepted by large numbers of farmers and its use has spread to other villages too. All together 95 number of farmers of his village and neighbouring villages adopted this technology.

Name: Sk. Hasibul
Village: Rukundipur
P.O.: Ratua
District: Malda

Problem/ challenge addressed

Weed management is a major problem in rainfed condition. Due to low-medium land and clay loam soil situation the cost of weeding and earthing up is high. Shortage of labour in the crop season makes the situation more critical.

Description of innovative practice/ technology

It is mainly a modified wheel hoe i.e. Cycle Hoe. Three tynes attached at the base of a cycle frame and cycle wheel for smooth, faster and easier operation. The cutter is attached at the base for convenient weeding. It facilitates easier intercultural operation.

Practical utility

The innovation is practically useful as its movement is smooth, fast and it is easy to handle. One man can complete hoeing 0.5 acre of land in a day, whereas normal hoeing needs six mandays for same operation.

It has been made with the concept of wheel hoe. Three tynes are attached at the base of a cycle frame and cycle wheel. The cost of the Cycle Hoe is Rs. 450/- only.

Source of information

From scientist of Malda Krishi Vigyan Kendra

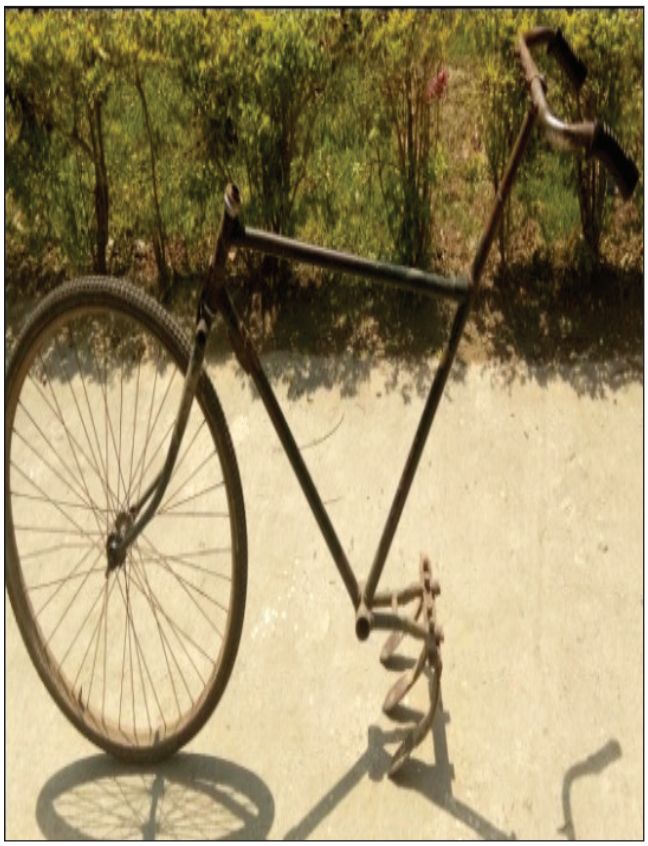
Economic Profitability of innovative practice/ technology

Using this hoe, the cost of weeding is Rs. 500-600/acre whereas with conventional weeding the cost of labour is Rs. 3000-3600/acre. Thus, cost benefit ratio is 1.5.

Potential: Acceptance level, horizontal spread of innovation and number of farmers' adoption

Several fellow farmers have adopted the technology so far and the machine is replicated to five numbers.

KVK Malda provided technical backstopping for this portable and cost saving technology.



Organic Agricultural Products

Name: Banamali Rout

Village: Digambarpur

P.O.: Dharmasala, P.S.: Dhramasala

Block: Dhrmasala

District: Jajpur-755008

Age: 75

Educational Qualification: Under matriculation

Aadhar Number: 340331368763

Mobile No.: 9090358272

Land holding: 7 acres

Pond area: 2 acres

Problem/challenge addressed

Agro-ecological farming situation- North-Eastern coastal plain zone

High purchase cost of commercial fish feed results to inadequate supply of feed to fishes. Thus, the yield and quality of fish gets deteriorated.

Description of innovative practice/ technology

Take a bowl (large bowl) and put polished rice bran one layer at bottom of the pot. Place bulk of cowdung (fresh) layer on it & then mustard oil cake layer, then rice/*dal*/*sattu* mill's waste dust & the last layer of sodium bicarbonate ($NaHCO_3$) and repeat the same process. Add required quantity of water to it & allow it for leaching through different layer for minimum of 6 days. Then the final product is ready as flavoured nutritive fish feed & can be applied to pond as feed to fish by bamboo basket.

Practical utility

Cost of production decreased 4 times than usual commercial feed purchase & net benefit increased 6 times than usual harvest of commercial fish feed use. Thus, it increases the net profitability for middle class farmers.

Source of information

Own idea

Economic profitability of innovative practice / technology

Cost of production is only Rs. 960/- per quintal against Rs. 3500/- per quintal commercial fish feed.

Net profit increased to around Rs. 38,000/- from Rs. 10,000/- per annum.

Potential: Acceptance level, horizontal spread of innovation and number of farmers' adoption

It is really appreciated by Scientists of KVK Jajpur as this fish feed reduces cost of production drastically. With the success of this product subsequently many enquiries from the neighbouring districts like Bhadrak, Kendrapara, Dhenkanal started pouring into both the farmer and KVK Jajpur. The KVK is providing technical backstopping and support in this respect.

