

Compendium of Research Findings (2006–2022)

Agriculture, Rural and Tribal Development Perspectives



Ramakrishna Mission Vivekananda Educational and Research Institute

(Deemed-to-be-University as declared by Govt. of India u/s 3 of UGC Act, 1956)

Faculty Center : Agriculture, Rural and Tribal Development

Ramakrishna Mission Ashrama

Morabadi, Ranchi, Jharkhand- 834008

*"Hence to show them new means of production of food
is our first and foremost duty"*

- Swami Vivekananda

Foreword

This Ranchi centre of R.K.M.V.E.R.I. having headquarter at Belur Math has been established in 2006. As envisaged by Swami Vivekananda, “the new university will come up by combining traditional wisdom with modern science and technology”. At another place he mentioned, “new means of food production should be our first and foremost goal”. To accomplish the vision of Swami Vivekananda, the thrust areas chosen for study and research in this faculty centre on low-cost natural resource based organic package of practices combining traditional wisdom with modern science and technology, screening of different indigenous genotypes or varieties including local varieties of field crops and important vegetables of Jharkhand through non-chemical farming approaches and so on, livelihood security, tribal development and on development policy issues. After a decade of initial struggle, this centre can now boast of being one of the finest centres in the state of Jharkhand in the field of Agriculture, Rural and Tribal Development for education and research in these areas.

This faculty centre has been conducting trials on different aspects of organic farming since its inception for the standardization of agro-techniques of crops by means of organic farming or non-chemical farming practices. Vegetables commercially cultivated in this plateau region are mainly based on huge application of synthetic agro-chemicals. As a consequence, vegetables grown through such conventional chemical farming often consist different residual toxic substances of several agro-chemicals used for their growing, as established by different researchers of the globe through their intensive research findings. Organic farming on the other hand, has minimum or negligible adverse effects in this regard. The faculty centre has been able to standardise organic farming practices on almost all vegetables grown in this region through validation in farmer’s field and in national and international platform.

The challenges in Agriculture, Rural and Tribal Development are both difficult and interesting. We are working on them with enthusiasm, tenacity and dedication to develop new methods of crop production and provide new solutions to keep up with the ever-increasing population and to frame out policies for social and livelihood security. So, a need was felt to document and compile the research findings undertaken by the Division of Rural and Tribal Development (RTD) and Division of Agriculture (DoA).

I congratulate Dr. Raghava Thakur, Associate Dean, Dr. Dipankar Chatterjee, Head, Rural and Tribal Development, Dr. Avijit Kr. Dutta, Head, Agriculture and all faculties for their valuable contribution, editing and publication of Compendium of Research Findings.

I pray to Thakur, Maa and Swamiji to bestow their blessings.

Swami Bhaveshananda

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"A university will be established combining traditional wisdom with modern science and technology"

- Swami Vivekananda

1.

Division of Agriculture

Section A: Agronomy

Title: Performance of rice (*Oryza sativa*) varieties under organic cultivation in Ranchi, Jharkhand

Scholar: Anant Kumar (ID. No. R16501)

Supervisor: Dr.(Prof.) Raghava Thakur

Rice is one of the important food crops, contributing 38.4 per cent in the national food basket and feeds more than 60 per cent population of the country. In the name of increased production to feed the growing population, indiscriminate application of an enormous quantity of chemical fertilizers is being followed keeping the soil and human health factor at bay. The alternative method of farming is of urgent need which could satisfy the needs of increased food production as well as providing security against any potential health problem. Organic farming has been proved as solution to both these problems. Hence, a field experiment on 'Performance of rice varieties under organic cultivation' has been conducted at Divyayan KVK farm, Ramkrishna Mission Ashrama, Morabadi, Ranchi during 2020. The experimental soil was clay loam in texture with ph 6.34 having high organic carbon (0.92%) and available P (102.13 kg/ha), medium in available N (393.11 kg/ha) and available K (169.06 kg/ha). Treatment consisted 7 rice varieties i. Prabhat ii. Sahbhagi Dhan iii. Swarna Shreya iv. Rajendra Kasturi and v. Rajendra Suwashini laid out in randomized block design and replicated 4 times. Results showed that 'Prabhat' rice produced higher grain yield (58.9 q/ha), straw yield (79.6 q/ha) and harvest index (42.5 %) than all other rice varieties tested owing to more panicles/hill (28.0), longer panicle size (25.2 cm), and heavier test weight (26.7 g). Further, 'Prabhat' rice was remunerative also as gave higher net return (Rs.109957/ha) and benefit: cost ratio (3.0).

Section B: Horticulture

Title: Response to Planting Dates and Organic Manures in Yield and Quality Attributes of Onion (*Allium cepa* L. 'Arka Niketan')

Scholar: Dibyajyoti Nag (ID No.: R13902)

Supervisor: Dr. Avijit Kr. Dutta

In Jharkhand, onion is grown only for self-consumption, and not for commercial purpose. Though very less attention is given to onion cultivation, but the onion productivity of this state (16.84 t ha⁻¹) is very close to the national average (18.10 t ha⁻¹), which clearly indicates the potential of this crop for this state. The aim of this research work was to improve a suitable package of practices for the farmers of this region. The objectives were to determine the best planting date, and organic manure combination in terms quality and quantity, identification of the best post-harvest liquid organic solution and identification of farmers' problem and dissemination of the best package of practices to farmer's field. Three planting dates (P₁ = 1st week of December; P₂ = 3rd week of December and P₃ = 1st week of January) were laid in main plots and six organic treatments including Farmer's Practice and Control [T₁ = FYM equivalent to RDN (Recommend Dose of Nitrogen); T₂ = FYM equivalent to 50% RDN + Bio-fertilizers in terms of *Azospirillum* and Phosphate Solubilizing Bacteria @ 5.0 kg ha⁻¹; T₃ = FYM equivalent to 50% RDN + Vermicompost equivalent to 50% RDN; T₄ = FYM equivalent to 50% RDN + Vermicompost equivalent to 25% RDN + *Azolla* equivalent to 25% RDN; T₅ = Farmers' Practices in terms of Nitrogen and T₆ = Control {where no input (organic manure) was used}] were laid in subplots through a split plot design technique. It was found that in terms of growth, yield attributing characters along with yield, higher range of data were recorded for onions planted in 1st and 3rd week of December, whereas, higher value was documented for treatment in which FYM equivalent to 50% RDN and vermicompost equivalent to 50% RDN were applied. The organically grown onions are not only safe for consumption but also could give good economic returns to the farmers. Here all the inputs available at the village level were used, and it may be concluded that, as per the situation farmer could adopt the suitable treatment combination.

Title: Dual Purpose Production of Green Pod and Dry Seeds of French Bean Under Organic Culture in Chhotanagpur Plateau Regions of Jharkhand.

Scholar: Suresh Kumar Mahto (ID No.: R17903)

Supervisor: Dr. Avijit Kr. Dutta

French bean (*Phaseolus vulgaris* L.) is one of the most important vegetables of the Fabaceae family. Chhotanagpur plateau is well-known for its quality vegetable production and often considered as ‘Vegetable Bowl’ of the eastern India. French bean is one of the most important vegetable crops grown extensively in this region. Most of the commercial growers are willing to grow the crop through chemical farming. Therefore, the nutritional quality of French bean is gradually deteriorating due to indiscriminate use of agro-chemicals. Besides, cost of cultivation of the crop is increasing day by day owing to rising prices of chemical inputs. In addition, the economic condition of the marginal and small farmers of Jharkhand (accounting more than 80%) cannot allow them to grow the crop in commercial scale. Considering all of the above aspects, the present experiment was conducted during *rabi* season of two consecutive years (2017-18 and 2018-19) at the Organic Experimental plots of Getalsud Farm located under Angara Block of Ranchi district by employing five bush type varieties of French bean namely Arka Komal (V_1), Swarna Priya (V_2), HAFB-2 (V_3), HAFB-4 (V_4) and Falcon (V_5). Those five varieties of the crop were evaluated under five organically designed treatment conditions, viz. T_1 : Amritjal (1%); T_2 : Sanjeevani (10%); T_3 : Shasyagavya (10%); T_4 : FYM @ 6 tha^{-1} + Vermicompost @ 3 tha^{-1} and T_5 : Absolute Control. Five varieties, five treatments along with their three replications were allocated randomly in 75 experimental plots each of with 2.25 m x 2.25 m sizes by adopting Factorial Randomized Block Design (FRBD). The seeds were sown during last week of October (31st October) by keeping a spacing of 45 cm inter row and 15 cm intra row. Poultry manure @ 2.5 tha^{-1} and wood ash @ 2.5 tha^{-1} were applied in all experimental plots (except absolute control) as basal dose before two weeks of sowing of seeds. Thereafter, the liquid organic formulations (for T_1 , T_2 , and T_3 treatments) were applied as soil drenching for seven times at 15 days interval started from 15 days after sowing. From the findings, it may be concluded that Shasyagavya (10%) can be used as a potential low-cost organic source of plant nutrients for alternative approach of non-chemical farming practice in French bean and Swarna Priya variety may be recommended for organic farming in the south Chhotanagpur plateau region of Jharkhand.

Title: Enhancement of Nutritional Status of Vermicompost Through Application of Different Organic Solutions During Composting.

Scholar: Subhabesh Ghosh (ID No.: R06501)

Supervisor: Dr. Avijit Kr. Dutta

The experiment was conducted based on twelve different treatments such as T_1 = 3 days old cow urine (5%); T_2 = Beej Sanjiboni (20%) (9 days old); T_3 = Beej Sanjiboni (10%) (9 days old); T_4 = Sashayagavya (20%) (11 days old); T_5 = Sashayagavya (10%) (11 days old); T_6 = Rice boil water (density = 0.998 g/cc); T_7 = Mustard oil cake soaked solution (5 days after soaking in water @ 1 kg/5 litres then diluted it with mixing one part mustard oil cake solution in five parts of water); T_8 = Fly ash soaked solution (5 days after soaking in water @ 1 kg/5 litres then took decoction and diluted it with mixing double quantity of water); T_9 = Beej Sanjiboni (20%) + Sashayagavya (20%) + Panchagavya (3%); T_{10} = Beej Sanjiboni (10%) + Sashayagavya (10%) + Panchagavya (3%); T_{11} = Panchagavya (3%) and T_{12} = Water (control). The highest weight (0.90 ± 0.08) g of earthworm was recorded in T_7 and T_{10} treatments as against the lowest (0.47 ± 0.03) g in the case of control treatment *i.e.*, in T_{12} . Mustard oil cake-soaked solution [T_7] and mixture solution of Beej Sanjiboni (10%) + Sashayagavya (10%) + Panchagavya (3%) [T_{10}] recorded the highest individual weight of earthworm. The findings revealed that the biomass content of earthworm is associated with higher levels of C: N ratios. The other parameters under studied in the sub head physical parameters such as average length of individual earthworm, average circumference of individual earthworm and earthworm population under different treatment situations recorded positive as well as negative but non-significant correlation. The non-significant but positive correlation was recorded between earthworm population and C: N ratio ($r = 0.171$), indicated more earthworm population under higher level of C: N ratio up to a certain level.

Title: Production Potentiality Study of Some Important Vegetables through Organic, Conventional and Advance Management Situations under the Chhotanagpur Plateau Region of Jharkhand.

Scholar: B. Sushil Kumar (ID No.: R07501)

Supervisor: Dr. Avijit Kr. Dutta

The present investigation was conducted by selecting four important vegetables, *viz.* Tomato, French bean, Onion and Spinach. The experiment was conducted at Larta village of Karra block in Khunti district of Jharkhand on the farmer's field during October-2011 to May-2012. Most of the vegetable growers of that region grow their crops by following very traditional way of farming practices. As a consequence, they get minimum profit from their crops instead of

growing different vegetables throughout the year even in the large scale. Most of the vegetables grown in this region are to some extent organic by default. Thereby, an impetus was given during formulation of plan for the present investigation towards organic package of practices. The population of our country is increasing day by day, therefore, need for different vegetables are increasing proportionately. In this background, advance package of practices for growing selected vegetables were also accommodated in the present study. Though toxic residual effects of different chemicals in advance package of practices derived produce may cause health as well as environmental hazards. In this context, priority was given in this experiment to adopt organic package of practices for growing those selected vegetables. The results for almost all cases showed that advance growing condition is the most profitable venture in terms of yield and economic return followed by organic package of practices. The conventional package of practices showed very negligible profit, on the other hand, minimum or negligible differences in terms of profit were documented in between advance and organically grown vegetables. In this perspective, organic package of practices may be emerged as the best alternative approach for growing comparatively safer vegetables in the Chhotanagpur plateau region of Jharkhand even in commercial scale.

Title: Yield Performance of Cabbage as Sole crop and as Inter crop under Organic Management Condition.

Scholar: Deepak Kr. Patel (ID No.: R08512)

Supervisor: Dr. Avijit Kr. Dutta

The experiment was conducted by keeping five different treatments, viz. T₁ (cabbage as sole crop), T₂ (cabbage intercropped with Indian spinach), T₃ (cabbage intercropped with coriander), T₄ (cabbage intercropped with onion) and T₅ (cabbage intercropped with French bean) with four replications by following Complete Randomized Block Design. The entire experiment was designed by following complete organic package of practices. The highest yield of 67.04 t/ha was documented in the cases where French bean was used as intercropped with cabbage (T₅) and the lowest yield of 49.96 t/ha was recorded in T₁ where cabbage was grown as sole crop. Nevertheless, the highest benefit cost ratio (6.23) was recorded in T₃ where cabbage was intercropped with coriander, on the contrary, the lowest benefit cost ratio of 4.30 was noted when cabbage was intercropped with onion. Thereby, T₃ (cabbage intercropped with coriander) emerged as the best treatment when benefit cost ratio is considered but sustainability and yield point of view T₅ (cabbage intercropped with French bean) appeared as the best treatment where maximum yield was realized.

Title: Performance of Sand Mulched Onion with The Application of Different Organic Manures Under Subtropical Climate of Jharkhand.

Scholar: Dibyajyoti Nag (ID No.: R08509)

Supervisor: Dr. Avijit Kr. Dutta

The present study was conducted during the *rabi* season of two consecutive years of 2011-12 and 2012-13 at the experimental farm of Agriculture, Rural and Tribal Development Faculty Centre of Ramakrishna Mission Vivekananda Educational and Research Institute, Morabadi, Ranchi, Jharkhand. Different liquid organic manures, viz. Shashyagavya 20% (T₁), Shashyagavya 10% (T₂), Sanjivani 20% (T₃), Sanjivani 10% (T₄), Mustard oil cake solution 12.5% (T₅), Cow urine 10% (T₆) and only water (T₇) as control were used as seven different treatments for the study. Onion cv. Agrifound Dark Red was employed as planting material for the experiment by adopting CRBD experimental design with three replications. Results found to be significant in most of the studied characters of both yield and quality parameters. Maximum values for bulb weight (93.23 g), bulb diameter (6.23 cm), plant height (66.73 cm), leaf number (11.93), neck diameter (1.18 cm), harvest index (0.86%), TSS (11.0⁰Brix), ascorbic acid (11.32 mg/ 100 g), total sugar (7.19%) and reducing sugar (3.89%) were recorded in different treatments except control under the present study. Character association ship studies revealed bulb weight, bulb diameter and leaf number as the major yield contributing components of onion. Highest yield of onion (54.75 t/ha) and shelf-life (77 days under ambient condition) were recorded for T₄ (Sanjivani 10%). Thereby, this treatment was tested in farmers' fields through on farm trials during *rabi* season of 2012-13 with the objective of disseminating the technology for the benefit of farming community. Economics study disclosed the profitability of the onion grown through the application of Sanjivani 10% (T₄) with the benefit cost ratio of 4.75. From the findings it may be concluded that the farmers can obtain more profit by adopting organic package of practices for sand mulched onion with the application of Sanjivani 10% solution.

Title: Study on the forest-based livelihood for the selected tribal population of Ranchi district of Jharkhand.