Take a large bowl & put polished rice bran

Add rice bran

Addition of fresh cow dung and mustard oil cake

Addition of rice waste dust & decompose cow dung over it

Addition of Sodium bicarbonate ($NaHCO_3$)

Final Product - Nutritive-Flavoured Fish Feed

Name: Sri Sudam Sahu

Village: Katapali

P.O.: Katapali

District: Bargarh, Odisha-768038

Age: 44

Educational Qualification: Secondary Education

Mobile No.: 8328875869, 9776878711

Land holding: 5 acres

Problem/ challenge addressed

Agro-ecological Farming Situation: Plain Land Irrigated

Injudicious use of fertilizer causes environmental as well as human health hazards. Also, disease & pest infestation increases at alarming rate with the use of chemicals.

Description of innovative practice/ technology

Self-made organic pesticide and fertilizer in the name of *Brahmastra* & *Jeevanu Shakti* respectively is applied in paddy field with indigenous variety called *Kusumkali.*

Jeevanu Shakti:

Year of Innovation: 2013-14

Ingredient: fresh cow dung, cow urine, curd & miscellaneous items.

Brahmastra:

Year of Innovation: 2009

Ingredient: medicinal value leaves having unpleasant odour and bitter taste

Practical utility

In the current scenario soil health is a major concern for the sustainable growth of agriculture due to the injudicious use of chemical fertilizers and pesticides. So, application of organic pesticide and fertilizer will improve the soil health.

Source of information

He got inspiration from Dr. Debal Deb, who is known as India's Rice warrior Deb, a plant scientist turned farmer and is on a mission not just to reintroduce the lost varieties but to improve agriculture for an age of climate change and scarcity. He is cultivating 920 rice varieties on just 2.5 acres in a forested area of the Niyamgiri hills

Economic Profitability of innovative practice/ technology

The expenditure on use of chemical fertilizer can be cut down by using this method. He invested a sum of Rs. 27000/- in 3 acres of paddy field in totally organic way and got a gross income of Rs. 1,25,000/-.

Potential: Acceptance level, horizontal spread of innovation and number of farmers' adoption

Mr. Sudam Sahu gives trainings to the farmers of nearby districts (Kuchinda, Sambalpur) & states (Rajim district of Chhatisgarh in joint effort of "Prerak" NGO) and practical demonstration is done in farmer's field of around 850-900 farmers. Some of them are self-employed in organic fertilizer and pesticide production.

ORGANIC FARMING THROUGH BIO-FERTILIZER

Name: Rajib Mandal
Village: Satbilli
P.O.: Belatikri, P.S.: Binpur
District: Jhargram-721516
Age: 29
Educational Qualification: M.Sc (Remote Sensing and GIS)
Mobile No.: 8826576655 / 8972153710
Land holding: 5 acres

Problem/ challenge addressed

Low profit due to low yield, more susceptible to pest and diseases, high cost involvement due to high use of chemical fertilizers and increase cost of cultivation.

Description of innovative practice/ technology

Paddy (variety: Ariza 14444) was cultivated using bio-fertilizer (*Jeeban Sudha*).

Composition of the bio-fertilizer: 10 kg cowdung + 10 L cow urine + 200 L water + 1-2 kg jaggery + 1-2 kg soil + 1 kg *besan* (chickpea flour). Fertilizer was applied through flood irrigation @ 1 L/ acre in one month interval for 3 months. Seed treatment was done by homemade organic product (composition: cow urine + cowdung + lime + water). Plant protection was also done organically using a mixture of cow urine + *Neem* extract + garlic extract @ 1 L/ 200 L of water 3 times at 21 days interval.

Practical utility

Low cost of cultivation due to less use of chemical fertilizers. Less pest and disease attack and better soil health condition found as a result of cultivating the crop organically. Therefore, higher yield and profitability is achieved.

Source of information

Govigyan Anusandhan Kendra, Nagpur

Economic Profitability of innovative practice/ technology

Benefit cost ratio was higher with use of organic component (2.75) than the conventional practices (0.54).

Potential: Acceptance level, horizontal spread of innovation and number of farmers' adoption

The effect of Rajib Mandal formula for *Jeeban Sudha* (Bio-fertilizer) on crop growth has been tested by fellow farmer in the area of 20 acres. About five farmers of the village Bamal, Binpur I block started preparing and using *Jeeban Sudha* in various crops.

Name: Mr. Kamal Mondal
Village: Moutala
P.O.: Nabagram
District: South 24 Parganas
Age: 38
West Bengal-743372
Educational Qualification: VIII
Mobile No.: 8001216094
Land holding: 1 acre

Problem/ challenge addressed

Vegetables are the principal cash crops in the village Moutala under Baruipur block of South 24 Parganas district. Pest problem including *Spodoptera* and whitefly infestation became difficult to manage using chemicals solely. Use of chemical pesticides possesses health hazard to the consumers. Eco-friendly pesticides, prepared from locally available materials will help to overcome the problem.

Description of innovative practice/ technology

Technology details:

a. Extraction of biologically active compounds from the plants through fermentation in cow urine

Method of preparation: The above-mentioned leaves (in paste form) of required quantity are mixed with cow urine in earthen/plastic pot and kept for fermentation for 20-25 days. The mixture is then stirred twice to thrice a day in clockwise and anticlockwise manner. The extract is collected after 2-3 sieving using muslin cloth.

Application: Fifty liters water mixed with 2.5 litre mother solution is sufficient to spray one bigha of land.

Spray interval: seven days or between the spray of chemicals in rotation.

Shelf life: - The herbal pesticide can be stored up to one month during summer season and up to three months during winter season. Storing should be done in glass bottle covering with black paper and stored in cool place for enhancing the shelf life.

Practical utility

The herbal pesticide is being prepared from the locally available plants *gumo*, *tamak* and *neem* and the bio active compounds of the plant can successfully reduce the *Spodoptera* in cabbage and whitefly infestation in different crops. It can be used for different vegetables and cereals

Type-I			Type-II		
Local name / Scientific Name	Parts Used	Qty.	Local name / Scientific Name	Parts Used	Qty.
Gumo: *Excoecaria agallocha*	Leaf	1 kg	Gumo: *Excoecaria agallocha*	Leaf	1 kg
Tamak: *Nicotiana tabacum*	Leaf	1 kg	Neem: *Azadiracta indica*	Leaf	1 kg

without phytotoxicity symptoms. The bio pesticide may confer host plant resistance to the crop via some anti-feedant and repellant action as well as vigour of the crop gets enhanced. The bio active compounds (alkaloids and phenolic compound) present in the leaf may provide insecticidal property.

Source of information

Revered Swami Bhabeshanandaji Maharaj, Secretary, Ramakrishna Mission Ashrama, Ranchi

Economic Profitability of innovative practice/ technology

BC ratios are estimated as 1.60 in chilly and 1.50 in cabbage as compared to the conventional method where BC ratios are 0.8 in chilly and 1.0 in cabbage. As the quality of both vegetables are good it fetch premium price in market.

Potential: Acceptance level, horizontal spread of innovation and number of farmers' adoption

SSKVK came to know about the innovation during a field visit to Moutala village and after personal interview of Mr. Kamal Mondal the method of preparation of this bio-pesticide was documented and inspected physically. This technology is now practiced in the village Moutala and the nearby villages of Joyatala and Paruldaha of Baruipur block.

Name: Manoranjan Barman
Village: 165 Uchal Pukuri
P.O.: Dhuliya Uchal Pukuri
P.S.: Mekhliganj
District: Cooch Behar-735303, W.B.
Aadhar Number: 5400 7497 4036
Mobile No.: 8972519975

Problem/ challenge addressed

Cucurbitaceous vegetables suffer huge loss due to attack of fruit fly, aphid and fruit and shoot borer. Its infestation may cause yield reduction to the tune of 70-80%.Due to the cryptic nature of the pest a huge no. of pesticidal sprays are being done by the farmers. Farmers often spray upto 100 times in a single crop growing season to escape its attack. Still significant control has not been achieved at the end.

Description of innovative practice/technology

1. To control melon fruit fly following ingredients are used in the mentioned quantity.

(5 kg raw cow dung + 20 L cow urine + 1 kg. chopped *Neem* leaves + 1 kg. chopped *calotropis* leaves + 1 kg. chopped *polygonum* leaves + 1 kg. chopped custard apple leaves + 1 kg. chopped *Nishinda* (*Vitex negundo*) + 1 kg. chopped *Kalmegh* + 8 g. *Hing* (Asafoetida) + 50 g. Copper sulphate ($CuSO_4$)

➢Boil for ½ an hour ➢cool it under shed ➢Dilute it with water to make 20 L of solution) ..... (A)

➢500 ml. of this solution (A) is mixed with 15 L of water for spraying. Repeat spraying after 15 days.

2. To control cabbage aphid and mustard aphid, 100 ml. solution (A) and 200 ml (B) are used both for pest control and growth supplement.

Following ingredients are used for preparation of (B):

2 kg. raw cow dung + 4 L cow urine + 2 kg. mustard cake + 250 g. molasses keep for 7 days rotting

➢Dilute it with water to make 20 L. of solution ➢sieving and 200 ml. of this solution will be mixed with 15 L. of water for spraying – Growth supplement (B). Repeat spraying after 15 days.

3. To control red mite in tea plantation following ingredients would be used:

5 kg. chopped *polygonum* leaves + 5 kg. chopped wild fern + 1 kg chopped *Neem* leaves + 1 kg. chopped *Kalmegh* leaves + 20 lit. cow urine

Different preparation to control fruit fly, aphids and shoot & fruit borer

➢Boil for ½ an hour ➢cool it under shed ➢Dilute it with water to make 20 L of solution

➢500 ml. of this solution will be mixed with 15 L of water for spraying. Repeat spraying after 15 days. .. (C)

4. To control brinjal shoot and fruit borer, tobacco caterpillar and diamond back moth, 200 ml. of solution (A) will be mixed with the 100 ml of the following solution and dilute it with 15 L of water for making spray solution: ...(D)

100 g ginger paste + 1 L of water ➢Boil for ½ an hour

Practical utility

These products made up with readily available indigenous materials, are very cheap and effective in controlling major pest of Cucurbitaceous and Solanaceous crops. It helps maintaining natural enemies of the pest and it is environment friendly and residue free produce.

Source of information

Own idea

Economic Profitability of innovative practice/ technology

1. To spray 1 acre of land (for fruit fly) cost of 6 L of solution (A) - Rs. 120/-. Cost of insecticide- Rs. 550/-. BC ratio 4.58
2. To spray 1 acre of land (for aphid) - Cost of 3 L of solution (A)+(B)- Rs. 105/-. Cost of insecticide- Rs. 550/-. BC ratio 5.23
3. To spray 1 acre of land (for red mite)- Cost of 6 L of solution (C)- Rs. 60/-. Cost of insecticide- Rs. 580/-. BC ratio 9.67
4. To spray 1 acre of land (for shoot & fruit borer) - Cost of 6 L of solution (D)- Rs. 55/-. Cost of insecticide- Rs. 760/-. BC ratio 13.8

Potential: Acceptance level, horizontal spread of innovation and number of farmers' adoption

As different preparation is made to control fruit fly aphids and shoot borer, these formulations are very successful among vegetable growers. The quality of the fruit is very good and much acceptable in the market which fetches a premium price. Thus, a larger number of farmers are willing to adopt this method.