Scholar: Somra Bedia (ID No.: R08504)

Supervisor: Dr. Avijit Kr. Dutta

The present investigation was carried out at different villages of Angara block of Ranchi district during April-2012 to March-2013 with the help of questionnaires and interview among the selected villagers. The selected all villagers of Kuturlowa belong to marginal category with land holding range of 0.75 to 2.50 acre(s). Although, other two selected villages (Koinardih and Sitadih) had no large category of farm family but the condition in terms of land holding status

was to some extent better than Kuturlowa village. From the study, it was found that different vegetables such as Dummar, Koinar sag, Genth, Tewna, Petiya, Dura, Bengo, Jerbhanja, Kachnarphool, Jilhur phool, Koreya phool, *etc.* among the summer vegetables; Karile, Kheksa, Kundri, Asari, Bamboo Mushroom, Rugra, wild Colocasia among rainy seasonal vegetables and Ketel sag, Pechki sag, Genth, Tewna, Petiya, Dura, Bengo, Jerbhanja, *etc.* among the winter seasonal vegetables are the important supplementary food items from the forest for the villagers of studied areas. Similarly, different fruits like Kend, Piyar, Bheluwa, Bael among summer seasonal fruits; black berry, Kusum, Mahuwa among rainy seasonal fruits and Aonla, Soyam Matha (winter seasonal fruit) are the supplementary sources of fruits from the forest for the villagers of the studied areas. Different edible oil sources available from the surrounding forests of the studied villages are Mahuwa, Kusum, Kujri, *etc.*, among the fuel wood trees like Sal, Koreya, Putri, Sidha, Bael, Lerusinduar, Dhawtha, Dhotki, Kari, *etc.* are the important for the almost all villagers of the studied areas. Comparative study on income from forest resources collected by the selected villagers throughout the year revealed that the March and April were the most income earning months for almost all the selected villagers of Angara block. This type of observation supported the livelihood related dependency on the forest resources during the off season of the summer months when maximum fields remain fallow due to acute shortage of irrigation water. Thereby, the villagers on that time inclined towards the forest-based resource collection, most specifically firewood and different summer fruits. Although there were no significant differences among selected farmers of the three villages but comparatively higher per family annual income from the forest resources recorded in the case of the villagers (selected) of Koinardih village due primarily to huge collection from the edible forest mushrooms only.

Title: Yield and Quality Attributes of Cabbage as Influenced by BD-501, *Shasyagavya* and Farmer's Production Practice.

Scholar: Amitava Dutta (ID No.: R10502)

Supervisor: Dr. Avijit Kr. Dutta

Biodynamic farming intervened with organic farming denotes 'working with the energies which create and maintain life', where energies from cosmos, mother earth, cow and plants are systematically and synergistically harnessed in the farm considering it as a living system itself which interacts with the environment, to build healthy living soil, and to produce food that nourishes, vitalizes and helps to develop humanity that signifies natural resource conservation. On the contrary, Indian farmers who follow conventional system of chemical farming practices were also taken into account in this study as Farmer's Production Practice (FPP) in comparison to the BD-cum-organic package of practices. With highlighting on above facts, a field experiment was conducted during Rabi season of 2014-15 at the experimental organic farm of the university,

to find out and observe the influence of different concentrations of BD-501 and *Shasyagavya* on growth, yield and quality of cabbage along with their effects on soil bio-chemical properties. The respective treatments (8+1) were: T₁ [BD-501 (1%)], T₂ [BD-501 (5%)], T₃ [BD-501 (10%)], T₄ [*Shasyagavya* (10%)], T₅ [BD-501 (1%) + *Shasyagavya* (10%)], T₆ [BD-501 (5%) + *Shasyagavya* (10%)], T₇ [BD-501 (10%) + *Shasyagavya* (10%)], T₈ [without any organic formulation] and T₉ as FPP [conventional chemical farming practices]. All the growth and yield parameters except stem length and quality parameters of cabbage were positively influenced by BD-501 and *Shasyagavya* applications. The performance of cabbage was not up to the mark in the case of the treatment where no organic input was applied; as a consequence, poor yield and quality was documented from the control treatment (T₈). Supplementation of organic sources of manures resulted in higher yield of cabbage heads with higher ascorbic acid (in T₅), and protein (in T₆) as compared to the control treatment (T₈). Considerable increase in available nitrogen, phosphorous, potassium, organic carbon and microbial population was observed in experimental soils of biodynamic and organic intervention after harvesting the crop as compared to their initial status or even conventionally growing condition (FPP).

Title: Effect of organic liquid manures on growth, yield and quality attributes of potato (*Solanum tuberosum* L.).

Scholar: Santu Adhikari (ID No.: R10521)

Supervisor: Dr. Avijit Kr. Dutta

The present investigation was carried out during *Rabi* season of 2014-15 to study the effects of different organic liquid formulations over the growth, yield and quality attributes of potato cultivars namely Kufri Pukhraj and Kufri Kanchan. The experiment was framed out by adopting RCBD model with eight treatments and three replications for the each. The treatment combinations were: T₁-Cow urine (5%); T₂- Cow urine (10%); T₃-Cow urine (15%); T₄-*Shasyagavya* (5%); T₅-*Shasyagavya* (10%); T₆-*Shasyagavya* (15%); T₇-*Shasyagavya* (20%); and T₈-Control (without any liquid formulations). From the experiment, it was revealed that T₇ [*Shasyagavya* (20%)] is the best organic liquid formulation for growth, yield and quality attributes of potato cultivars Kufri Pukhraj and Kufri Kanchan under the Chhotanagpur plateau of Jharkhand followed by the T₃ [cow urine (15%)] treatment. Thereby, the highest yield of 22.96 t. ha⁻¹ [Kufri Pukhraj] and 15.44 t.ha⁻¹ [Kufri Kanchan: second highest yield with non-significant differences] with the application of *Shasyagavya* (20%) solution. Similarly, cow urine (15%) emerged as the best treatment in terms of yield (15.52 t.ha⁻¹) for Kufri Kanchan and (22.70 t.ha⁻¹) was obtained from Kufri Pukhraj with the application of same organic liquid formulation. Starch content was recorded significantly higher in both varieties of potato with

the application of *Shasyagavya* (20%). In this context, 13.92% and 11.59% starch contents were documented in Kufri Pukhraj and Kufri Kanchan varieties of potato, respectively. When economic aspect was taken into account, then T₇ i.e., *Shasyagavya* (20%) applied treatment emerged as the best B: C ratio of 3.10 in the case of Kufri Pukhraj variety followed by T₃ i.e., cow urine (15%) applied treatment with the B: C ratio of 3.06 for the same variety. In case of Kufri Kanchan variety the highest B: C ratio of 2.47 was documented with the application of cow urine (15%) solution followed by the *Shasyagavya* (20%) solution with 2.45 B: C ratio. From the findings, it may be concluded that liquid formulations of organic manures have immense potentiality to grow potatoes in Chhotanagpur plateau regions of Jharkhand.

Title: Influence of *Shasyagavya* on Growth, Yield and Quality Attributes of Cabbage (*Brassica oleracea* var. *capitata* L.).

Scholar: Sourav Mohanta (ID No.: R10522)

Supervisor: Dr. Avijit Kr. Dutta

The experiment was conducted during October-2014 to April-2015 to study the 'Influence of *Shasyagavya* on Growth, Yield and Quality Attributes of Cabbage (*Brassica oleracea* var. *capitata* L.)'. Seven treatments viz. T₁: 5% *Shasyagavya*; T₂: 10% *Shasyagavya*; T₃: 15% *Shasyagavya*; T₄: 20% *Shasyagavya*; T₅: 25% *Shasyagavya*; T₆: 30% *Shasyagavya* and T₇: Control (without *Shasyagavya*) were assigned for the study over the cabbage cv. Rare Ball (F₁ hybrid). From the experiment, it was revealed T₄ (20% *Shasyagavya*) as the best treatment among all treatments in most of the cases for expression of growth, yield and quality attributing characters. Although the treatment T₄ detected as the best in terms of yield but other treatments like T₃ and T₆ performed better for several quality parameters as well. In this context, T₃ recorded more ascorbic acid (240.00 mg.100g⁻¹) and T₆ emerged with maximum protein (3.92%) content over the other treatments. It was also documented that the application of organic inputs as different treatments helps to improve the soil health by enhancing beneficial microbial population, NPK, organic carbon content as well as maintaining the pH status of the experimental soil towards the neutral range with the intervention of *Shasyagavya* that leads to enhance the growth parameters of plant, culminating with higher yield in T₄ treatment. Beside these, soil beneficial microbes were also documented higher in T₄ treatment that stimulates the mineralization process of soil applied manure and thereby, nutrients become available for plants of T₄ treatment specifically which was the utmost cause behind the highest yield (91.85 t.ha⁻¹) in this treatment. From the findings of the present investigation, it may be concluded that organic package of practices along with the incorporation of *Shasyagavya* (20%) is well suited for growing cabbage commercially even under the plateau regions of Jharkhand.

Title: Screening Onion (*Allium cepa*-L.) Varieties for Growth, Yield and Quality Attributes through Different Organic Management Conditions during Late *Kharif* Season of Jharkhand.

Scholar: Subrata Ghosh (ID No.: R11516)

Supervisor: Dr. Avijit Kr. Dutta

The experiment was conducted during late *kharif* season of the South Chhotanagpur plateau of Jharkhand during 2015 at the faculty centre of Agriculture, Rural & Tribal Development, Morabadi, Ranchi. Ten varieties of onion, viz. V₁ (Sukhsagar); V₂ (Agrifound Dark Red); V₃ (Bhima Sweta); V₄ (Bhima Subhra); V₅ (Bhima Dark Red); V₆ (Bhima Super); V₇ (F₁: BSS-258); V₈ (Nasik Red); V₉ (Arka Niketan); and V₁₀ (N-53) were subjected to screen under four different organic treatment conditions such as T₁: Wood Ash @ 5 t.ha⁻¹ and FYM @ 10 t.ha⁻¹; T₂: Wood Ash @ 5 t.ha⁻¹ and FYM @ 10 t.ha⁻¹ + *Shasyagavya* (15%) four times at 15 days' intervals starting from 15 days after transplanting + mulching with dry paddy straw; T₃: Wood Ash @ 5 t.ha⁻¹ and FYM @ 10 t.ha⁻¹ + Biofertilizer (*Azotobacter* 3 kg.ha⁻¹) + *Shasyagavya* (15%) four times at 15 days' intervals starting from 15 days after transplanting + mulching with dry paddy straw and T₄: Wood Ash @ 5 t.ha⁻¹ and FYM @ 10 t.ha⁻¹ + Biofertilizer (*Azotobacter* 3 kg.ha⁻¹) + *Shasyagavya* (15%) four times at 15 days intervals starting from 15 days after transplanting + fermented mustard oil cake solution (10%) @ 15 days interval for 3 times starting from 21 days after transplanting + *Panchagavya* (5%) at 30 days, 45 days and 60 days after planting as foliar spray + mulching with dry paddy straw for detecting suitable variety/varieties for the late *kharif* season of the region. From the study, it may be further concluded that in terms of yield V₃ (Bhima Sweta), V₅ (Bhima Dark Red), V₇ (BSS-258), V₄ (Bhima Subhra), V₁ (Sukhsagar), V₆ (Bhima Super) and V₂ (Agrifound Dark Red) are suitable for late *kharif* season in Chhotanagpur plateau of Jharkhand. However, in terms of quality, it was observed that different varieties performed in a different way under the influence of organically designed treatments. But when treatment and varietal interaction as well as economics aspects were taken into account, then it was materialized that T₂ is the most suitable organic treatment for growing above mentioned onion varieties during late *kharif* season in South Chhotanagpur plateau regions of Jharkhand.

Title: Screening Tomato (*Solanum lycopersicum* L.) Varieties for Growth, Yield and Quality Attributes through Organic Management Conditions in South Chhotanagpur Plateau of Jharkhand.

Scholar: Ranita Das (ID No.: R12514)

Supervisor: Dr. Avijit Kr. Dutta

Jharkhand has a remarkable share in the production of tomato mainly from Ranchi, Gumla, Lohardaga, Ramgarh, Hazaribagh and Godda districts. Not only tomato extensively cultivated

in Jharkhand but also it has a remarkable share in vegetable cultivation around the year. After the green revolution the trend of chemical farming grows rapidly which hampers the human health as well as the soil structure and fertility as well. In this context, an attempt has been taken into account in the present investigation in order to produce different tomato varieties through non-chemical approaches. The aim of the present study is to promote different liquid organic formulations of non-chemical (synthetic) origin in present situation where chemical farming is ruling. The genetic entity of crop variety and growing environment along with management practices are responsible for overall performance of the particular crop variety. Keeping view in mind seven varieties namely V_1 : Arka Rakshak, V_2 : Swarna Lalima, V_3 : PKM-1, V_4 : Patharkuchi, V_5 : Navadai, V_6 : Laxmi and V_7 : S-22 were exposed to four organically designed treatment sets viz. T_1 : *Shasyagavya* (10%), T_2 : *BD-501* (3%) T_3 : *Amritpani* (1%) and T_4 : Absolute control and these were allocated in the Experimental Plot adopting Split-Plot Design Technique. Among treatments, T_1 (*Shasyagavya*-10%) performed best in expression of almost all growth and yield attributes. Besides these, all-other varieties also performed well under the influence of T_1 in terms of yield and growth parameters. Best performing variety V_6 also produced maximum yield under the influence of T_1 (*Shasyagavya* 10%). In this perspective, T_1V_6 emerged as the best treatment and varietal interaction with maximum yield (54.45 ± 1.23 t. ha⁻¹) culminated with the highest B: C ratio (5.62). However, quality attributes articulated differently under the influences of different organically designed treatments as well as varietal situations. From the study, it may be concluded that organic cultivation of tomato is possible even in commercial scale under the South Chhotanagpur plateau regions of Jharkhand.

Title: Evaluation of Garden Pea Varieties through Non-Chemical Growing Approaches in Chhotanagpur Plateau Region of Jharkhand.

Scholar: Sayan Kumar Majee (ID No.: R12518)

Supervisor: Dr. Avijit Kr. Dutta

Rampant utilization of chemical fertilizers, pesticide, and water system was instigated after the green revolution in our country. Consequently, it was understood that by utilizing substantial amounts of chemical fertilizers and pesticide, soil health was harmed and eventually impacted upon human wellbeing. Chhotanagpur plateau is well known for its quality vegetable production and garden peas grown in this region has special impetus because of their pleasant aroma and sweet taste. However, this special quality of the crop is gradually deteriorating due to over uses of agro-chemicals during the production cycles of the crop. Thereby, an emphasize was given here during conducting the experiment by employing four organically designed treatments, viz. T_1 : 1% *Amritjal*; T_2 : 3% *BD-501*; T_3 : 10% *Shasyagavya* and T_4 : Absolute Control [without

any liquid organic formulation i.e., organic by default]. Seven varieties of the crop namely, V_1 : G-10, V_2 : HAEP-1, V_3 : HAEP-2, V_4 : Swarna Mukti, V_5 : Swarna Amar, V_6 : Azad Pea-3 and V_7 : Azad Pea-1 were exposed to grow under four organically designed treatment conditions through split-plot design during *rabi* season of 2016-2017. Results revealed that V_5 (Swarna Amar) is the best performing variety in terms of green pod yield (19.55 ± 0.29 t/ha) and T_3 (10% *Shasyagavya*) emerged as the best treatment with maximum green pods production potentiality (18.34 ± 0.22 t/ha). However, when treatment and varietal interaction was taken into consideration then T_3V_6 emerged as the best combination with green pod yield of 23.10 ± 0.58 t/ha. The observation highlighted that Swarna Amar and Azad Pea-3 are highly responsive to organic farming practices under the condition of the South Chhotanagpur plateau of Jharkhand particularly during *rabi* season.

Title: Evaluation of Onion Varieties under Organic Growing Condition during Early Rabi Season of the South Chhotanagpur Plateau of Jharkhand.

Scholar: Monojit Das (ID No.: R13509)

Supervisor: Dr. Avijit Kr. Dutta

The experiment was conducted during early *rabi* season of 2017-18 at the organic experimental plot of Agriculture, Rural & Tribal Development Faculty Centre, Morabadi, Ranchi. Six varieties of onion *viz.* V_1 (Agrifound Dark Red); V_2 (Bhima Shweta); V_3 (Bhima Red); V_4 (Basant-780); V_5 (Ghosh Bati Selection); and V_6 (Arka Niketan) were employed in the present investigation and exposed them to grow under organic growing conditions by using *Amritjal* (1%) as split application for plant nutrient source. The basal dose as FYM @ 10 t ha⁻¹ and wood ash @ 5 t ha⁻¹ were used during final land preparation. Different prophylactic measures of plant protection were also considered based on the botanicals or biological origin. The experiment was designed after Complete Randomize Block Design (CRBD) considering four replications for each of the six varieties. Result found to be significant in almost all of the studied characters of both yield and quality parameters under different varietal situations. As a consequence, the maximum yield (29.32 t ha⁻¹) was estimated in Bhima Red but in term of dry weight of bulb Ghosh Bati Selection recorded the highest (18.47%). The different quality traits of onion varieties were performed independently under organic growing condition. It was also revealed that Bhīma Red is the most profitable variety with the highest B: C ratio (3.75) based on the yield followed by Bhima Shweta (2.31), Agrifound Dark Red (2.18), Ghosh Bati Selection (1.85), Arka Niketan (1.83) and the lowest (1.79) as documented in Basant-780. From the study, it may be concluded that Bhima Red, Bhima Shweta, Agrifound Dark Red or even Ghosh Bati Selection are suitable for organic farming during early *rabi* season cultivation in the south Chhotanagpur plateau region of Jharkhand.

Title: Efficacy of Enriched *Sanjeevani* on Growth, Yield and Quality Attributes of Cabbage (*Brassica oleracea* var. *capitata* L.).

Scholar: Akshay Kumar Mahto (ID No.: R14502)

Supervisor: Dr. Avijit Kr. Dutta

The present study was conducted during the rabi-summer season of 2018-2019 at the Organic Experimental Farm of ARTD Faculty Centre, Morabadi, Ranchi, Jharkhand. This study was conducted by evaluating the response of cabbage cv. Golden Acre to different concentrations of organic liquid manure (Enriched *Sanjeevani*) considered as diverse treatments, namely, T₁: Enriched *Sanjeevani* (5%), T₂: Enriched *Sanjeevani* (7.5%), T₃: Enriched *Sanjeevani* (10%), T₄: Enriched *Sanjeevani* (12.5%), T₅: Enriched *Sanjeevani* (15%), T₆: Enriched *Sanjeevani* (20%), and T₇: Control (without *Sanjeevani*). The experiment was designed after RCBD with three replications for each treatment. Most of the studied growth, yields and quality parameters were found to be significant under different treatment situations. T₄ (12.5% Enriched *Sanjeevani*) emerged as the best in terms of expression of different growth attributes but in terms of yield, treatment T₆ recorded the highest yield (59.41 t. ha⁻¹) with *at par* effect as observed in T₅. However, different treatments performed independently for expressing quality traits. Economics study revealed that the return per rupee investment was higher (2.79) in T₅ as compared to other treatments, Hence, it may be concluded that organic package of practices along with the incorporation of Enriched *Sanjeevani* (15-20%) may be recommended for higher yield with good quality crop in south Chhotanagpur plateau regions of Jharkhand.

Title: Evaluation of Brinjal Varieties under Different Non-Chemical Growing Conditions in the South Chhotanagpur Plateau Region.

Scholar: Reddi Gowtham (ID No.: R14507)

Supervisor: Dr. Avijit Kr. Dutta

Brinjal is one of the widely grown vegetable crops all over India. In Chhotanagpur region especially Jharkhand where commercial vegetable production is rampantly practiced by using chemical fertilizers that has now been leading to deterioration of quality of both the produce and the cultivated soil. Also, the local varieties with better traits like disease resistance are gradually becoming extinct with the use of hybrid varieties. In such a context, attempts have been made to combat both the problems by conducting a varietal trial using different non-chemical and conventional agricultural practices. The experiment was conducted by employing seven local varieties *viz.* V₁: Mani Chappar Selection, V₂: Murhu Selection, V₃: Angara Selection, V₄: Swarna Sree, V₅: Swarna Shyamli., V₆: Swarna Pratibha, and V₇: HABR-21 and those were grown under three treatment conditions, *viz.* T₁: Enriched *Sanjeevani* (5%), T₂:

Enriched Sanjeevani (5%) + Agnihotra and T₃: Absolute Control. The experiment was designed after split plot model. The studied growth, yield and quality attributing characters revealed significant differences under the influences of organically designed treatments and varietal situations. In this context, the maximum yield ($62.67 \pm 0.76 \text{ t ha}^{-1}$) was recorded in T₂ *Enriched Sanjeevani* (5%) + Agnihotra because of its healing effect on the environment. Also, different quality parameters like TSS and TA etc. showed better results in T₂: *Enriched Sanjeevani* (5%) + Agnihotra treatment condition. Coming to the varieties, the variety V₅ i.e., Swarna Shyamli recorded more yield ($70.86 \pm 1.16 \text{ t.ha}^{-1}$). Among the interaction the interaction effect of T₁V₅ showed highest yield ($93.33 \pm 2.01 \text{ t ha}^{-1}$). The expression of different studied quality traits performs independently under the influences of organically designed treatment conditions in different varieties. However, the return per rupee investment of 4.02 was recorded in T₁V₅. So, it may be concluded that Swarna Shyamli variety of brinjal is highly suitable for organic farming in Jharkhand by using *Enriched Sanjeevani* (5%) + Agnihotra farming.

Title: Effect of Organic Liquid Formulation ‘Sanjeevani’ on Growth, Yield and Quality Attributes of Cauliflower (*Brassica oleracea* var. *botrytis* L.).

Scholar: Kuldeep Rajak (ID No.: R14508)

Supervisor: Dr. Avijit Kr. Dutta

Indiscriminate use of inorganic input is supportive toward feeding the nation but beside this it gives us so many hazardous diseases that’s why an initiative had taken to minimise the wide application of fertilizer replaced by organic liquid formulation. The entire experiment was carried out by employing different concentrations of enriched Sanjeevani in cauliflower cv. Snowball-16 through an experimental layout by randomised complete block design with three replications for each treatment situation. The seven different concentrations of Enriched Sanjeevani thus applied as treatments were T₁ (5%), T₂ (7.5%), T₃ (10%), T₄ (12.5%), T₅ (15%), T₆ (20%) and T₇ (absolute control) for growing the crop variety during the *rabi* season of 2017-2018 and 2018-2019. Different treatments showed significant differences for expression of growth, yield and quality traits with better performance in almost all cases as observed in T₆ and consequently the highest yield (47.12 t/ha) with the benefit-cost ratio (return per rupee investment) of 3.79 as recorded in T₆. Therefore, it may be concluded that Snowball-16 variety of cauliflower can be grown under the Chotanagpur plateau region through the application of Enriched Sanjeevani (20%) for getting better result in terms of quality and yield.

Title: Evaluation of Onion Varieties through Non-Chemical Growing Conditions during late Kharif Season of the South Chhotanagpur Plateau of Jharkhand.

Scholar: Arpan Mondal (ID No.: R15503)

Supervisor: Dr. Avijit Kr. Dutta

Onion is generally *rabi* season crop but can be grown in *kharif* season as well especially in few areas of our country. Considering the above-mentioned fact, the experiment has been conducted during late *kharif* season of the South Chhotanagpur plateau of Jharkhand during 2019-20 at the Faculty Centre for Agriculture, Rural & Tribal Development, Ramakrishna Mission Vivekananda Educational and Research Institute, Morabadi, Ranchi. Five varieties of onion *viz.* V₁ (Sukhsagar); V₂ (Agrifound Dark Red); V₃ (N-53); V₄ (Pusa Sona); V₅ (Pusa Riddhi) were subjected to evaluate under three different growing conditions such as **Growing Condition-1(Organic):** Wood Ash @ 5 t.ha⁻¹ and FYM @ 10 t.ha⁻¹ + seven times split application of *Jeevamrutha* (500 litre.ha⁻¹) at 10 days' intervals starting from 15 days after transplanting + mulching with dry paddy straw; **Growing Condition-2 (Biodynamic):** Wood Ash @ 5 t.ha⁻¹ and FYM @ 10 t.ha⁻¹ + seven times Bio-Dynamic (BD-501) 3% spray at 10 days' intervals starting from 15 days after transplanting + mulching with dry paddy straw; **Growing Condition-3 (Conventional):** Absolute Control (without any organic/biodynamic intervention) for detecting suitable variety/varieties for the late *kharif* season for the region. The experiment was designed after Latin Square Design by employing five varieties with their five replications each under three different non-chemical growing conditions. Among these three different growing conditions, the highest average yield was obtained under organic growing condition (Growing Condition-1). Higher average yield was obtained under organic growing condition from V₂ [41.49 t.ha⁻¹] and the same variety produced 25.42 t.ha⁻¹ under biodynamic growing condition but only 17.02 t.ha⁻¹ under conventional growing condition. When economics aspect in terms of benefit: cost ratio (better to say, returns per rupee investment) was taken into justification, then it was revealed that varieties under organic growing condition has the highest benefit:cost ratio followed by biodynamic and conventional growing conditions. From the above observations, it may be concluded that organic growing condition is suitable for higher yield in late *kharif* onion cv. Agrifound Dark Red cultivation under the south Chhotanagpur plateau of Jharkhand.

Title: Effect of Different Sources of Organic Manures on Growth, Yield and Quality of Cabbage Grown in the Southern Chhotanagpur Plateau.

Scholar: Sayan Adhikary (ID No.: R15520)

Supervisor: Dr. Avijit Kr. Dutta

Three varieties of cabbage namely, V_1 (Pride of India), V_2 (Red Acre) and V_3 (Golden Acre) were treated with nine (9) organic amendments including control and the experiment was designed after Randomized Complete Block Design (RCBD). The treatments were different sources of organic manures, viz., Treatment-1 (T_1): Sasyagavya (10%), Treatment-2 (T_2): Sanjeevani (10%), Treatment-3 (T_3): Vermicompost @ 1 kg/m², Treatment-4 (T_4): FYM @ 2.5 kg/m², Treatment-5 (T_5): Enriched Sanjeevani (1%), Treatment-6 (T_6): Poultry Manure @ 0.5 kg/m², Treatment-7 (T_7): Vermicompost @ 0.5 kg/m² + FYM @ 1.25 kg/m², Treatment-8 (T_8): Vermicompost @ 0.5 kg/m² + Poultry manure @ 0.25 kg/m², Treatment-9 (T_9): Absolute Control (without any organic amendment). Each variety of the crop was exposed to grow independently under nine (9) organic sources of manures as different treatments with their thrice replications. Different morphological traits on growth, yield attributes including yield and proximate quality traits were considered for the study. The results found to be significant under different treatments or even varietal situations. Consequently, Vermicompost @ 0.5 kg/m² + Poultry manure @ 0.25 kg/m² (T_8) emerged as the best treatment for expression of several studied traits of the crop varieties. When performance of the varieties was taken into account, it was observed that Golden Acre (V_3) responded well under different sources of organic manures. The findings highlighted that toxicity free or comparatively safer cabbage may be produced through organic farming in the south Chhotanagpur region of eastern India.

Title: Performance of Chilli Grown through Organic and Agnihotra Farming in the Eastern Indian Plateau.

Scholar: Soumitra Maity (ID No.: R15521)

Supervisor: Dr. Avijit Kr. Dutta

The experiment was conducted during September-2019 to May-2020 at the Faculty Centre of Agriculture, Rural & Tribal Development, Ramakrishna Mission Vivekananda Educational and Research Institute, Morabadi, Ranchi-834008 to study the effect of different non-chemical growing approaches on different chilli varieties in terms of their growth, yield and quality traits expression. Five varieties of the crop, namely, V_1 : Bullet Chilli; V_2 : Beldanga Chilli; V_3 : Suryamukhi; V_4 : Perek Chilli; and V_5 : VNR were grown through three different non-chemical growing approaches, viz. *Organic*, *Agnihotra* and Absolute Control (without any intervention). The Latin Square Design was adopted by replicating five times of each variety under three different experimental conditions independently. Different growth, yield & its attributes and

proximate quality traits were considered for evaluation of those varieties under three different growing conditions. From the experiment, it was revealed that the V_4 (Perek Chilli) is the best variety in terms of yield (19 ± 3.55 t ha⁻¹) under *Agnihotra (Homa)* condition followed by V_3 (17.20 ± 3.55 t ha⁻¹) and V_5 (15 ± 3.55 t ha⁻¹). Consequently, V_4 variety emerged as the best in terms of net return per unit area of land with the highest benefit: cost ratio (2.59). While in case of organic, V_2 (Beldanga Chilli) emerged as the best in terms of yield (15.80 ± 3.48 t. ha⁻¹) with benefit: cost ratio of 2.19. The absolute control growing condition, on the contrary, recorded the highest B: C ratio in V_2 (1.88) followed by V_4 (1.53) and V_1 (1.47) and the lowest in V_3 (1.38). However, different studied quality contributing parameters performed independently under the influences of non-chemical growing approaches. From the findings of the present investigation, it may be concluded that *Agnihotra* farming practices in chilli may well be suited for its cultivation even in commercial scale as non-chemical farming approach in the south Chhotanagpur plateau region of Jharkhand.

Title: Screening of Potato (*Solanum tuberosum* L) Varieties based on their Growth, Yield and Quality Attributes as influenced by different approaches of Organic Farming.

Scholar: Sucharita Ghoshal (ID No.: R16534)

Supervisor: Dr. Avijit Kr. Dutta

Eight varieties of potato viz. V_1 (Kufri Jyoti); V_2 (C-1); V_3 (C-40); V_4 (2236); V_5 (Ultimatum); V_6 (Sathi); V_7 (Lal Gula); and V_8 (Nainital) were subjected to evaluate under four different growing conditions such as **Growing Condition-1 (Conventional Farming):** FYM @ 20 t.ha⁻¹ as basal dose only; **Growing Condition-2 (Bulky Organic Manure):** FYM @ 10 t.ha⁻¹ as basal dose + two times vermicompost @ 10 t.ha⁻¹ as top dressing at 30 DAS & 45 DAS; **Growing Condition-3 (Vivek Krishi):** FYM @ 10 t.ha⁻¹ as basal dose + 3 times applicational 10% Enriched Sanjeevani at 30, 45 and 60 DAS; **Growing Condition-4 (Control):** Absolute Control (without any organic intervention) for detecting suitable variety/varieties for the rabi season of the region. The experiment was designed after Complete Randomized Block Design by employing eight varieties with their three replications each under four different non-chemical growing conditions. Among these four different growing conditions, the highest average yield was obtained under bulky organic manure growing condition (Growing Condition-2). Consequently, higher average yield was obtained under bulky organic manure growing condition from V_4 (2236) [34.13 t.ha⁻¹]. However, under Vivek Krishi growing condition, highest yield was obtained from V_7 (Lal Gulab) [26.83 t.ha⁻¹] and under conventional growing condition V_4 (2236) emerged with the highest yield [13.90 t. ha⁻¹] but under Absolute Control Condition, V_6 (Sathi) recorded the highest tuber yield [6.33 t.ha⁻¹]. When economics aspect in terms of

returns per rupee investment was taken into justification, then it was revealed that varieties under bulky organic manure growing condition has recorded the more return followed by Vivek Krishi, conventional and absolute control growing conditions. From the above observations, it may be further concluded that bulky organic manure growing condition is suitable for higher yield in rabi potato cv. 2236 cultivation under the south Chhotanagpur plateau of Jharkhand.

Title: A Study on Vegetable Based Livelihood of Small and Marginal Farmers of Jharkhand.

Scholar: B. Sushil Kumar (ID No.: R07501)

Supervisor: Dr. Avijit Kr. Dutta

Villages around Ranchi have been described as the ‘**vegetable bowl**’ of Jharkhand. The present investigation was carried out at different villages of Angara (Ranchi district) and Karra (Khunti district) blocks of Jharkhand with the help of questionnaires and interview among the purposively selected farmers. Most of the farmers under studied areas of both blocks belong to either marginal or small category. The villages under studied areas of the Karra block of Khunti district are subjugated for cultivation of different vegetables like potato, tomato, cauliflower, cabbage, chilli, brinjal, French bean, garden pea, cowpea, onion, radish, carrot, okra, ginger and garlic. Similarly, almost all farmers of the Badri and Obar villages of the Angara block are interested to grow potato followed by tomato, brinjal and garden pea but only few of them are on behalf of growing carrot and onion. The benefit cost ratio of potato and tomato were 2.30 and 4.00; 2.57 and 3.50; 2.73 and 4.46, for Tangratoli, Larta and Kusumtoli villages of Karra block, respectively. More than 3.0 benefit cost ratio was recorded in all cases of the three studied villages of the Karra block by growing cauliflower and cabbage. The benefit cost ratio for growing different vegetables in selected villages of Karra block was more than 2.0 in almost all cases; these results justify the scope of vegetable cultivation as livelihood in the studied areas of Karra block. The finding also indicates maximum profitability for growing potato, tomato and *cole* crops like cabbage, cauliflower, etc. under Karra block of Khunti district. Similarly, the benefit cost ratio of potato and tomato were 2.17 and 2.20; 2.08 and 2.14, for Badri and Obar villages of Angara block, respectively. These findings are in favour of cultivation of such vegetables as livelihoods of the farmers of the both Karra and Angara blocks.

Title: Economic Contribution Through Intervention of New Technologies in Different Horticultural Crops Cultivation in Ramgarh District of Jharkhand.

Scholar: Deepak Kr. Patel (ID No.: R08512)

Supervisor: Dr. Avijit Kr. Dutta

The present investigation was carried out at different villages of Ramgarh, Gola and Chitrapur blocks of Ramgarh district during January-2011 to May-2011 with the help of questionnaires and interview among the selected farmers. Different horticultural crops such as potato, tomato, cauliflower, radish, carrot, okra, cucurbits (bottle gourd, cucumber and sponge gourd), cowpea, coriander, colocasia, ginger, garlic, lablab bean, French bean, palak (Spinach), brinjal, chilli *etc.* were cultivated by the selected farmers of Kaitha and Kothar (Ramgarh block); Chhotaki Pona and Chhotaki Lari (Chitarpur block) and Chakarwali and Chokad (Gola block) villages.