Agricultural Practices

Name: Mr. Parama Podha
Village: Lakarma
G.P: Hardokhol
Block: Sonepur
Age: 45
Educational Qualification: Illiterate
Mobile No.: 7751979463
Land holding: 1.0 acre

Problem/ challenge addressed

Goat farming is one of the sustainable income generating option available with the farmer to tide over unforeseen situation arising from aberrant weather. Lack of awareness of shelter management causes ventilation problem. Also lack of awareness in feeding techniques often led to heavy mortality in goats. Prevalence of disease was more in wet floor as there was problem in cleaning and maintaining sanitation.

Description of innovative practice/ technology

The farmer is rearing Black Bengal breed of goats (52 nos.).The floor of goatery house is made up of bamboo over the cemented pillar at a height of 3 ft over the ground. To climb up the bamboo floor, steps are made from bamboo. All the animals are insured. Routine de-worming is being done in every three month and regular vaccination is followed.

Practical utility

By applying this technique occurrence of disease will reduce to greater extent. The goatery is easy to clean and floor remains dry. As a result of which, mortality rate reduces to greate extent. Also, collection of manure is easier in this type of bamboo flooring and manure can be used properly. As well as this type of goatery protects goats from bad weather condition.

Source of information

District Veterinary Dept., Subarnapur

Economic Profitability of innovative practice/ technology

The cost rearing goat including feed, medicine & insurance is Rs. 18,400/-. He got a return of Rs. 80,000/- using this technique. So, he obtained a net profit of Rs. 61,600/-. BC ratio is 4.34.

Potential: Acceptance level, horizontal spread of innovation and number of farmers' adoption

Farmers of adjoining villages, line department officials and the Collector of the district have visited the goatery unit. The farmer has received appreciation from district administration and became a source of inspiration for other farmers. About 5 nos. of farmers adopted the technology in the village.

LOW COST PORTABLE STRUCTURE FOR NURSERY RAISING

Name: Jagabandhu Mohanty
Village: Tahalia
G.P.: Tahalia
Block: Remuna
District: Balasore
Age: 43
Educational Qualification: Matriculation
Mobile No.: 7873732893
Land holding: 2 acres

Problem/ challenge addressed

Agro-ecological farming situation: Alluvial Rain-fed (Rice-Vegetable)

Nursery raising for offseason vegetables is a major problem in this agro-ecological farming situation.

With conventional method nurseries cannot be protected from extreme weather conditions such as untimely rain, flood and hail storm.

Description of innovative practice/ technology

A nursery bed of size 5ft x 3ft is prepared by using bamboo at a height of 1ft. from the ground level. Bamboo sticks are fitted in a crisscross manner using nails. A white perforated polythene sheet is spread over the bamboo structure. Mixture of soil, compost & sand in 2:1:1 ratio is used to fill up the structure and required amount of fertilizers are applied for better nutrient supply and growth.

Practical utility

Early raising of seedlings for rabi vegetable & flower cultivation can be possible by using this type of raised nursery bed. This can particularly be helpful for the small & marginal farmers under paddy-vegetable cropping system. The seedlings can be transplanted within 5-6 days of paddy harvesting which translate to early yield & more profit to the farmers. Also this nursery structure can be transferred to any safe place in case of adverse weather condition.

Source of information

Own Idea

Economic Profitability of innovative practice/ technology

Gross cost was Rs.1350/year/bed. And he got gross return of Rs.4000/year/bed by using this method.

Thus, net return is Rs. 2650/year/bed with benefit cost ratio of 2.96.

Potential: Acceptance level, horizontal spread of innovation and number of farmers' adoption

This innovation is accessed and popularized by KVK Balasore & Horticulture department of Balasore. During the

capacity building training programme at various parts of district, Scientists of KVK advised the farmers to use this low cost portable nursery for raising of seedlings during off-season. Around 26 nos. of farmer of nearby 5 nos. of villages under Tahalia GP adopted this technology for nursery raising.

Name: Ramesh Chandra Pattnaik

Village: Jamunadnaki

P.O.: Jamunadnaki, Block: Kuarmunda

District: Sundargarh-II, Odisha

Age: 58

Educational Qualification: M.A. in Economics

Mobile No.: 08598094442

Land holding: 800 sqm.

Problem/ challenge addressed

Agro-ecological: North western plateau Zone

Farming situation : Homestead

Rapid contamination occurs in Paddy straw mushroom beds due to fungal or bacterial infestation which in turn lowers the yield and quality of mushroom.

Description of innovative practice/ technology

1. Soaking of paddy straw with *Neem* oil in concentration 100 ml of *Neem* oil and 8ml organic shampoo in 1000 liters of water for 6-7 hours. Sun drying of soaked straw for 1 hour to maintain 65% moisture level before used for spawning.

2. Spraying of eco-enzyme on mushroom beds at pinhead stage which is prepared by fermentation of kitchen waste 300g+ jaggery 100g and 1 litre water for 90 days.

Practical utility

As *Neem* oil is anti-bacterial and anti-fungal in nature, it prevents the contamination in mushroom beds. With sun drying the level of moisture is maintained which enhance or create optimum condition for profuse proliferation of mushroom. All these technology increases the yield of mushroom up to 25% and also improves the quality of mushroom.