The benefit cost ratio for the tomato was the highest (3.98) for modern farmers of Kaitha followed by 2.08 (in cauliflower) while it was only 1.75 (in tomato) and once again 1.75 (in cauliflower) for conventional farmers of the same village because the modern farmers accepted the advantages of adopting high yielding hybrids or improved varieties for those crops. Likewise, the selected modern category of farmers of Kothar village extracted more profit by growing different horticultural crops than their respective conventional counterparts. For example, in the case of cucurbits (bottle gourd) the benefit cost ratio was the highest (4.91) for modern farmers, whereas, it was only (2.59) for conventional farmers of Kothar village. The lowest benefit cost ratio of 2.35 was recorded in colocasia among the crops grown by the selected modern category of farmers of Kothar as against only (1.84) for the conventional category of farmers from the same crop. The conventional category of the selected farmers was not getting more profit by growing different crops as compared to modern category of farmer in almost all cases of these two villages because the conventional farmers were reluctant to accept new technologies for cultivation of different crops. Only six crops namely potato, tomato, cowpea, cucurbits, onion and okra were commonly cultivated by the at least six each from the selected modern and conventional categories of farmers of Gola, Chitarpur and Ramgarh blocks of Ramgarh district. The selected modern farmers of Ramgarh block enjoyed more profit by growing tomato, cowpea and cucurbits over their respective counterparts of Gola and Chitarpur blocks while the selected modern farmers of Chitarpur block gained more profit by growing potato and okra over their respective counterparts of Ramgarh and Gola blocks. Although in the case of onion, the selected modern farmers of Gola block enjoyed the more profit than their respective counterparts of Ramgarh and Chitarpur blocks. On the contrary, the selected conventional farmers of Gola gained comparatively more profit over their respective counterparts of Ramgarh and Chitarpur blocks by growing almost all of the above crops except potato and cucurbits. In the case of cucurbits, the selected conventional farmers of Ramgarh block enjoyed more profit over their

respective counterparts of Gola and Chitarpur blocks whereas in the case of potato, the selected conventional farmers of Chitarpur blocks gained the more profit over the selected conventional farmers of Ramgarh and Gola blocks. The profitability of growing different horticultural crops in different selected villages of Ramgarh, Gola and Chitarpur blocks of Ramgarh district were not constant even within the similar category of farmers. The findings also tinted on the probable reasons for gaining lower profit for growing different horticultural crops by the conventional farmers of all the selected villages of Ramgarh district despite their opportunity to harness more profit from the available resources.

Title: A Comparative Study on Present Agriculture Based Livelihood Status for the Villagers of different Tolas of Chanpi Village.

Scholar: Dibyajyoti Nag (ID No.: R08509)

Supervisor: Dr. Avijit Kr. Dutta

The present investigation was carried out at different Tolas (hamlets) of Chanpi village under Karra block of Khunti district under eastern plateau region of Jharkhand during January-2011 to May-2011 with the help of questionnaires and interview among the selected farmers. The village Chanpi has five tolas (hamlets) *viz.* Mahto Tola, Bara Chanpi, Simar Tola, Munda Tola and Karamdih. Fourty three farmers were selected from five different tolas of the village. Almost all of the selected farmers belong to either marginal or small category. The topography of the studied areas is undulated comprising of low, medium and up land situations. The selected farmers grow several agricultural as well as horticultural crops to sustain their livelihood. The most important crops are paddy, finger millet, maize, kulthi, niger, urd bean, *etc.* among the agricultural crops and horticultural crops mainly include vegetables like potato (both rabi and kharif), tomato, cauliflower, pea, onion, *etc.* beside the spice crops like ginger. From the study, it was revealed that horticultural crops cultivation is a profitable proposition but most of the selected farmers were cultivating other crops in spite of horticultural crops due to sustain their livelihood. The selected farmers of Mahto Tola were emerged as the progressive farmers over other tola's selected farmers because of their propensity towards agriculture and allied activities. In the comparative study between Mahto Tola and Bara Chanpi, it was scrutinized that the four crops *viz.* paddy, potato (rabi), pea and finger millet were commonly cultivated by the selected farmers. The results showed that almost all cases the farmers of Mahto Tola boasted more profit than the farmers of the Bara Chanpi. Similarly, two crops *viz.* Paddy and finger millet were commonly cultivated by the selected farmers of Mahto Tola and Simar Tola. The results also showed that all cases the farmers of Mahto Tola extracted more profit than the farmers of the Simar Tola. Three crops *viz.* Paddy, finger millet and pea were commonly cultivated by the

selected farmers of Mahto Tola and Munda Tola. The results again explained that all cases the farmers of Mahto Tola earned more profit than the farmers of the Munda Tola. On the contrary, three crops viz. paddy, finger millet and tomato were commonly grown by the selected farmers of Mahto Tola and Karamdih. The result once again clarified that all cases the farmers of Mahto Tola were enjoying more profit than the farmers of the Karamdih.

Title: A Study on the Forest Based Livelihood of the Tribal Populace of Ranchi District of Jharkhand.

Scholar: Somra Bedia (ID No.: R08504)

Supervisor: Dr. Avijit Kr. Dutta

The present investigation was carried out at different villages of Angara and Silli blocks of Ranchi district during January-2011 to May-2011 with the help of questionnaires and interview among the selected villagers. Sixty-three families from seven different villages namely, Kuturlowa, Hundrujara, Putadag, Harjanum, Banbrwadih (from Angara block) and Jumla, Thungrudih (from Silli block) were selected for the study. Almost all selected farming families fall either under marginal or small category. Different vegetables such as dummar, koinar sag, genthi, tewna, petiya, dura, bengo, jerbhanja, kachnar phool, jilhur phool, koreya phool, etc. among the summer vegetables; karile, kheksa, kundri, asari, bamboo mushroom, rugra, wild colocasia among rainy seasonal vegetables and ketal sag, pechki sag, genthi, tewna, petiya, dura, bengo, jerbhanja, koreya phool, etc. among the winter seasonal vegetables were the important supplementary food items from the forest for the villagers of studied areas. Similarly, different fruits like kend, piyar, bheluwa, bael among summer seasonal fruits; black berry, kusum, mahuwa among rainy seasonal fruits and aonla (winter seasonal fruit) were the supplementary sources of fruits from the forest for the villagers of the studied situations. Different edible oil sources available from the surrounding forests of the studied villages were mahuwa, kusum, kujri, etc. Among the fuel wood trees sal, koreya, putri, sidha, bael, lerusinduar, etc. were the important for the almost all villagers of the studied areas. Bamboo, chiru grass, charchota, woods of different trees like kusum, dhautha, koreya, doka, sisal, etc. that were available from the nearby forests and used by the selected villagers for the preparation of different manufacturing items like bamboo broom, plough, khatiya, guldasta, crocodile, knife, etc. Collections of honey and mahua flowers emerged as another source of supplementary income from the forest resources for the studied area's selected villagers. Lakshaman buti, Purnowa (Khaprasag), Gogotaro (*Sathavari-Asparagus racemosus*), Srutisag root, Chirchiti (Apang-*Achyranthus aspera*) root, Jhalerpeti root, Mungamala root, Charpeti, Behra fruit, Baibedia, Aonla fruit, Darchini, Jethimod, Ashwagandha, Elaichi, Gorbach/Gorbacc (Sweet Flag-*Acorus calamus*), etc. emerged as the important medicinal plants available in the forests

for curing different diseases like Mirgi, Gethibat (Rheumatism), Chakar Aana, *etc.* indigenously for the selected villagers of all villages of the studied locations.

Title: Comparative study between *kharif* and *rabi* seasonal potato cultivation in Ranchi district of Jharkhand along with its economics and labour utilization pattern.

Scholar: Priyadarshi Roy (ID No.: R09503)

Supervisor: Dr. Avijit Kr. Dutta

The present investigation was carried out in six villages of Nagri and Bero blocks of Ranchi district during January-2012 to July-2012. Farmers were selected purposively based on their interest to grow both *Kharif* as well as *Rabi* potatoes. From the study, it was revealed that about 40% of the farmers of the selected villages are interested to grow *Kharif* potato and for the purpose they used only 2236 variety. Although the seed of this particular variety produced by the farmer's themselves from their *Rabi* grown potato crop. To some extent, other varieties like Ultimatum, Lal Gulab were grown by the farmers of the selected villages during *Rabi* season. Around 60% farmers of the studied villages are interested to grow *Rabi* potato. As agriculture is the main profession of the villagers of the selected villages, thereby, a part of study has been under taken in the present investigation regarding labour requirement for growing different seasonal potatoes and it was revealed that *Rabi* potato requires more laborers than the *Kharif* potatoes for both the blocks. Comparative study between *Kharif* and *Rabi* potatoes cultivation by the selected farmers of six villages revealed that most of the cases *Kharif* potato cultivation is the more profitable one over the *Rabi* grown potatoes. Although, the yield of *Rabi* potato is more than *Kharif* potato but higher market price of *Kharif* potato as well as non-involvement of irrigation cost relied on the lower total cost of production of *Kharif* potato. The study also revealed several bottlenecks for growing both *kharif* and *Rabi* seasonal potatoes. Few of them were identified as the most prominent barriers for the commercialization of the crop. Lack of high yielding varieties for *Kharif* potato rather than 2236 is the most important factor in this direction besides shortage of storage facilities coupled with poor marketing network of the crop.

Title: Influence of Various Concentrations of BD-501 and Sayagavya on Yield and Quality of Onion.

Scholar: Atmadeep Das (ID No.: R10505)

Supervisor: Dr. Avijit Kr. Dutta

India had ancient wisdom of farming since the beginning of human civilization. The ‘Green Revolution’ with high input use has reached a plateau and is now sustained with diminishing return of falling dividends. Thus, a natural balance needs to be maintained at all cost for existence of life and property. Considering this problem in mind, an experiment was conducted during *Rabi* season of 2012-13 at the experimental farm of Ranchi Faculty Centre of Ramakrishna Mission Vivekananda Educational and Research Institute to find out the influence of different concentrations of BD-501 and Sasyagavya on yield and quality of onion. Different statistical tolls were used for data analysis and their subsequent interpretation. All the growth and yield parameters (bulb length, bulb diameter, bulb weight *etc.*) and quality attributes of the crop were positively influenced by BD-501 and Sasyagavya application. The performance of onion recorded poor under the condition of no organic or biodynamic input application, as reflected in poor growth and lower yield. Among different sources of organic manures, treatment consisting of BD-501 (10%) solution proved beneficial, as manifested in vigorous growth and higher yield. With the application of these liquid manures (produced by low-cost technology) the experimental crop has performed better than the crop grown through control environment or even under conventional farming condition.

Title: Influence of various concentrations of BD-501 and Sashyagavya on yield and quality of cabbage.

Scholar: Amitava Dutta (ID No.: R10502)

Supervisor: Dr. Avijit Kr. Dutta

A field experiment was conducted during *Rabi* season of 2012-13 at the experimental farm of ARTD Faculty Centre, Ranchi to find out and observe the influence of different concentrations of BD-501 and Sashyagavya on yield and quality of cabbage. The treatments involved combination of Biodynamic preparations (BD-501) with its 1%, 5% and 10% concentrations and Sashyagavya (10%) solution namely T₁ [BD-501 (1%)], T₂ [BD-501 (5%)], T₃ [BD-501 (10%)], T₄ [Sashyagavya (10%)], T₅ [BD-501 (1%) + Sashyagavya 10%], T₆ [BD-501 (5%) + Sashyagavya 10%], T₇ [BD-501 (10%) + Sashyagavya 10%] and T₈ [Control (without BD-501 and Sashyagavya)]. The experiment comprises of the application of organic manure along with treatments like BD-501 and Sashyagavya which imparted and reported beneficial and valuable effect on growth and yield attributes of cabbage as well as for the soil chemical

properties. All the growth and yield attributes (head length, head diameter, number of non-wrapper leaves and head weight) and quality contributing traits of cabbage head as well as the soil chemical properties were positively influenced by BD-501 and Sashyagavya application. The performance of cabbage was poor and not up to the mark in the case of the treatment where no organic input was applied; as a consequence, poor growth and lower yield was obtained from the control treatment. Supplementation of organic sources of manures resulted in higher yield of cabbage heads with higher ascorbic acid (T_5), total sugar content (T_5), reducing sugar content (T_7) and TSS content (T_4) as compared to the control treatment or even the samples collected from the farmer's fields where the crop was grown through conventional methods of farming.

Title: Benefit Cost Analysis of Small-Scale Lac Processing Industries in India.

Scholar: Amit Kumar Bhuin (ID No.: R10501)

Supervisor(s): Dr. Avijit Kr. Dutta and Dr. R. K. Yogi

India is the global leader in lac production as well as its processing. More than 60 per cent of total raw lac is processed in West Bengal. The present investigation was carried out at Balarampur of Purulia district during February-2013 to June-2013. This investigation was completed through questionnaire and personal interview among the lac processors and workers. There was a decline of button lac processing units in Balarampur. There were 118 handmade processing units in 2009 but in last 5 years it has decreased to 54. There is a great challenge for small scale lac processing units in present scenario of lac sector. This study was completed for understanding the challenges and constrains of small-scale lac processing units. In the study, it was observed that the gross return of small firm was ` 1547.18 per day and the B: C ratio was 1.04. Net returns in small firm were ` 39/kg. Price fluctuations in raw materials, uncertain raw materials supply, poor marketing system, shortage of skilled labour, uneven demand of button lac, seed lac and shellac were observed as major constrains of lac processing units. Difficulties in export of processed goods, lack of modern machinery for efficient processing and financial assistance unavailability are also the major problems for lac processors. Institutions and government agencies should provide skills and opportunities of training for adoption of improve technologies. Positive approach should be taken by the government to promote the export of lac-based products. Financial assistance should be provided by government agencies and banks to safeguard the small-scale industries like button lac processing units.

Title: Impact Assessment of Technology Intervention in Agriculture on Farmers of Kawali village of Ranchi district.

Scholar: Brikodar Mahto (ID No.: R10507)

Supervisor(s): Dr. Avijit Kr. Dutta and Dr. B. K. Jha

The present investigation was carried out at Kawali village of Namkum block, Ranchi district during January 2013 to May 2013 with the help of questionnaires and interview among the selected farmers. Different crops such as potato, tomato, cabbage, cauliflower, brinjal, paddy etc. were cultivated by the selected farmers. The benefit cost ratio for the cauliflower was the highest (3.91) for technology adopted farmers whereas, it was 1.72 for non-technology adopted farmers of the same village because the modern farmers accepted the advantages of adopting improved varieties for those crops. Likewise selected technology adopted farmers of Kawali village extracted more profit by growing different crops than their respective non-adopted counterparts. For example, in the case of potato the benefit cost ratio was the highest (2.96) for modern farmers whereas it was only 1.82 for non-technology adopted farmers of the village. The lowest benefit cost ratio of 2.43 was recorded in paddy among the crops grown by the selected technology adopted farmers as against only 1.31 for the non-technology adopted farmers from the same crop. The non- technology adopted farmers of the selected farmers was not getting more profit by growing different crops as compared to technology adopted farmers in almost all cases because the non-technology adopted farmers were reluctant to accept new technologies for cultivation of different crops.

Title: Impact Assessment of Technology Intervention in Agriculture at Saraitoli village of Ranchi district.

Scholar: Raj Paul (ID No.: R10518)

Supervisor(s): Dr. Avijit Kr. Dutta and Dr. B. K. Jha

The present investigation was carried out at Sarai Toli village under Namkom block of Ranchi District during January-2013 to May-2013 with the help of questionnaires and interview among the selected farmers to observe the impact of different technologies adopted by the farmers. The study encompasses the impact of the technologies that imparted and reported beneficial and valuable effect on the economics of different crops cultivation such as tomato, potato, pea *etc.* with the intervention of drip irrigation and hybrid/improved seed adoption as compared to their opposite counterparts. Here, seeds of hybrids/improved varieties and drip irrigation were taken into consideration for the purpose of the study. The maximum benefit cost ratio (3.21) for tomato was recorded in case of the farmer using both hybrid seeds as well as drip mode of irrigation, whereas it was recorded (2.50) for the farmers adopted only improved variety without adoption

of drip as against the lowest benefit cost ratio (1.93) for the non-adopted farmers. Similarly, the maximum benefit cost ratio (3.50) for French bean was recorded in case of the farmer using both improved seeds as well as drip mode of irrigation, whereas it was 2.76 for the farmers adopted only improved variety without adoption of drip, on the contrary, it was only 1.85 for the non-adopted farmers. Correspondingly, same observations were documented for the other crops viz. garden pea, potato and paddy. The technology adopter category farmers always harnessed more crop yield as a consequence obtained more income as compared to the technology non-adopter category of selected farmers. It may be concluded that the livelihood status of the farming community can obviously be improved with the adoption of new technologies for growing their crops.

Title: Nutritional status and longevity study of Sanjivani (10%) prepared by utilizing different based materials.