Source of information

From Internet

Economic Profitability of innovative practice/ technology

In conventional method (without using the technology) net income for 100 bed is Rs. 3500/-, with benefit cost ratio of 2.12. By adopting this technology net income for 100 bed is Rs. 8500/-, with a benefit cost ratio of 2.7.

Potential: Acceptance level, horizontal spread of innovation and number of farmers' adoption

Shri Ramesh Chandra Pattnaik regularly shared his expertise and experience with trainees of KVK in more than 10 training programmes covering 150-200 participants. His product is displayed in different exhibition. Inspired by his success 2-3 other entrepreneur started home scale production of mushroom. Also, 24 farmers and tribal women practicing mushroom cultivation by his technology.

HIGH VALUE PROTECTED CULTIVATION- AN EMERGING ARENA OF FARMER CHOICE

Name: Mr. Ananda Biswas
S/O: Shri Tarapada Biswas
Village: Dhokhola
P.O.: Dharmada, District: Nadia
Age: 47
Educational Qualification: Graduate
Mobile No.: 09735528107
Land holding: 1.67 Acres and Leased Land 14.67 Acres

Problem/ challenge addressed

The farmer was traditional crop cultivator like paddy & jute, which was less remunerative. Mono cropping as well as low price of the produce makes his farming non-profitable. As crop diversification is more remunerative than traditional one, he opted for this technology.

Description of innovative practice/ technology

After 2007 onwards, Nadia KVK started it's activity in the area specifically for high value and protected crop cultivation along with other remunerative vegetables like cole crops, chilli, brinjal, dolicous bean, fruits like banana and flower like tuberose, marigold and chrysanthemum. Technical intervention was made like quality seedling production, varietal replacement (G-9) and quality bunch production (use of bunch cover) & high density planting of banana, cultivation of green and coloured capsicum, gerbera & orchid (*Dendrobium sp.*) under different protected structures.

Practical utility

The farmer now has 6000 sq. m. poly house for high tech crop cultivation.

For the 1st poly house, no bank offered any credit to the farmer. He had to collect his own share of construction from private money lender @ 24% annual interest. Now every bank is willing to finance the upcoming structure. Till date, 43 units have been developed by different farmers in the area of Sri. Biswas. His success in high value cultivation leads formation of a Farmer Producer Company namely Nakashipara farmer producer company Ltd., which have 1000 active farmer members with operational fund of Rs. 13,36,000/-.

Source of information

Technological information was initiated by Spices Development Project, Bidhan Chandra Krishi Viswavidyalaya and further developed and modified by Nadia Krishi Vigyan Kendra through NHM funded project on high value crop cultivation.

Economic Profitability of innovative practice/ technology

Economic analysis of different high value crop based cropping sequence for 1000 sq. m. poly house

Crop	Cost of production (Rs.)	Gross Return (Rs.)	Net Return (Rs.)	B:C ratio
Green capsicum in shade structures	41,100/-	1,30,500/-	89,400/-	3.18
Colour capsicum in polyhouse	97,400/-	3,10,000/-	2,12,600/-	3.18
Gerbera under polyhouse	2,40,000/-	7,20,000/-	4,80,000/-	3.00

Potential: Acceptance level, horizontal spread of innovation and number of farmers' adoption

Status of adoption of the technology

Year	2009	2017
Area under polyhouse	1500 sq. m. (2 units)	28,500 sq. m. (43 units)
No. of farmers involved	3	43
Skilled labour employed / day (other than family labour)	2-3 /day	55 /day

NEW APPROACHES OF TOMATO CULTIVATION FOR HIGH QUALITY PRODUCE

Name: Mr. Dipak Mandal
S/O: Late Rajendranath Mandal
Village: Banamalipara
P.O.: Digra, P.S.: Chakdaha
District: Nadia
Age: 49
Educational Qualification: Non Matric
Mobile No.: 07478747309
Land holding:8 acres

Mr. Dipak Mandal is specialized in paddy cum fish culture, vegetable production, fruit crop production like mango, papaya, lemon and in nursery management having nursery on 0.2 ha of land, which is utilized for high quality seedling and sapling production of vegetables and fruit crops.

Problem/ challenge addressed

Pest and disease problem of tomato incurs a loss of about 60-70% and chemical ripening process of tomato is the main constrain for the quality improvement of tomato which cannot fetch a good return.

Description of innovative practice/ technology

Modification of seedling raising and planting:-

Generally tomato seedlings are raised in seed bed and planted in a spacing of 100 cm row to row and 45 cm plant to plant. But Mr. Mandal raised the seedlings in plug tray under 50 mesh mosquito net for twenty five days. He cultivated PAN-1286 variety which is oval in shape and possesses good keeping quality. Seeds were sown on first week of October. He applied 6000 kg of cow dung manure mixed with *Trichoderma viride* and *Pseudomonus fluorescence*, 6 kg sulphur and 3 kg Borax per acre of land in the main field during final land preparation. Seedlings were transplanted in the main field on last week of October. 100 kg of 10:26:26 NPK fertilizer was applied in the main field in split doses. Seedlings were planted in a wide spacing of row to row 125 cm and plant to plant 60 cm. This wider spacing suits the variety and reduces the incidence of early blight and late blight. The plant produces more branches and flower drop percentage reduces remarkably. He also applied micro nutrient mixture three times at pre flowering, post flowering and fruit setting period respectively. First green fruits are harvested after 65 days of planting which was sent to Andaman and Nicobar islands, which was of great demand of there. Mature fruits are harvested from 75 days of transplanting.