Scholar: Sourav Mohanta (ID No.: R10522)

Supervisor(s): Dr. Avijit Kr. Dutta and Swami Bhaveshananda

The experiment was conducted during January-2013 to June-2013 at the laboratory of ARTD Faculty Centre, Ramakrishna Mission Vivekananda Educational and Research Institute, Morabadi, Ranchi-834008 to study on the nutritional status and longevity of Sanjivani 10% solution (an organic preparation) prepared by utilizing different based materials. The treatments were prepared by utilizing different easily available materials like-cow dung, poultry litter and goat excreta along with cow urine and water at 1:1:10 ratios. From the experiment, it was revealed that T₂ (Poultry litter: Cow urine: Water @ 1:1:10 proportions) was the best treatment among all other treatments when both nutritional status as well as longevity of the treatment in respect of the nutrient content were taken into consideration. Other treatments with poultry litter as an ingredient viz. T₄, T₆ and T₇ recorded significant result in terms of available Organic C, Nitrogen (N), Potassium (K) and Phosphorus (P) content. Although, the higher longevity with higher amount of nutrients content even after 15 days of preparation was also observed in treatments like T₃, T₅, T₆ and T₇ those contained goat excreta as a based material probably due to the lower rate of their decomposition.

Title: Nutritional status and longevity study of Shasyagavya (10%) prepared by utilizing different based materials.

Scholar: Vijay Oraon (ID No.: R10523)

Supervisor(s): Dr. Avijit Kr. Dutta and Swami Bhaveshananda

The experiment was conducted during January-2013 to June-2013 at the laboratory of ARTD Faculty Centre, Morabadi, Ranchi-834008 to study on the nutritional status and longevity of Shasyagavya 10% solution (an organic preparation) prepared by utilizing different materials. The treatments were prepared by utilizing different easily available materials like-cow dung, poultry litter and goat excreta along with cow urine, crop residue and water at 1:1:1:10 ratios. From the experiment, it was revealed that T₂ (Poultry litter: Cow urine: Crop residue: Water @ 1:1:1:10 proportions) was the best treatment among all other treatments when both nutritional status as well as longevity of the treatment in respect of the nutrient content were taken into consideration. Other treatments with poultry litter as an ingredient *viz.* T₄, T₆ and T₇ recorded significant result in terms of available Organic C, Nitrogen (N), Potassium (K) and Phosphorus (P) content. Although, the higher longevity with higher amount of nutrients content even after 15 days of preparation was also observed in treatments like T₃, T₅, T₆ and T₇ those contained goat excreta as a based material probably due to the lower rate of their decomposition.

Title: Study on the Yield and Quality Attributes of Potato Grown Through Organic Farming.

Scholar: Santu Adhikari (ID No.: R10521)

Supervisor: Dr. Avijit Kr. Dutta

The present investigation was carried out at the Organic Plot (at 23.23⁰N latitude and 85.23⁰E longitude with the altitude of 2,140 feet above sea level) of the Faculty Centre for Agriculture, Rural & Tribal Development under the School of Agriculture and Rural Development of Ramakrishna Mission Vivekananda Educational and Research Institute, Morabadi, Ranchi-834008, Jharkhand, India during *Rabi* season of 2012 to 2013. Application of various sources of organic manure with their beneficial effect on growth and yield attributes as well as quality parameters of potato was studied. All the growth parameters (tuber diameter, tuber weight and yield/plot) *i.e.*, yield attributes and almost all quality parameters, *viz.* TSS, total sugar, ascorbic acid and starch content of tuber were positively influenced by cow urine 20% and incorporation of methi as intercrop. The performance of potato was poor when there was no organic input applied, as reflected in poor growth and lower yield. Among different sources of organic manures, treatment consisting of cow urine 20% solution and methi as intercrop (T₆ treatment) was proved to be beneficial, as manifested in vigorous growth and higher tuber yield. Similar, observation was recorded for starch content of tuber and in this regard T₆ again

emerged as the best treatment. Fenugreek/ methi (*Trigonella foenum-graecum*-L.) as intercrop (1:1) is not suitable for higher yield of potato in spite of its repellent effects on some insect-pests especially rodents. Although, some quality parameters of potato had shown positive influence with the incorporation of methi as intercrop in potato field at 1:1 proportion.

Title: Study on the Nutrient Enhancement of *Kunapajala* added Bulky Organic Manures in terms of their Shelf-life.

Scholar: Aniruddha Sengupta (ID No.: R11505)

Supervisor(s): Dr. Avijit Kr. Dutta and Swami Bhaveshananda

The experiment was conducted during January-2014 to April-2014 at the laboratory of ARTD faculty centre, Ramakrishna Mission Vivekananda Educational and Research Institute, Morabadi, Ranchi-834008 to study the Nutrient Enhancement of *Kunapajala* added Bulky Organic Manures in terms of their Shelf-life. Commonly available bulky organic manures- FYM, Vermicompost and Poultry manure and their combinations were selected for the study. Addition of *Kunapajala* to the manures enhanced their nutrient composition in terms of available NPK in relation to the shelf-life. The treatments combinations were: T₁= FYM (1 kg) + *Kunapajala* (900 ml); T₂= Vermicompost (1 kg) + *Kunapajala* (1280 ml); T₃ =Poultry litter (1 kg) + *Kunapajala* (1640 ml); T₄ = FYM (500 g) + Vermicompost (500 g) + *Kunapajala* (1120 ml); T₅ =FYM (500 g) + Poultry litter (500 g) + *Kunapajala* (1340 ml); T₆ =Vermicompost (500 g) + Poultry litter (500 g) + *Kunapajala* (1456 ml); T₇= Vermicompost (333.33 g) + Poultry litter (333.33 g) + FYM (333.33 g) + *Kunapajala* (1272 ml) and T₈= Control [*Kunapajala* (mother solution) only]. From the experiment, it was revealed that T₃ was the best treatment among all other treatments when nutritional status of the treatment in respect of the nutrient contents was taken into consideration. On the contrary, T₆ (vermicompost + poultry litter + *Kunapajala*) and T₃ (poultry litter + *Kunapajala*) emerged as the best treatment in terms of longevity/shelf-life with desirable levels of almost all studied parameters that remain either unchanged or increased for longer periods after preparation of *Kunapajala* as well as mixing with treatment-based carrier materials.

Title: Nutritional Status and Longevity Study of *Kunapajala* at Fortnight Interval Prepared by Utilizing Different Carrier Materials.

Scholar: Amit Kumar Mahto (ID No.: R11503)

Supervisor(s): Dr. Avijit Kr. Dutta and Swami Bhaveshananda

The present experiment was conducted at the laboratory of ARTD Faculty Centre, Morabadi, Ranchi-834008 during January-2014 to May-2014 to study the nutritional status and longevity of *Kunapajala* (an organic preparation) after mixing with different carrier materials. The treatments combinations were: T₁= FYM (500g) + *Kunapajala* mother solution (450 ml); T₂=Vermicompost (500 g) + *Kunapajala* mother solution (640 ml); T₃ =Poultry litter (500 g) + *Kunapajala* mother solution (820 ml); T₄ = FYM (250 g) + Vermicompost (250 g) + *Kunapajala* mother solution (560 ml); T₅ =FYM (250 g) + Poultry litter (250 g) + *Kunapajala* mother solution (670 ml); T₆ =Vermicompost (250 g) + Poultry litter (250 g) + *Kunapajala* mother solution (728 ml); T₇=Vermicompost (166.66 g) + Poultry litter (166.66 g) + FYM (166.66 g) + *Kunapajala* mother solution (728 ml) and T₈= Control [*Kunapajala* (mother solution) only]. From the experiment, it was revealed that T₃ is the best treatment among all other treatments when nutritional status of the treatment in respect of the nutrient contents was taken into consideration. On the contrary, T₆ (vermicompost + poultry litter + *kunapajala*) has emerged as the best treatment in terms of longevity/shelf-life with desirable levels of almost all studied parameters that remain either unchanged or increased for longer periods after preparation of *kunapajala* as well as mixing with treatment-based carrier materials.

Title: Enhancement of the Nutritional Status and longevity of liquid Organic Manure ‘*Shasyagavya*’ by Mixing with Available Bulky Organic Manures.

Scholar: Kartick Chandra Sahu (ID No.: R11509)

Supervisor(s): Dr. Avijit Kr. Dutta and Swami Bhaveshananda

The experiment was conducted during January-2014 to May-2014 at the laboratory of ARTD Faculty Centre, Ramakrishna Mission Vivekananda Educational and Research Institute, Morabadi, Ranchi-834008 to study on the enhancement of nutrients content and longevity of *Shasyagavya* by mixing with different bulky organic manures. The treatments were prepared by utilizing different easily available materials like-Farm Yard Manure (FYM), poultry litter and Vermicompost along with ‘*Shasyagavya*’ an effective liquid organic manure prepared by utilizing easily and locally available resources such as cow-dung, cow-urine, peels of vegetables (potato) and water at 1:1:1:2 ratios. The treatments combinations were: T₁ = FYM (500 g) + *Shasyagavya* (420 ml); T₂=Vermicompost (500 g) + *Shasyagavya* (640 ml); T₃ = Poultry litter (500 g) + *Shasyagavya* (740 ml); T₄ = FYM (250 g) + Vermicompost (250 g) + *Shasyagavya* (500 ml); T₅ = FYM (250 g) + Poultry litter (250 g) + *Shasyagavya* (550 ml); T₆ = Vermicompost

(250 g) + Poultry litter (250 g) + *Shasyagavya* (666 ml); T₇=Vermicompost (166.66 g) + Poultry litter (166.66 g) + FYM (166.66 g) + *Shasyagavya* (600 ml) and T₈= Control [*Shasyagavya* (mother solution) only]. The findings revealed nutritional status and longevity of '*Shasyagavya*' may be increased by mixing with available bulky organic manures. From the results, it was also revealed that T₃ is the best treatment among all other treatments when nutritional status of the treatment in respect of the nutrient contents was taken into consideration. On the contrary, T₆ (vermicompost + poultry litter + *Shasyagavya*) and T₁ (FYM + *Shasyagavya*) emerged as the best treatments in terms of longevity/shelf-life with desirable levels of almost all studied parameters that remain either unchanged or increased for longer periods after preparation of *Shasyagavya* as well as mixing with carrier materials as per the specified treatments.

Title: Study on the Nutrient Contents of *Sasyagavya* at Fifteen Days Interval After Mixing with Different Available Bulky Organic Manures.

Scholar: Dinesh Kumar Mandavi (ID No.: R11507)

Supervisor(s): Dr. Avijit Kr. Dutta and Swami Bhaveshananda

The experiment was conducted during January-2014 to April-2014 at the laboratory of ARTD Faculty Centre, Morabadi, Ranchi-834008 to study on the nutrient contents of *sasyagavya* at fifteen days interval by mixing with different available bulky organic manures. The treatments were prepared by utilizing different easily available organic manures like-FYM, vermicompost, poultry manure, etc. after mixing with *sasyagavya*. The treatments were: T₁ = *Sasyagavya* (420 ml) + FYM (500 g); T₂ = *Sasyagavya* (640 ml) + Vermicompost (500 g); T₃ = *Sasyagavya* (740 ml) + Poultry manure (500 g); T₄ = *Sasyagavya* (500 ml) + [½ FYM (250 g) + ½ Vermicompost (250 g)]; T₅ = *Sasyagavya* (550 ml) + [½FYM (250 g) + ½Poultry manure (250 g)]; T₆ = *Sasyagavya* (666 ml) + [½Vermicompost (250 g) + ½Poultry manure (250 g)]; T₇ = *Sasyagavya* (600 ml) + [⅓ FYM (166.66 g) + ⅓Vermicompost (166.66 g) + ⅓ Poultry manure (166.66 g)] and T₈ = *Sasyagavya* (mother solution) only. Different parameters like available NPK, organic carbon, pH and EC as well as total microbial population were estimated as per the experiment at fortnight intervals. From the experiment, T₆ emerged as the best treatment in terms of nutrients content (available N, P, K and OC) and microbial population. The longevity study also emphasized the same treatment (T₆) with their longer periods of nutrient retention capability.

Title: Effects of different bulky organic manures on yield and quality of cabbage.

Scholar: Mainu Ram Salam (ID No.: R11510)

Supervisor: Dr. Avijit Kr. Dutta

A field experiment was conducted during *Rabi* season of 2013-14 at the experimental farm of ARTD Faculty Centre, Ramakrishna Mission Vivekananda Educational and Research Institute, Ranchi to observe the effects of different bulky organic manures on yield and quality of cabbage. The experiment comprised with the application of different bulky organic manures that have been reported beneficial and valuable effect on growth and yield of cabbage as well as the soil chemical properties. All the growth and yield parameters (head length, head diameter, number of non-wrapper leaves and head weight) and quality attributes (total sugar, reducing sugar, TSS and ascorbic acid) of cabbage as well as the soil chemical properties were positively influenced by bulky organic manures. The performance of cabbage was poor and not up to the mark in the case of the treatment where no organic input was applied; as a consequence, poor growth and quality and lower yield was obtained from the control treatment. Cow dung, poultry manure, vermicompost and their different proportions were applied @ 500g per plant (as basal dose: one week before transplanting) followed by 200g/plant (as split dose: 45 days after transplanting) showed a significant increase in the growth rate of cabbage. Supplementation of organic sources of manures resulted in higher yield (57.14 t/ha) in T_6 with better qualitative traits expressions like higher ascorbic acid (108.0 mg/100 g) in T_4 , total sugar content (3.67%) in T_1 , reducing sugar content (2.44%) in T_5 and TSS content (5.63⁰ Brix) in T_4 as compared to the control treatment (T_8) or even the samples collected from the farmer's fields. After harvesting the crop soil samples were analysed and it was found that the available N, P, K or even OC as well as soil microbial population increased over the initial.

Title: Study on the availability of plant nutrients in *Panchagavya* added bulky organic manures.

Scholar: Pankaj Kumar (ID No.: R12510)

Supervisor(s): Dr. Avijit Kr. Dutta and Swami Bhaveshananda

The experiment was conducted during December-2014 to May-2015 at the laboratory of ARTD Faculty Centre, Ramakrishna Mission Vivekananda Educational and Research Institute, Morabadi, Ranchi-834008. Commonly available bulky organic manures like FYM, Vermicompost and Poultry manure and their combinations were selected for the study. Addition of *Panchagavya* to the manures enhanced their nutrient composition in terms of available NPK, OC and microbial population. The treatments combinations were: T_1 = FYM (600 g) + *Panchagavya* (550 ml); T_2 = Vermicompost (600 g) + *Panchagavya* (350 ml); T_3 = Poultry litter (600 g) + *Panchagavya* (490 ml); T_4 = FYM (300 g) + Vermicompost (300 g) + *Panchagavya*

(460 ml); T₅ = FYM (300 g) + Poultry litter (300 g) + *Panchagavya* (520 ml); T₆ = Vermicompost (300 g) + Poultry litter (300 g) + *Panchagavya* (440 ml); T₇ = Vermicompost (200 g) + Poultry litter (200 g) + FYM (200 g) + *Panchagavya* (740 ml) [*Panchagavya* (25%) solution was used and the quantification of this liquid manure was based on the maximum absorption capacity of the treatment materials *i.e.* bulky organic manures]. From the experiment, it was revealed that T₆ (vermicompost + poultry litter + *Panchagavya*) was the best treatment among all other treatments when nutritional status of the treatment in respect of the plant nutrient contents was taken into consideration. On the contrary, T₆ and T₃ (poultry litter + *Panchagavya*) had emerged as best treatments in terms of longevity or shelf-life viewpoint with desirable levels of almost all studied parameters that remain either unchanged or increased for comparatively longer periods after addition of *Panchagavya* as per the requirement of the treatment combinations.

Title: Enhancement of the nutritional status and shelf life of '*Shasyagavya*' by mixing with different additives.

Scholar: Naveen Kumar (ID No.: R12509)

Supervisor(s): Dr. Avijit Kr. Dutta and Swami Bhaveshananda

The experiment was conducted during January-2015 to May-2015 at the laboratory of ARTD Faculty Centre, Morabadi, Ranchi-834008 to study on the enhancement of nutrients content and shelf life of *Shasyagavya* by mixing with different low-cost additives. The treatments were prepared by utilizing different easily available materials like-Glycerol, Soyabean oil, Niger oil, Coconut oil, Karanj oil and Groundnut oil, along with '*Shasyagavya*' an effective liquid organic manure prepared by utilizing easily and locally available resources such as cow-dung, cow-urine, peels of vegetables (potato) and water at 1:1:1:2 ratios. The treatments combinations were: T₁ = Glycerol (200 ml) + *Shasyagavya* (2 lt.); T₂ = Soyabean oil (200 ml) + *Shasyagavya* (2 lt.); T₃ = Niger oil (200 ml) + *Shasyagavya* (2 lt.); T₄ = Coconut oil (200 ml) + *Shasyagavya* (200 lt.); T₅ = Karanj oil (200 ml) + *Shasyagavya* (2 lt.); T₆ = Groundnut oil + *Shasyagavya* (2 lt.); T₇ = Control [*Shasyagavya* (mother solution) only (2.2 lt.)]. The findings revealed nutritional status and shelf life of '*Shasyagavya*' may be increased by mixing with available different organic additives. From the results, it was also revealed that T₆ (Groundnut oil + *Sasyagavya*) as the best treatment among all other treatments when nutritional status of the treatment in respect of the plant nutrients content was taken into consideration. The same treatment also emerged as the best treatment in terms of longevity/shelf-life with desirable levels of almost all studied parameters that remain either unchanged or increased for longer periods after preparation of *Shasyagavya* as well as mixing with additives as per the requirement of the specified treatments.

Title: Study on the nutrients content and shelf life of *Shasyagavya* prepared by utilizing different proportions of water.

Scholar: Ronith Banerjee (ID No.: R12515)

Supervisor(s): Dr. Avijit Kr. Dutta and Swami Bhaveshananda

The experiment was conducted during January-2015 to May-2015 at the laboratory of ARTD Faculty Centre, Ramakrishna Mission Vivekananda Educational and Research Institute, Morabadi, Ranchi-834008. The treatments were prepared by utilizing different easily available materials like-cow dung, cow urine, vegetable wastes and water by mixing in different proportions of water. The treatments combinations were: T_1 = Cow dung: cow urine: vegetable waste: water:: 1:1:1:0.5; T_2 = Cow dung: cow urine: vegetable waste: water:: 1:1:1:1; T_3 = Cow dung: cow urine: vegetable waste: water:: 1:1:1:1.5; T_4 = Cow dung: cow urine: vegetable waste: water:: 1:1:1:2; T_5 = Cow dung: cow urine: vegetable waste: water:: 1:1:1:2.5; T_6 = Cow dung: cow urine: vegetable waste: water:: 1:1:1:3; T_7 = Cow dung: cow urine: vegetable waste: water:: 1:1:1:3.5 and T_8 = Cow dung: cow urine: vegetable waste: water:: 1:1:1:4. The findings revealed nutritional status and longevity of '*Shasyagavya*' may be increased by mixing with different proportions of water. From the results, it was also revealed that T_6 as the best treatment among all other treatments when nutritional status of the treatment in respect of the nutrient contents was taken into consideration. On the contrary, T_8 (Cow dung: cow urine: vegetable waste: water:: 1:1:1:4) and T_7 (Cow dung: cow urine: vegetable waste: water:: 1:1:1:3.5) emerged as best treatments in terms of longevity/shelf-life with desirable levels of almost all studied parameters that remain either unchanged or increased for longer periods after preparation of *Shasyagavya* as well as mixing with different proportions as per the specified treatments even after 90 days of their preparation. It is also concluded that the amount of moisture level is directly proportional to the amount of nutrients present in the preparation probably due to higher level of congenial conditions for the growth and development of the beneficial microbes in different treatments. In this context, T_4 emerged as the best preparation because of its higher level of microbial population.

Title: Performance of different onion varieties on yield and quality attributes under organic management condition.

Scholar: Rupesh Kundu (ID No.: R12516)

Supervisor: Dr. Avijit Kr. Dutta

The present study was conducted during the *rabi-summer* season of 2014-2015 at the experimental farm of Agriculture, Rural & Tribal Development Faculty Centre of Ramakrishna Mission Vivekananda Educational and Research Institute, Morabadi, Ranchi, Jharkhand. Different organic growing conditions were used as treatments viz. *Shasyagavya* -10% with Straw Mulching as (T₁), Only Straw Mulching as (T₂) and Inherent Organic Control as (T₃). Four varieties of onion viz. Sukhsagar (V₁), Arka Niketan (V₂), Agrifound Dark Red (V₃), and Agrifound Light Red (V₄) were used as planting material for the experiment by adopting Split Plot Design with three replications. Several yield and quality attributing characters of the crop were studied. Results found to be significant in all of the studied characters of both yield and quality parameters. Highest yield of onion (23.75 t/ha) was recorded in T₁ of V₂ (Arka Niketan). From the study, it was revealed that the T₁ of V₂ the best treatment in terms of B:C ratio (6.14) followed by the T₁ of V₃ (5.96), T₁ of V₁ (5.49), T₁ of V₄ (5.31) as against the lowest T₃ of V₂ (1.32). From the study it was found that T₁ (*Shasyagavya* 10% with straw Mulching) as the best treatment and V₂ (Arka Niketan) as the best performer variety under organic management conditions than the remaining three varieties.

Title: Effect of *Shasyagavya* on the Growth, Yield and Quality Attributes of Pot as well as field Grown Strawberry.

Scholar: Ranita Das (ID No.: R12514)

Supervisor: Dr. Avijit Kr. Dutta

The experiment was conducted during Oct-2014 to May-2015 at the ARTD Faculty Centre, Ramakrishna Mission Vivekananda Educational and Research Institute, Morabadi, Ranchi-834008 to study the effect of *Shasyagavya* over growth, yield and quality attributes of pot and field grown strawberry. Five treatments viz. T₁: 5% *Shasyagavya*; T₂: 10% *Shasyagavya*; T₃: 15% *Shasyagavya*; T₄: 20% *Shasyagavya* and T₅: Control were allocated for conducting the experiment under three specific conditions i.e., FC: Field Condition, PC-1: Pot Condition-1 (80% soil + 20% sand) and PC-2: Pot Condition-2 (40% soil + 40% vermicompost + 20% sand). From the experiment, it was revealed that T₃ (15% *Shasyagavya*;) was the best among all treatments for almost all growth, yield and quality parameters of strawberry under field, PC-1 and PC-2 conditions. It was also revealed that organic management conditions may enhance the soil fertility status. In this context, available nitrogen and phosphorus increased

significantly under both cropped and without cropped conditions. Although microbial population increased significantly in almost all treatments and growing conditions but PC-2 (Soil-40% + vermicompost-40 + sand-20%) condition with cropped recorded the highest microbial population followed by the field condition with cropped combination. Such type of findings may probably due to crop micro-climatic environments which is congenial for the growth and multiplication of several beneficial microbes like bacteria and fungus.

Title: Influence of various concentrations of BD-501 and *Panchagavya* on yield and quality of Garden pea.

Scholar: Sayan Kr. Majee (ID No.: R12518)

Supervisor: Dr. Avijit Kr. Dutta

A field experiment was conducted during *Rabi season of 2014-15* at the experimental farm of ARTD Faculty Centre, Ranchi to find out and observe the influence of different concentrations of BD-501 and *Panchagavya* on yield and quality of Garden Pea cv. Arkel. The treatments combinations were: T₁ = BD 501 (2%); T₂ = BD 501 (5%); T₃ = BD 501 (10%); T₄ = *Panchagavya* (3%); T₅ = *Panchagavya* (3%) + BD-501 (2%); T₆ = *Panchagavya* (3%) + BD-501 (5%); T₇ = *Panchagavya* (3%) + BD-501 (10%) and T₈ = Control (without any organic or biodynamic input). The experiment comprises of the application of organic manure along with BD-501 and *Panchagavya* as per the treatments which imparted and reported beneficial and valuable effect on growth, yield and quality attributes of several crops. Almost all the growth, yield and quality parameters under studied were highly influenced by the combined effect of BD-501 and *Panchagavya*. In this context, T₅ [*Panchagavya* (3%) + BD-501 (2%)] emerged as the best treatment where maximum green pod yield of 15.56 t/ha was recorded beside the good quality pods with the higher ascorbic acid (220.00 mg/100g fresh seed) and moderate seed protein content (16.25%) were also documented from the same treatment. From the finding, it may be concluded that BD-501 and *Panchagavya* have good effects over the growth, yield and quality attributes of garden pea and this ancient technology may be recommended even for commercial cultivation of the crop.

Title: Performance of Kharif Potato Cv. Kufri Pukhraj for Growth, Yield and Quality Attributes Under Organic Management Conditions.

Scholar: Subhasis Mondal (ID No.: R13518)

Supervisor: Dr. Avijit Kr. Dutta

The present investigation was carried out at the Faculty Centre of Agriculture, Rural and Tribal Development under the School of Agriculture and Rural Development of Ramakrishna Mission Vivekananda Educational and Research Institute, Morabadi, Ranchi-834008, Jharkhand, India at 23.23°N latitude and 85.23°E longitude with the altitude of 2,140 feet above sea level during *kharif* season of 2015 to study the performance of *Kharif* Potato Cv. Kufri Pukhraj for growth, yield, and quality attributes under organic management conditions. The experiment was framed out by adopting CRBD model with seven treatments and four replications for the each. The treatment combinations were: T₁- *Azolla* mixed *Shasyagavya* (10%); T₂- *Azolla* mixed *Shasyagavya* (15%); T₃- Vegetable waste mixed *Shasyagavya* (10%); T₄- Vegetable waste mixed *Shasyagavya* (15%); T₅- Potato peels mixed *Shasyagavya* (10%); T₆- Potato peels mixed *Shasyagavya* (15%); T₇- Control (without any liquid formulations). From the investigation, it may be concluded that in terms of yield, T₄ (vegetable wastes mixed *Shasyagavya* 15%) is the best treatment with yield potentiality of 13.94 t. ha⁻¹ but when quality attributes were taken into consideration then T₁ (*Azolla* mixed *Shasyagavya* 10%) emerged as the best although T₄ treatment materialized as average to above average performer in terms of almost all quality traits under studied. Similarly, when benefit: cost ratio was taken into account then T₄ again emerged as the best treatment with B:C ratio of 4.49. Hence, T₄ treatment may be recommended for even commercial scale organic *kharif* potato cultivation in the South Chhotanagpur plateau regions of Jharkhand.

Title: Screening Tomato (*Solanum lycopersicum*) Varieties for Growth, Yield and Quality Attributes under Different Organic Management Conditions.

Scholar: Anik Kumar Adak (ID No.: R13503)

Supervisor: Dr. Avijit Kr. Dutta

The present investigation was conducted during the *rabi*-summer season of 2015-2016 at the Experimental plot of ARTD Faculty Centre of Ramakrishna Mission Vivekananda Educational and Research Institute, Morabadi, Ranchi, Jharkhand. Different organic growing conditions used as treatments were T₁: FYM @ 10 t.ha⁻¹ and Wood Ash @ 10 t.ha⁻¹; T₂: T₁ + *Shasyagavya* (15%) four + dry paddy straw mulching; T₃: T₁+ Biofertilizer (*Azotobacter*) + *Shasyagavya* (15%) +dry paddy straw mulching]; T₄: T₁ + Biofertilizer (*Azotobacter*) + *Shasyagavya* (15%) + fermented mustard oil cake solution (10%) + dry paddy straw mulching. Nine varieties of

tomato *viz.* Pusa Ruby (V₁), Swarna Lalima (V₂), PKM-1 (V₃), S-22 (V₄), Arka Rakshak (V₅), Swarna Ratan (V₆), Frontier: F₁ hybrid (V₇), Navadai (V₈) and Patharkuchi (V₉) were used as planting material for the experiment by adopting Split Plot Design with three replications. Several yield and quality attributing characters of the crop were studied. Results found to be significant in all of the studied characters of both yield and quality parameters. Highest yield of tomato (56.97 t. ha⁻¹) was recorded in T₄ of V₂ (Swarna Lalima). From the study, it was revealed that T₄ of V₂ the best treatment in terms of B: C ratio (7.77) followed by T₂ of V₂ (6.83), T₄ of V₅ (6.24), T₃ of V₂ (6.12) as against the lowest T₂ of V₇ (0.91). From the study it was found that T₄ [T₁ + Biofertilizer (*Azotobacter*) + *Shasyagavya* (15%) + fermented mustard oil cake solution (10%) + dry paddy straw mulching] as the best treatment and V₂ (Swarna Lalima) as the best performer variety under organic management conditions than the remaining eight varieties of the crop.

Title: Influence of *Sanjeevani* on Growth, Yield and Quality Attributes of Cabbage cv. Golden Acre and Soil Bio-chemical Properties of Experimental Plots.

Scholar: Akshay Kumar Mahto (ID No.: R14502)

Supervisor: Dr. Avijit Kr. Dutta

The present study was conducted during the rabi-summer season of October 2016 - May 2017 at the Organic Experimental Farm of ARTD Faculty Centre, Morabadi, Ranchi, Jharkhand. Different concentrations of organic liquid manure (*Sanjeevani*) were used as treatments *viz.* T₁: *Sanjeevani* (1%), T₂: *Sanjeevani* (5%), T₃: *Sanjeevani* (10%), T₄: *Sanjeevani* (15%), T₅: *Sanjeevani* (20%), T₆: *Sanjeevani* (25%), and T₇: Absolute Control (without *Sanjeevani*) by employing cabbage cv. Golden Acre through CRBD experimental design with thrice replications for each treatment. Results showed the treatment T₂ (5% *Sanjeevani*) as the best in terms of expression of different growth and yield attributes culminated with the highest yield (53.02 t.ha⁻¹) and higher benefit: cost ratio (3.85). It was also documented that the application of organic inputs as different treatments helps to improve the soil health by enhancing beneficial microbial population, NPK, organic carbon content as well as maintaining the pH status of the experimental plots either in neutral or in slightly alkaline range. Beside these, an important finding of the experiment showed that higher doses of *Sanjeevani* enhanced more soil beneficial microbes as isolated from the soils of the T₆ treatment. From the findings of the present investigation, it may be concluded that organic package of practices along with the incorporation of *Sanjeevani* (5%) may be recommended for higher yield of the crop in south Chhotanagpur plateau regions of Jharkhand. However, in case of less fertile soils higher dose of this organic liquid formulation (*Sanjeevani*) may be recommended for harnessing long run benefit and sustain soil fertility as well.

Title: Performance of Capsicum cv. Yellow Wonder Grown through non-Chemical Farming practices under Low-Cost Protective Structure and Open Field Conditions.

Scholar: Buddhadev Jana (ID No.: R14506)

Supervisor: Dr. Avijit Kr. Dutta

The experiment was conducted during October-2016 to May-2017 at the Faculty Centre of Agriculture, Rural and Tribal Development, Ramakrishna Mission Vivekananda Educational and Research Institute, Morabadi, Ranchi-834008. Seven treatments viz.: T₁: *Amritjal* (1%); T₂: *Amritjal* (3%); T₃: BD- 501 (1%); T₄: B.D. 501 (3%); T₅: *Sasyagavya* (10%); T₆: *Sanjivani* (10%) and T₇ Absolute Control were assigned for the study by employing Complete Randomized Block Design with three replications for each treatment under both of the experimental conditions (low-cost protective structure and open field). From the experiment, it was revealed that the T₆ treatment *i.e.*, *Sanjivani* (10%) is the best treatment in terms of yield of capsicum cv. Yellow Wonder ($13216.46 \pm 297.46 \text{ kg. ha}^{-1} \approx 13.0 \text{ t. ha}^{-1}$) under low-cost protective structure. As a consequence, growing capsicum variety Yellow Wonder through T₆ treatment under low-cost protective structure emerged as the best in terms of net return per unit area of land with the highest benefit: cost ratio (3.46). Whereas in case of open field condition, although T₂ treatment [*Amritjal* (3%)] was emerged as the best in terms of yield but the overall performance of the crop under open field condition was too poor to harvest good yield culminated with very poor output of the crop ($424.69 \pm 39.33 \text{ kg. ha}^{-1} \approx 0.4 \text{ t. ha}^{-1}$). From the findings, it may be concluded that coloured capsicum is not suitable for growing in open field condition of the Chhota Nagpur plateau of Jharkhand but it can perform better under low-cost protective structure.

Title: Selection of Brinjal Varieties for Chhotanagpur Plateau of Jharkhand Based on Their Performance through Non-chemical Growing Approaches.

Scholar: Reddi Gowtham (ID No.: R14507)

Supervisor: Dr. Avijit Kr. Dutta

Brinjal is a crop grown widely all over India. In Chhotanagpur region especially Jharkhand where vegetable production is rampantly done, there is a wide use of chemical fertilizers that reduces the quality of both the produce and the cultivated soil. Also, with the growing use of the hybrid varieties the local varieties which are having better traits like disease resistance *etc.* are becoming wiped out. In this context, attempts have been made combining solutions both the problems by conducting a varietal trail using different non-chemical growing approaches. For the purpose, different concentrations of organic liquid manures were used as treatments viz. T₁: *Amritpani* (1%), T₂: *BD* (3%) T₃: *Shasyagavya* (10%), T₄: Inherent organic status of the experimental plots (as control) by employing seven varieties viz. V₁: HABR 21, V₂: Swarna

Abhilamb, V₃: Swarna Shree, V₄: Swarna Shobha, V₅: Swarna Pratibha, V₆: Swarna Mani, V₇: Swarna Shyamli. The experiment was designed after split plot model. The studied growth, yield and quality attributing characters revealed that maximum yield ($62.49 \pm 1.66 \text{ t. ha}^{-1}$) was recorded by the treatment T₃ (*Shasyagavya*) because of its high nutritional composition. Whereas in quality parameters like TSS and Chlorophyll *etc.* T₂ (BD-501) showed better results. Coming to the varieties, V₇ (Swarna Shyamli) recorded maximum yield ($58.38 \pm 1.75 \text{ t. ha}^{-1}$). Among the interaction the interaction effect of T₃V₇ showed highest yield with maximum B:C ratio of 3.60. So, it may be concluded that Swarna Shyamli variety of brinjal is highly suitable for organic farming in the south Chhotanagpur plateau of Jharkhand by using organic liquid formulation '*Shasyagavya*'.

Title: Performance of Different Brinjal Varieties under Organic Management Conditions in terms of their Expression of Growth, Yield and Quality Attributes.