Modification of ripening process:

Generally tomatoes are not ripened in the plant due to bird damage. As soon as the red colour start developing, birds start to damage the fruits. To overcome this problem farmers generally harvest 80% mature fruits and those are ripened with application of Ethrel. This process is time consuming and the harvested fruits loss 20% of its weight during ripening process. Chemical ripening also deteriorates the

quality of the fruits. Mr. Mandal developed an idea to harvest fully ripen fruits from the plants. He covered the entire plot with large hole net. This net prevents the birds but allows the pollinators. The netting costs Rs. 12,000/- per acre. Now the fully ripen fruits are harvested from the plants and directly marketed. These fruits possess better quality and attractive colour. Use of ripening chemical is also avoided. This high quality product fetches Rs 3/- extra per kg as compared to chemical ripened tomatoes.

Practical utility

This invention is able to improve the quality of the produce as it is naturally ripen. Also no use of ripening chemical reduces the cost. Net is used for the protection of tomatoes from bird at ripening stage, which improves the quality as well as production of the fruits. Also this net can be reused in the next season which is cost effective. Altogether, cost involvement is very less as compared to the profit.

Source of information

Technological information was obtained during various training and discussion held in Nadia KVK and State Government Training.

Economic Profitability of innovative practice/ technology

Economic analysis of the technology

Profit calculation (per acre)	
Ripening in the plant	Chemical ripening
Cost of net – Rs. 12000/- for two years (Rs. 6000/- per year)	Cost of chemical - Rs. 1000/-
Total produce – 24 ton Loss during ripening- Nil	Total produce – 24 ton Loss during ripening- 20% = 4.8 ton Marketable produce- 19.8 ton
Sale price- Rs. 9000/-per ton Total sale price = Rs. 9000/-per ton X 24=Rs.216000/-	Sale price- Rs. 6000/-per ton Total sale price = Rs. 6000/-per ton X 19.8=Rs.118800/-

Potential: Acceptance level, horizontal spread of innovation and number of farmers' adoption

This technology is practised for the first time in this year. Other farmers of the same village encouraged by the result of the technology. It is expected that in near future this technology will spread in large area. Farmers are aware of the mandi prices of this vegetables and they are willing to adopt this technology.

Name: Mr. Kutubuddin Biswas
S/O: Nasiruddin Biswas
Village: Dhantala, P.S.: Dhantala
District: Nadia, West Bengal- 741256
Age: 47
Educational Qualification: Madhyamik
Mobile No.: 09732773201
Land holding: 0.66 ha and leased 3 ha

He is also specialist in growing fruit crops like ber, dragon fruit, papaya, strawberry and flower crops like tube rose, rose, chrysanthemum, marigold, dahlia etc. He practises organic farming and grows potted plants.

Problem/ challenge addressed

In the local condition chrysanthemum cut flower standard does not match with the requirement of cut flower production which can be marketed in New Delhi, Bengaluru etc.

Description of innovative practice/ technology

Bed preparation and fertilizer application: Beds are 3.0 ft wide, 0.5 ft. high and 30-40 ft long. In winter the beds are covered with silver colour mulch but in spring-summer season the beds are covered with milky white mulch. Before mulching required fertilizers are applied in the bed. In 1.0 ha of land 150 kg bone meal, 375 kg horn meal, 375 kg mustard cake, 150 kg DAP and 75 kg 10:26:26 NPK applied during bed preparation. Then it is covered with poly mulch 3-4 rows of chrysanthemum seedlings are planted longitudinally in each bed. Seedlings are planted in the mid of October. During planting 1500 kg of vermicompost per hectare is applied in the planting holes. Flood irrigation is applied in the channels and sometimes 10:26:26 NPK @ 20 kg/ha is applied with the irrigation water. Some liquid fertilizers like calcium nitrate, 19:19:19 and 12-61-0 NPK also applied as spray in the standing crop. Harvesting of the flower is started from 1st week of February.

Application of artificial light: Artificial lights applied @ 7500 watt per hectare for six hours after sunset. This improves the size and quality of the flowers

Practical utility

Large scale cultivation is only possible with mulching, because mulching reduces the labour and herbicide requirement for weeding, increases water and nutrient use efficiency. So, it reduces the cost of cultivation. On the other hand it improves the crop growth due to less crop weed competition and increases water and nutrient use efficiency.

Source of information

Technological information was obtained from Nadia Krishi Vigyan Kendra, AICRP on floriculture, BCKV, state government training etc.

Economic Profitability of innovative practice/ technology

Economic analysis

Profit calculation (per hectare)	
Normal cultivation of chrysanthemum	cultivation of chrysanthemum with mulch and artificial light
Cost of cultivation – Rs. 900000.00	Cost of cultivation – Rs. 750000.00
Total produce – 525000 flowers	Total produce – 675000 flowers
Sale price- Rs. 2/-per flower Total sale price = Rs. 2/-per flower X 525000=Rs.1050000/-	Sale price- Rs. 3/-per flower Total sale price = Rs. 3/-per flower X 675000=Rs.2025000/-

Potential: Acceptance level, horizontal spread of innovation and number of farmers' adoption

It is a profitable technology due to its scientific method. Though process of adoption of this technology is slow as it needs specialization in operation, many farmers are now getting interested. Mr. Kutubuddin Biswas shared his expertise and experience with the neighbouring farmers. He receives appreciation from Scientists, Officials and he works closely with KVK Nadia.

OFF SEASON CULTIVATION OF GLADIOLUS

Name: Mr. Umesh Biswas
Village: Puratan chapra
Block: Ranaghat
District: Nadia
Age: 49
Educational Qualification: Graduate
Mobile No.: 08145236575
Land holding: 2.33 acres

He has farming experience of 25 yrs, specialised in floriculture and pioneer of Prajjal variety cultivation of tube rose in land of 2.33 acres.