Scholar: Kuldeep Rajak (ID No.: R14508)

Supervisor: Dr. Avijit Kr. Dutta

The present study was conducted during the *rabi-summer* season of 2016-2017 at the experimental farm of Ramakrishna Mission Vivekananda Educational and Research Institute, Morabadi, Ranchi Faculty Centre, Jharkhand. Seven varieties of brinjal *viz.* V₁: HABR-21, V₂: Swarna Abhilamb, V₃: Swarna Shree, V₄: Swarna Shobha, V₅: Swarna Pratibha, V₆: Swarna Mani, V₇: Swarna Shyamli were grown with the application of organic liquid manures as different treatments *viz.* T₁: *Amritpani* (3%), T₂: *BD-501* (1%) T₃: *Sanjeevani* (10%), and T₄: Inherent Organic Status following split plot experimental design with their thrice replications. Results found to be significant in most of the studied characters of both yield and quality parameters in different varieties under the exposure of organically designed treatment sets. Considering the efficacy of organic manures and responsiveness of the varieties towards those organic inputs, it may be concluded that the farmers can harness more profit by growing brinjal varieties like V₂: Swarna Abhilamb, V₇: Swarna Shyamli by adopting organic package of practices with the application of *Sanjeevani* 10 % (T₃) and *Amritpani* 3% (T₁) in the south Chhotanagpur plateau of Jharkhand.

Title: Performance of Sprouting Broccoli Cv. Fiesta (F_1 Hybrid) in Zero Chemical Farming Approaches under Open Field and Low-Cost Protective Structure.

Scholar: Sarthak Roy (ID No.: R14515)

Supervisor: Dr. Avijit Kr. Dutta

The experiment was conducted during October-2016 to April-2017 at the Faculty Centre of ARTD, Ramakrishna Mission Vivekananda Educational and Research Institute, Morabadi, Ranchi-834008 to study the performance of sprouting broccoli cv. Fiesta (F_1 hybrid) grown through zero chemical farming approaches under open field and low-cost protective structure. Seven organic treatments viz. T_1 : *Amritpani* (1%), T_2 : *Amritpani* (3%), T_3 : *BD-501* (1%), T_4 : *BD-501* (3%), T_5 : *Shasyagavya* (10%); T_6 : *Sanjeevani* (10%), and T_7 : Control [without any organic formulation] were assigned for the study by adopting CRBD with three replications for each treatment. From the experiment, it was revealed T_5 [10% *Shasyagavya*] as the best treatment among all treatments in most of the cases for growth and yield attributing characters in open field growing condition. As a result, the highest yield [70.59 t/ha] was obtained from T_5 treatment in open field condition. However, very low yield [15.77 t/ha] was recorded in the case of low-cost protective structure in T_1 treatment. Although different treatments performed independently in terms of the expression of quality attributes in both of the experimental conditions. The performance of broccoli was not up to the mark in the case of the treatment where no organic input was applied; as a consequence, poor yield was documented from the control treatment (T_7) in both of the growing conditions. As a result of better performances in almost all growth and yield attributes in open field condition under the exposure of T_5 treatment, higher benefit: cost ratio (6.72) was documented in this treatment under the growing condition of open field but for the protective condition negative results were recorded in all cases of treatments. From the findings of the present investigation, it may be concluded that this cultivar of broccoli cannot perform well under protective condition but well suited in open field condition when supplemented with *Shasyagavya* (10%) as a source of plant nutrients under the Chhota Nagpur plateau regions of Jharkhand.

Title: Screening Onion Varieties through Organic Farming Conditions in Chhotanagpur Plateau of Jharkhand during Post-kharif Season” during Late *Kharif* Season of Jharkhand.

Scholar: Sourav Pathak (ID No.: R14520)

Supervisor: Dr. Avijit Kr. Dutta

After the first green revaluation (1966) in our country, production was increased by using of huge quantity of fertilizer, pesticide, irrigation. However, it was realized that by using heavy amount of fertilizer and pesticide soil health was damaged and even human health was seriously

affected. In this backdrop, organic farming has come into existence in 20th century. Organic farming is an eco-friendly and cost minimized farming practices that has the yield potential similar to chemical farming practices. Considering the above facts, the present investigation was conducted at organic experimental plot of RKMVER, Ranchi Campus during post *kharif* season of 2016. Different organic growing packages as stated below considered as treatments viz. *Amritjal* (1%) with straw mulching (T₁), BD-501 (3%) with mulching (T₂), *Sasyagavya* (10%) with mulching (T₃), and inherent fertility status of the experimental plot as control or by default organic (T₄). Seven varieties of the crop namely V₁ (Sukhsagar); V₂ (Agrifound Dark Red); V₃ (Bhima Sweta); V₄ (Bhima Dark Red); V₅ (Nasik Red); V₆ (Arka Niketan); and V₇ (N-53) were used as planting materials for the experiment by growing them in a field experiment through split plot experimental design with their thrice replications. Several growth, yield and quality attributing characters of the crop were studied and result found to be significant in all the studied characters both yield and quality traits under different treatments and varietal situations. From the findings, it may be concluded that *Sasyagavya* (10%) is the best for production of onion organically followed by BD-501 (3%) along with vermicompost (10 t.ha⁻¹), wood ash (5 t.ha⁻¹) coupled with mulching with dry paddy straw. Among the varieties, Sukhsagar, Agrifound Dark Red, Bhima Sweta, Bhima Dark Red and Arka Niketan are suitable for late *kharif* or early *rabi* season cultivation in the south Chhotanagpur plateau of Jharkhand.

Title: Influence of *Sasyagavya* on Growth, Yield and Quality Attributes of Cabbage and Effect of Such Liquid Organic Formulation Over Bio-Chemical Properties of Soil.

Scholar: Souvik Chatterjee (ID No.: R14521)

Supervisor(s): Dr. Avijit Kr. Dutta and Swami Bhaveshananda

The experiment was conducted during October-2016 to May-2017 in Organic Experimental Plot of Ramakrishna Mission Vivekananda Educational and Research Institute, Ranchi Campus. Seven treatments viz. T₁: *Sasyagavya* (1%); T₂: *Sasyagavya* (5%); T₃: *Sasyagavya* (10%); T₄: *Sasyagavya* (15%); T₅: *Sasyagavya* (20%); T₆: *Sasyagavya* (25%) and T₇: Absolute Control (without any organic input application i.e., by default organic) were assigned for the study adopting cabbage cv. Golden Acre. From the experiment, it was revealed T₆ (*Sasyagavya* 25%) as the best treatment in most of the cases for expression of growth, yield and quality traits of the crop. It was also documented that the application of organic liquid formulation (*Sasyagavya*) as different treatments helps to improve the soil health by enhancing beneficial microbial population, NPK, organic carbon content as well as maintaining the pH status of the experimental soil towards the neutral range that leads to enhance the growth parameters of plant, culminating with more yield in T₆ treatment. Besides, soil beneficial microbes were also

documented higher in T_6 treatment that stimulates the mineralization process of soil applied manure and thereby, nutrients become available for plants grown through this treatment. From the findings of the present investigation, it may be concluded that organic package of practices along with the incorporation of *Sasyagavya* (25%) is well suited for growing cabbage commercially even under the plateau regions of Jharkhand.

Title: Performance of Strawberry cv. Douglas for Growth, Yield and Quality Attributes Under Zero Chemical Farming Condition.

Scholar: Shuchismita Guha (ID No.: R14518)

Supervisor: Dr. Avijit Kr. Dutta

The experiment was conducted during Sept.-2016 to May-2017 at the ARTD Faculty Centre, Ramakrishna Mission Vivekananda Educational and Research Institute, Morabadi, Ranchi by employing seven treatments viz. T_1 : *Amritjal* (1%), T_2 : *Amritjal* (3%), T_3 : *BD-501* (1%), T_4 : *BD-501* (3%), T_5 : *Shasyagavya* (10%); T_6 : *Sanjeevani* (10%), and T_7 : Control [without any organic formulation]. The experiment was designed after CRBD with three replications for each treatment. From the experiment, it was revealed that T_5 (*Shasyagavya* 10%) is the best treatment among all treatments in most of the cases for yield (225.20 g plant⁻¹). However, different treatments performed independently in terms of expression of quality attributes. The performance of strawberry was not up to the mark in the case of the treatment where no organic input was applied (T_7); as a consequence, poor yield was documented from this treatment (34.80 g. plant⁻¹). From the findings, it may be concluded that strawberry cv. Douglas performed well in open field condition along with the incorporation of *Shasyagavya* (10%) under the plateau regions of Jharkhand.

Title: Evaluation of Tomato Varieties in South Chhotanagpur Plateau Region through Application of Vermiwash and *Amritjal*.

Scholar: Musalamadugu Yasaswini (ID No.: R15525)

Supervisor: Dr. Avijit Kr. Dutta

Tomato is a crop grown widely all over the world exclusively in India ranked in second global position in production. In Chhotanagpur plateau where vegetable production is rampantly done, there is a wide use of chemical fertilizers that reduces the quality of both the produce and the cultivated soil. In this context, different organic liquid formulations, viz. T_1 : *Vermiwash* (10%), and T_2 : *Amritjal* (1%) were used to grow 10 tomato varieties namely V_1 : Swarna Baibhav, V_2 :

Swarna Deepti, V_3 : Swarna Sampada, V_4 : Swarna Vijaya, V_5 : Swarna Lalima, V_6 : RCDT-1315, V_7 : RCDT-1314, V_8 : Mahalakshmi; V_9 : Vani-F₁, V_{10} : Arunodhaya-3149 and their performance was compared with control treatment T_3 (without any organic input i.e., inherent fertility status of the experimental plots). The experiment was designed after Factorial Randomized Block Design. The studied growth and yield attributing traits revealed that maximum yield ($19.80 \pm 1.27 \text{ t ha}^{-1}$) was recorded in T_2 : *Amritjal* (1%) because of its high growth enhancing composition. Although, the expression of quality attributes like Ascorbic acid, lycopene and β -carotene content showed better results in T_1 : *Vermiwash* (10%). Coming to the varieties, V_{10} (Arunodhaya-3149) has recorded more yield ($27.86 \pm 2.31 \text{ t ha}^{-1}$) and consequently, the interaction effect of T_2V_{10} showed highest yield ($32.52 \pm 4.00 \text{ t ha}^{-1}$). So, it may be concluded that Arunodhaya-3149 is highly suitable for organic farming in the south Chhotanagpur plateau of Jharkhand by using organic liquid formulation '*Amritjal*'.

Title: Screening Chilli Varieties for Growth, Yield and Quality through Non-chemical Growing Approaches.

Scholar: Soumitra Maity (ID No.: R15521)

Supervisor: Dr. Avijit Kr. Dutta

The experiment was conducted through a field experiment at ARTD Faculty Centre, Ranchi by including eight varieties of chilli namely V_1 : HC-70; V_2 : Suryamukhi; V_3 : Bullet Chilli; V_4 : Perek Chilli; V_5 : Swarna Prafulya; V_6 : Beldanga Chilli, V_7 : Chalta Lanka; and V_8 : Tejasmi Lanka. Those varieties of the crop were grown under four different non-chemical growing approaches (considered here as treatments) viz.: T_1 : *Amritjal* (1%); T_2 : *Amritjal* (1%) with *Homa (Agnihotra)*; T_3 : only *Homa (Agnihotra)*; and T_4 : Absolute Control (without *Amritjal* and *Homa*). Eight varieties of chilli were grown independently under four treatment conditions by adopting Complete Randomized Block Design with three replications for each variety. From the observation, it was revealed that V_2 (Perek Chilli) is the best variety in terms of yield ($900.06 \pm 90.86 \text{ kg ha}^{-1}$) under T_2 [*Amritjal* (1%) with *Homa (Agnihotra)*] condition followed by V_7 ($888.13 \pm 90.86 \text{ kg ha}^{-1}$) and V_4 ($866.06 \pm 90.86 \text{ kg ha}^{-1}$). As a consequence, V_2 emerged as the best in terms of net return per unit area of land resulting the highest benefit: cost ratio (2.14). From the study, it may be concluded that *Amritjal* with *homa (Agnihotra)* farming practices in chilli may well be suited for its cultivation even in commercial scale as one of the non-chemical farming approaches in south Chhotanagpur plateau region of Jharkhand.

Title: Effect of *Agnihotra* and *Amritjal* on Growth, Yield and Quality of Brinjal (*Solanum melongena* L.).

Scholar: Saswatik Tripathy (ID No.: R15519)

Supervisor: Dr. Avijit Kr. Dutta

Brinjal is a crop grown widely all over India including the Chhotanagpur plateau region of Jharkhand. In commercial cultivation of brinjal. Synthetic fertilizers and agro-chemicals are immensely used to grow the crop those are too expensive to afford by most of the small and marginal farmers of the region. The high use of chemicals and synthetics also reduces the quality of both the produce and the cultivated soil. In this context, attempts have been made by conducting a varietal trial using four non-chemical alternative growing conditions *viz.* E_1C_1 : *Amritjal* (1%), E_1C_2 : Absolute Control (Inherent Fertility Status of Experimental Soil); E_2C_1 : *Amritjal* (1%) + Homa Induction (*Agnihotra*), and E_2C_2 : Only Homa Induction (*Agnihotra*) by employing five varieties of brinjal *viz.* V_1 : Swarna Pratibha; V_2 : Swarna Neelima; V_3 : Swarna Shakti; V_4 : Mukta Jhuri; and V_5 : Long Green. The experimental was designed after RBD with three replications for each of the variety under four independent experimental situations. The studied growth, yield and quality attributing characters revealed that the maximum yield (91.41 ± 6.05 t. ha⁻¹) in Swarna Neelima as recorded in E_2C_1 : *Amritjal* (1%) + Homa Induction (*Agnihotra*) because of its supply of high nutrition through soil and air. Quality contributing traits like TSS and Chlorophyll of different varieties also performed better in E_2C_1 : *Amritjal* (1%) + Homa Induction (*Agnihotra*) condition. Coming to the varieties, V_2 (Swarna Neelima) has recorded the highest yield (91.41 ± 6.05 t. ha⁻¹). Considering both the variety and alternative growing conditions, V_2 (Swarna Neelima) emerged as the best performing variety under the growing condition of E_2C_1 : *Amritjal* (1%) + Homa Induction (*Agnihotra*). So, it may be concluded that Swarna Neelima variety of brinjal is highly suitable for cultivation in the south Chhotanagpur plateau of Jharkhand by using *Amritjal* (1%), a liquid organic formulation under homa/*Agnihotra* farming.

Title: Evaluation of Garden Pea Varieties Based on Their Growth, Yield and Quality Attributes under Organic Growing Condition in South Chhotanagpur Plateau of Jharkhand.

Scholar: Payel Dinda (ID No.: R15512)

Supervisor: Dr. Avijit Kr. Dutta

Garden pea (*Pisum sativum* var. *hortense* L.) belongs to the family *Fabaceae* is a popular vegetable grown widely all over India. The quality of the crop grown in the south Chhotanagpur region of Jharkhand is well known but rampant uses of chemical fertilizers and different other plant protection chemicals lead to reduce the quality of the produce and the cultivated soil as

well. The performance of crop variety depends on the growing environment and its genetic makeup. In this context, attempts have been made through present investigation by combining different commonly cultivated varieties of the crop in this particular region under the exposure of non-chemical (so called organic) growing condition. The performance of the crop under organic farming was studied using a liquid organic formulation *Amritjal* (%) and compared with non-chemical but by default organic growing condition without using *Amritjal* by employing seven commonly grown varieties viz. V_1 : Azad Pea-1, V_2 : Azad Pea-3, V_3 : Swarna Amar, V_4 : Swarna Mukti, V_5 : HAEP-1, V_6 : HAEP-2, and V_7 : GS-10. The experiment was designed after Complete Randomized Block Design (CRBD) with thrice replications of each variety under both of the experimental situations. Different growth, yield and quality attributing characters of garden pea was taken into account and the results found to be significant under the influences of *Amritjal*. As a consequence, the maximum yield was recorded in variety V_2 (14.80 t/ha) where *Amritjal* was applied. As the highest B:C ratio was recorded in V_2 (2.60) grown with the application of *Amritjal* and eventually Azad Pea-3 (V_2) emerged as the highly responsive variety of garden pea towards organic farming condition in the south Chhotanagpur plateau of Jharkhand.

Title: Effect of Agnihotra, Biodynamics and Organic Farming on Growth, Yield and Quality Attributes of Tomato (*Solanum lycopersicum* L.).