Problem/ challenge addressed

Gladiolus flowers are not available in the local market in the summer season. So off season cultivation of gladiolus can fetch higher price from the market.

Description of innovative practice/ technology

Generally gladiolus is cultivated in the open field. The bulbs are planted from mid of September to mid of October. Flowering starts from early December and ends in February. Average cost of the sticks are Rs. 3/- per piece. Mr. Umesh Biswas decided to cultivate gladiolus in the shed net house in the off season. In the year 2017 he constructed a 1000 sq m shed net house from SASHMIRA project by the recommendation of Nadia KVK. This shed net house is white in colour. This year he planted gladiolus in that net house in the off season. The cover of the shed net is removed from east, north and south side for better light penetration and aeration. He prepared the beds of 4 ft wide and 30 ft long. Such twenty beds were prepared.

Organic manure and 30 kg of 10:26:26 NPK was applied in the total bed area. Bulbs of gladiolus were planted in 1st week of February 2018. The sticks were harvested in mid of April 2018. In this lean period no gladiolus stick is available in the market. So, the product is able to fetch higher price in the market. Ten thousand sticks are produced, and cost is Rs. 5/- per piece.

Practical utility

This technology is able to produce higher profit. Initial cost is involved in construction of shed net house, though this shed net house is subsidized. But even the cost of shed net house can be reimbursed in 4-5 years.

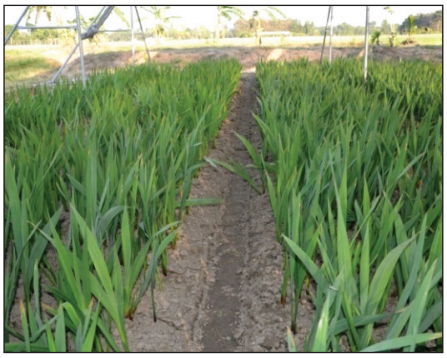
Source of information

Mr. Umesh Biswas constructed the 1000 sq m shed net house from SASHMIRA project by the recommendation of Nadia KVK. But it is his idea of off season gladiolus cultivation.

Economic Profitability of innovative practice/ technology

Economic analysis of off season gladiolus cultivation

Profit calculation	
Normal cultivation of gladiolus	Off season cultivation of gladiolus
Total produce – 10000 sticks	Total produce – 10000 sticks
Sale price- Rs. 3/-per stick Total sale price = Rs. 3/-per stick X 10000=Rs.30000/-	Sale price- Rs. 5/-per stick Total sale price = Rs. 5/-per stick X 10000=Rs.50000/-



Potential: Acceptance level, horizontal spread of innovation and number of farmers' adoption

He has started off season cultivation of gladiolus in this year only. It fetches very good price in the market. By seeing the success of Mr. Umesh Biswas many rural youths are interested in developing this type of enterprise and they are getting suggestions and expertise comments from Mr. Biswas in developing their enterprise.

AN ECO-FRIENDLY TECHNIQUE FOR VEGETABLE FIELD PROTECTION THROUGH MILD SOUND BY USING OF POLY RIBBON FROM RABBIT

Name: Shri Dilip Mandal
Village: Panbari
P.O.: Ramshai, Block: Maynaguri
District: Jalpaiguri, West Bengal
Age: 42
Educational Qualification: Class Xth
Aadhar Number: 45066062412
Mobile No.: 9002154865
Land holding: 4.5 acres

Problem/ challenge addressed

Rabbit being the problem of vegetable growers at plantation & forest areas under Terai & Teesta Alluvial zone of Jalpaiguri district. Farmers experienced great losses, from seedlings to harvesting stage & mainly at vegetative stage. Rabbit feed the tender leaves which cause major yield losses.

Description of innovative practice/ technology

To get rid of rabbit problem from vegetable field the vegetable growers are using polythene ribbon along the periphery of the field. Ribbons are tied with bamboo pole above knee height position which will produce mild sound and vibration by natural wind blowing.

Practical utility

This technique is eco-friendly & farmers friendly without any harm to flora and fauna. It ensures the production without using any poisonous trap or mechanical trap for rabbit. Polythene ribbons can also be reused for next crop.

Source of information

Field level staff from Dept. of forest, Govt. of West Bengal

Economic Profitability of innovative practice/ technology

With minimum initial investment for polythene ribbon to overcome this problem farmers ensured their profit of Rs. 2250/ha except the expenses. BC ratio is 5.

Potential: Acceptance level, horizontal spread of innovation and number of farmers' adoption

Farmers around forest fringe and plantation area are eager to know and adopt the innovative low cost technology. Horizontal spread is done by training & exposure visits to the farmer field. KVK is also working with these farmers.

Name: Mohammad Ali
Village: Domapir
P.O.: Jagdishpur
Block: Raiganj
District: Uttar Dinajpur
Educational Qualification: IX
Mobile No.: 9002805026
Land holding: 1 ha

Main crops grown are paddy, maize and mustard along with button mushroom cultivation. He has been working as migrated labour for near about 20 years. During this period he has worked in a quality control lab at Haryana and attained a training programme of mushroom cultivation and spawn preparation at GB Pant University of Agriculture and Technology, Uttarakhand.

Problem/ challenge addressed

Fungal or bacterial infestation occurs in mushroom beds which in turn lowers the yield and quality of mushroom. Due to traditional method of mushroom cultivation income generation is less.

Description of innovative practice/ technology

A paddy straw thatched house of dimension of 50'x 30'x 6' was constructed on bamboo frame. For outlet there were three windows and one small door. In the whole structure one window and door on the front side and two windows on the back side of the room. The spawn run beds of 5'x3.5' size were prepared and supported with bamboo frames. In each room there were four rows of mushroom production beds which vertically include four shelves and horizontally included 15 shelves. It costs around Rs. 35,000.00 per unit.

Practical utility

The cost of technology is very low. By keeping the inner temperature & moisture low in paddy thatched house, contamination can be avoided. Thus, it increases the quality and the quantity of the produce. Also it is easy to maintain and easily adoptable technique.

Source of information

Own idea of farmer in this particular situation and his earlier practical knowledge of working in spawn lab.

Economic Profitability of innovative practice/ technology

Per unit cost is around Rs. 35,000 per season and total income is around Rs. 1.18 lakh. Thus, net return is Rs. 83000/-. BC ratio is 3.38

Potential: Acceptance level, horizontal spread of innovation and number of farmers' adoption

As Uttar Dinajpur district is adjoining district to Siliguri which is main national and international market hub for mushrooms. This technology has great potential to support resources for poor farmers and farm women. The technology has already fascinated many youths. KVK is also working with these farmers for more refinements. In the whole district near about 30 farmers have adopted this low cost technology.

INTEGRATION OF DUCK FARMING OF NATIVE & KHAKI CAMPBELL BREED WITH FISH FARMING

Name: Mangal Soren
Village: Machhol
P.O.: Altapur
District: Uttar Dinajpur-733215
Age: 36
Educational Qualification: Primary
Mobile No.: 8436157858
Land holding: 2 acres

Problem/ challenge addressed

Pond based farming situation. There is comparatively less income from pond due to only fish production. If fish culture is integrated with duck farming, then total income of farmers will be increased.

Description of innovative practice/ technology

This duck-cum-fish farming model was based on a total water area of 0.13 ha. Fish fingerlings were stocked @ 10000 nos./ ha. Stocking density of ducks was maintained @ 300 no.s/ ha. The main innovation is that the fishes stocked in the pond with ducks of native & Khaki Campbell breed at a ratio of 1:1 due to non availability of Khaki Campbell in sufficient numbers.

Practical utility

Practically it was very difficult to collect requisite numbers of Khaki Campbell at every corners of Uttar Dinajpur district to integrate ducks in pond based production system. This type of innovation may help to integrate ducks in pond based production system at a local level.

Source of information

Own idea

Economic Profitability of innovative practice/ technology

BC ratio of 1.72 is achievable in this integrated fish cum duck farming whereas for sole farming of fish BC ratio is 1.3 and for duck farming BC ratio is 1.5

Potential: Acceptance level, horizontal spread of innovation and number of farmers' adoption

The success of integration of duck and fish farming is being validated in the farmers' participatory mode by KVK Uttar Dinajpur. The farmers were sensitized on this system and they expressed that this system is more profitable than their traditional practice.

CULTIVATION OF PADDY THROUGH INNOVATIVE ORGANIC MANAGEMENT

Name: Churamoni Mondal
Village: East Kalinagar
P.O.: Howrah - 711303
Block: Sankrail
Mobile No.: 9674117524

Problem/ challenge addressed

Rice cultivation is thought to be no more profitable. Mr. Mondal was the first farmer in his area to start paddy cultivation through SRI. He also incorporated his innovative organic management in paddy cultivation.

Description of innovative practice/ technology

He prepared a seed bed of 2 kattah area for 0.133 ha land and sown 1 kg seed in the seed bed after treating the seed with *Trichoderma viridae* @ 4 g/kg seed. He used 15 kg vermicompost in the seed bed during seed bed preparation. He transplanted 13-15 days old seedling in the main field (1-2 seedling/hill). The finally prepared main field was divided into several plots (6 m x 6 m) with 1.5 ft. drainage/irrigation channel all around the plot. For 0.133 ha area he applied 400 kg vermicompost. As basal application he used 10 kg DAP and 7 kg MOP, for first top dressing (7 DAT) he used 10 kg urea and for 2nd top dressing (21-25 DAT) he used 7 kg urea and 5 kg MOP.

For control of pest and diseases he used different leaf extract. The composition is as follows:

Tulsi, *Karanja*, *Neem*, *Akanda* leaves - 1 kg each, Cow dung – 2 kg, Cow urine – 2 L, Molasses – 200 gm

Leaves were crushed and all the materials were mixed and kept in a pot for 20 days. The mixture was stirred everyday for one time. After filtering, the solution was spread in the field as well as in the irrigation channel before transplanting @ 200 gm solution in 10 L water. 800 gm solution was required for 0.133 ha area. This solution was again spread over the leaves during 21-25 DAT (800 gm solution for 50 L water). This spray is effective to control major pest and diseases. In this method of cultivation the yeild was 670-680 kg of seed from 0.133 ha area.

Practical utility

Now a days rice cultivation is thought to be non-profitable, but this farmer has showed that, high profit can be achieved through this practice of cultivation. As the use of chemical pesticides is hazardous, he used locally available ingredients for pest control. Hence, improving the quality and production of paddy through this effective practice.

Source of information

Own idea

Economic Profitability of innovative practice/ technology

The innovative effort results to a yield increase of 15%. Before adopting this technology he got Rs. 7000/- whereas by using this method he obtained Rs. 10,000/-.

Potential: Acceptance level, horizontal spread of innovation and number of farmers' adoption

Almost all leading agricultural scientist across the state are visiting his plots to exchange his ideas.

Not just local farmers but farmers from all over the districts come to him to learn this technology.