Scholar: Abhishek Barman (ID No.: R16502)

Supervisor: Dr. Avijit Kr. Dutta

Four varieties of tomato namely, V_1 : Pusa Ruby, V_2 : S-22, V_3 : Swarna Lalima, and V_4 : RCDT-1314 were exposed to grow under four organically designed treatment conditions viz. T_1 : Sanjeevani (10%) + BD-501 (3%), T_2 : Sanjeevani (10%) + BD-501 (3%) + Agnihotra, T_3 : Sanjeevani (10%) + Agnihotra, and T_4 : Absolute Control. The treatments and varieties of the crop were allocated in an experimental plot by adopting RCBD model. Different growth, yield and quality attributes of different tomato varieties under different organic conditions were taken into account. Results revealed that V_3 (Swarna Lalima) performed best in case of yield (57.23 ± 2.34 t ha⁻¹) under T_3 condition due to present of high growth enhancing composition. From the study, it may be concluded that organic cultivation of tomato is highly suitable both for small and commercial scale under the South Chhotanagpur plateau regions of Jharkhand. The organic package of practices helps to reduce cost of cultivation, increase higher productivity, ensured profitability and environment friendly.

Title: Study on the performance of French Bean (*Phaseolus vulgaris*) under non-chemical growing condition.

Scholar: Kailash Kumar (ID No.: R16515)

Supervisor: Dr. Avijit Kr. Dutta

French bean (*Phaseolus vulgaris* L.) is one of the most widely cultivated vegetable crops for their green pods or tender pods and also for their seeds in India. The demand of the crop is increasing day by day especially the organically grown one. In this context, a field experiment was conducted during *post-kharif* season during September to December, 2018 at ARTD Faculty Centre of Ramakrishna Mission Vivekananda Educational and Research Institute, Morabadi, Ranchi. Seven varieties of the crop, namely, V₁: Brunda, V₂: Swarna Priya, V₃: Arka Komal, V₄: HAFB-4, V₅: HAFB-2, V₆: Abhay, and V₇: Anupama were grown through the application of *Enriched Sanjeevani* and *Amrut Mitti* and their performance was compared in absolute control growing condition where no *Sanjeevani* or *Amrut Mitti* was applied. The experiment was designed after randomized complete block design (RCBD) technique. Results revealed that the variety HAFB-4 (V₄) had greater pod yield (26.40 ± 2.99 t/ha) under organic intervened condition as against only (10.37 ± 2.99 t/ha) under absolute control growing condition. From the findings, it may be concluded that the application of *Enriched Sanjeevani* and *Amrut Mitti* is an alternative approach of farming practice to grow comparatively safer produce of French bean under the south Chhotanagpur plateau of Jharkhand.

Title: Screening Tomato (*Solanum lycopersicum* L.) Varieties Based on their Growth, Yield and Quality Attributes Under Organic Management Conditions in the South Chhotanagpur Plateau of Jharkhand.

Scholar: Mahendra Karmali (ID No.: R16521)

Supervisor: Dr. Avijit Kr. Dutta

The organic liquid formulation *viz.* *Enriched Sanjeevani* (10%), was used as input against the control for growing four varieties of tomato namely V₁: Pusa Ruby, V₂: S- 22, V₃: Swarna Lalima, and V₄: RCDT-1314. The experiment was designed after Randomized Complete Block Design. The studied growth and yield attributing characters revealed that maximum yield (47.45 ± 5.11 t ha⁻¹) was recorded in [V₁: *Pusa Ruby*] with the application of enriched version of *Sanjeevani* because of its high growth enhancing composition that also influenced the expression of proximate qualitative traits like ascorbic acid, lycopene and β -carotene in different studied varieties especially for Pusa Ruby (V₁). So, it may be concluded that Pusa Ruby variety of Tomato is highly suitable for organic farming in the south Chhotanagpur plateau of Jharkhand by using organic liquid formulation like '*Enriched Sanjeevani*'.

Title: Evaluation of Kharif Potato Varieties under Organic Farming Condition based on their Growth, Yield, and Quality Attributes.

Scholar: Nitish Kumar (ID No.: R16523)

Supervisor: Dr. Avijit Kr. Dutta

The present investigation was carried out at the faculty centre of Agriculture, Rural and Tribal Development under the School of Agriculture and Rural Development of Ramakrishna Mission Vivekananda Educational and Research Institute, Morabadi, Ranchi at 23.23° N latitude and 85.23° E longitude with the altitude of 2,140 feet above mean sea level during *kharif* season of 2018. The experiment was outlined by adopting RCBD model with five varieties and four replications for the each. The varieties used for the purpose were V₁: K-22, V₂: 2236, V₃: Ultimatum, V₄: C-1, and V₅: Kufri Jyoti. These varieties were subjected to grow with the application of Enriched Sanjivani (10%) and their performance was compared with absolute control growing condition where no organic input was applied. Different growth, yield and its attributes as well as quality contributing traits were taken into account for the study and results found to be significant in almost all conditions. Organically designed treatment has greater role on yield and quality traits expression over its respective control counterpart. From the present investigation, it may be concluded that in terms of yield V₃ (Ultimatum) emerged as the best variety with the tuber yield of 12.84 tha⁻¹ under organic culture as contrast to only (6.23 tha⁻¹) as recorded in absolute control condition, but when quality attributes were taken in consideration then it was observed that different varieties performed independently even under both of the experimental conditions. Hence, V₃ (Ultimatum) may be recommended for kharif season cultivation through organic farming in the South Chhotanagpur plateau regions of Jharkhand.

Title: Performance Study of Okra (*Abelmoschus esculentus* L.) Through Organic and Agnihotra Growing Condition during Autumn-Winter and Spring-Summer Seasons of the Chhotanagpur Plateau.

Scholar: Rahul Bepari (ID No.: R16525)

Supervisor: Dr. Avijit Kr. Dutta

The experiment was conducted during September 2018 to May 2019 at the faculty centre of Agriculture, Rural and Tribal Development, Ramakrishna Mission Vivekananda Educational and Research Institute, Morabadi, Ranchi by growing five varieties of okra under autumn-winter and spring-summer growing seasons of the region. These five varieties of the crop namely, V₁: Gunjan; V₂: NOKH-1001; V₃: ES-440; V₄: SKS-4001; and V₅: Anmol were grown through four different non-chemical growing conditions of two different seasons such

as E_1C_1 : Sanjivani (10%) with Homa (Agnihotra) in Autumn-winter season, E_1C_2 : Absolute control in Autumn-winter season, E_2C_1 : Sanjivani (10%) with Homa (Agnihotra) in Spring-summer season, E_2C_2 : Absolute control during Spring-summer season were assigned for the study by adopting Randomized Complete Block Design (RCBD) with four replications for each variety under both the experimental conditions. From the findings, it was revealed that the V_2 (NOKH-1001) is the best variety in term of yield (10.44 ± 0.44 t/ha) in E_2C_1 growing condition followed by V_4 (10.22 ± 0.44 t/ha) and V_1 (9.78 ± 0.44 t/ha). However, in case of E_1C_1 growing condition, V_2 (NOKH-1001) emerged as the best with higher yield (4.02 ± 0.18 t/ha) than other varieties. Different studied quality contributing parameters performed independently under the influences of non-chemical growing approaches in different growing seasons of the crop but quality parameters like ascorbic acid in homa treatments were recorded significantly superior as compared to those of non-Agnihotra treatment condition. From the findings, it may be concluded that Sanjivani (10%) with Homa (Agnihotra) farming practices in okra during Spring-summer season may well be suited for its cultivation even in commercial scale in the south Chotanagpur plateau region of Jharkhand.

Title: Evaluation of Okra Varieties Based on their Growth, Yield and Quality Attributes as influenced by Non-chemical Growing Approaches.

Scholar: Rishav Ghosh (ID No.: R16526)

Supervisor: Dr. Avijit Kr. Dutta

Okra is a crop which is widely grown all over India and not the exception for Chhotanagpur region of Jharkhand. The rampant uses of chemical fertilizers reduce the fertility of land and quality of the produce also. Seven different varieties of okra viz. V_1 : Super Jet (NG-81), V_2 : Tanvi-595, V_3 : ES-440(OSAKA), V_4 : NOKH-1001, V_5 : Gunjan, V_6 : Anmol, V_7 : SKS-4001 were grown with the application of Sanjivani (10%) and their performance was compared against the control where no input was applied. The experiment was designed after Randomized Complete Block Design. The studied growth, yield and quality attributing characters expressed greatly with the application of Sanjeevani (10%). Among the varieties V_2 Tanvi-595 (9.45 ± 0.97 t/ha) recorded more yield with the higher B: C ratio of 2.86 than other varietal counterparts. So, it may be concluded that Tanvi-595 variety of okra is highly suitable for organic farming in the South Chhotanagpur plateau of Jharkhand by using organic liquid formulations like ‘Sanjeevani’.

Title: Screening of Kharif Potato Varieties based on their Growth, Yield and Quality Attributes as influenced by different approaches of Organic Farming.

Scholar: Sucharita Ghoshal (ID No.: R16534)

Supervisor: Dr. Avijit Kr. Dutta

The experiment was conducted during September-2018 to December-2018 at the Faculty Center of Agriculture, Rural and Tribal Development, Ramakrishna Mission Vivekananda Educational and Research Institute, Morabadi, Ranchi by employing five varieties of the crop namely V_1 : Ultimatum; V_2 : C-1; V_3 : 2236; V_4 : K-22; and V_5 : Kufri Jyoti. Those commonly grown kharif potato varieties of the region were cultivated under three different non-chemical growing approaches (here considered as treatments) viz. T_1 : Enriched Sanjeevani-1 @10% + BD-501 (3%); T_2 : Enriched Sanjeevani-1 @10% and T_3 : Absolute Control (*Organic by default*) were assigned by adopting Randomized Complete Block Design with four replications for each variety under all of the experimental conditions independently. From the experiment, it was revealed that the V_3 (2236) is the best variety in terms of tuber yield (10.98 ± 0.69 t. ha⁻¹) under T_2 condition [Enriched Sanjeevani-1@10%] followed by V_1 (Ultimatum) (8.18 ± 0.69 t. ha⁻¹). As a consequence, V_2 variety emerged as the best in terms of net return per unit area coupled with the highest benefit: cost ratio (3.26) under the condition of T_2 . While in case of T_1 [Enriched Sanjeevani-1@10%+BD-501(3%)], V_3 (2236) emerged as the best variety in terms of yield (9.74 ± 0.86 t. ha⁻¹) with benefit: cost ratio of 2.70. However, different studied quality traits showed that BD-501 has significant effect on quality enhancement of the crop varieties. From the study, it may be concluded that each and every qualitative parameter performed best under T_1 [Enriched Sanjeevani-1@10%+BD-501 (3%)] condition.

Title: Growth, Yield and Proximate Quality Attributes of Garden Pea as Influenced by Organic Farming.

Scholar: Tina Sarkar (ID No.: R17536)

Supervisor: Dr. Avijit Kr. Dutta

Garden pea (*Pisum sativum* var. *hortense* L.) is one of the most popular and important winter vegetables of our country and extensively grown in the Chhotanagpur plateau of eastern India. The present investigation was conducted during September-2019 to March-2020 at the Faculty Centre of Agriculture, Rural & Tribal Development of Ramakrishna Mission Vivekananda Educational and Research Institute, Ranchi Campus. Three varieties of the crop, namely, V_1 : GS-10, V_2 : Murshidabad Local, and V_3 : Patna Motor were grown under seven different organically designed treatments, viz T_1 : Sasyagavya (10%); T_2 : Sanjeevani (10%); T_3 : Vermicompost @1.0 kg/m²; T_4 : Farm Yard Manure @ 2.5 kg/m²; T_5 : Enriched Sanjeevani (1%); T_6 : Poultry Manure

@ 0.5 kg/m² and T₇: Absolute Control (without any organic amendment). The experiment was designed after Randomized Block Design with three replications under each treatment. Three varieties of the crop were exposed to grow independently under organically designed treatment conditions. From the experiment, it was revealed that under T₁ (Sasyagavya) treatment the V₁ (GS-10) was the best variety in terms of green pod yield (10.72 ± 0.12 t ha⁻¹) with the highest benefit: cost ratio (2.40). From the findings of the present investigation, it may be concluded that Sasyagavya as an organic source of plant nutrient may be used for organic farming in garden pea in the south Chhotanagpur plateau region of Jharkhand.

Title: Performance of Sack Grown Tomato cv. Arka Samrat under the Condition of Open and Semi –Protected Roof Garden.

Scholar: Satyanand Bedia (ID No.: R17522)

Supervisor: Dr. Avijit Kr. Dutta

Tomato is extensively grown in the eastern Indian plateau especially in the south Chhotanagpur region of Jharkhand. However, the commercial scale growers generally use different chemical fertilizers and pesticides that reduces the quality of both the produce and the cultivated soil. The vertical farming is gaining popularity due to shrinkage of cultivated land in the era of urbanization. Also, with the growing use of the hybrid varieties the local varieties which are having better traits like good in taste, disease resistance *etc.* are becoming wiped out. In this context, an attempt has been made by using alternative farming approaches using different organic inputs as plant nutrient and protection sources. Different growth, yield & its attributes and proximate quality traits were considered for performance study of the crop variety under open and semi-protected condition of roof garden. The findings revealed that maximum number of fruits per plant, more fruit weight and consequently the maximum yield were realized in semi protective growing condition of the roof garden through sack grown tomato cv. Arka Samrat.

Title: Evaluation of cv. Golden Acre Grown Through Different Organic Amendments.

Scholar: Dinesh Oraon (ID No.: R17510)

Supervisor: Dr. Avijit Kr. Dutta

The present study was conducted during the rabi-summer season of November 2019- May 2020 at the Organic Experimental Farm of ARTD Faculty Centre, Morabadi, Ranchi, Jharkhand. Different ratios of organic manure were used as treatments *viz.* T₁: Sasyagavya (10%), T₂: Sanjeevani (10%), T₃: Vermicompost (@1.0kg/sq.m), T₄: FYM (@2.5kg/sq.m), T₅: Enriched Sanjeevani (1%), T₆: Poultry Manure (@0.5kg/sq.m), and T₇: Absolute control (without any

organic manure) by employing cabbage cv. Golden Acre as planting material for the experiment by adopting RBD with three replications. Several growth, yield and quality attribute characters of the crop of the experimental plots were taken into account and results found to be significant in most of the studied characters for both yield and quality parameters. Although the treatment T₂ (10% Sanjeevani) detected as the best in terms of expression of different growth and yield attributes culminated with the highest yield (53.02 t. ha⁻¹) and higher benefit: cost ratio (3.85). However, different treatments performed independently for expressing quality traits and thereby higher ascorbic acid (119.26 mg.g⁻¹) was detected in T₆ but higher TSS (5.67°Brix) as observed in T₅ treatment. It was also documented that the application of organic inputs as different treatments helps to improve the soil health by enhancing beneficial microbial population, NPK, organic carbon content as well as maintaining the pH status of the experimental plots either in neutral or in slightly alkaline range. Beside these, an important finding of the experiment showed that higher doses of Sanjeevani enhanced more soil beneficial microbes as isolated from the soils of the T₆ treatment. From the findings of the present investigation, it may be concluded that organic package of practices along with the incorporation of Sanjeevani (10%) may be recommended for higher yield of the crop in south Chhotanagpur plateau regions of Jharkhand. However, in case of less fertile soils higher dose of this organic liquid formulation (Sanjeevani) may be recommended for harnessing long run benefit and sustain soil fertility as well.

Title: Effect of *Enriched Sanjeevani* - a liquid organic manure on growth, quality and yield of Radish (*Raphanus sativus* L.) 'Japanese White'.

Scholar: Sucheta Goswami (ID No.: R18528)

Supervisor: Dr. Avijit Kr. Dutta

Radish (*Raphanus sativus* L.) is a popular salad vegetable having a mild flavour. Vegetable production using chemical fertilizers and pesticides has some bad effects on human health and chemicals using in crop production reduce the fertility of soil and harm the environment also. For poor farmer who cannot afford expensive synthetic fertilizers and chemicals for plant protection can use organic manures as an alternative. The quality of organic vegetable is high and its demand is increasing day by day. In the present study, an attempt has been made to investigate the effect of *Enriched Sanjeevani* – a liquid organic manure on growth and yield of radish (*Raphanus sativus* L.) 'Japanese White' by the application of that liquid formulation with its six different concentrations i.e., 1%, 5%, 10%, 15%, 20%, 25% and the seventh being the control. Randomized Completed Block Design was adopted by replicating three times of each treatment. The findings helped to reach to the conclusion that 10% *Enriched Sanjeevani* (T₃) is

the best treatment in terms of growth and yield of radish (19.01 ± 1.20 t. ha⁻¹) with the highest benefit: cost ratio (4.94). But in case of quality parameters of radish, protein (%) of both T₂ and T₃ has been recorded better results. Similarly, 5% *Enriched Sanjeevani* (T₂) has been emerged as the best treatment for the quality traits expression like TSS (4.80 ± 0.46 °Brix), Ascorbic acid (14.42 ± 0.51 mg/100g), Total sugar (2.05 ± 0.22 %). Therefore, it may be concluded that for growing root vegetables like radish (*Raphanus sativus* L.) ‘Japanese White’, 5% *Enriched Sanjeevani* (T₂) is suitable if we consider both quality and yield but 10% *Enriched Sanjeevani* (T₃) is suitable for its organic cultivation in commercial scale if we consider farmer’s interest like benefit cost ratio.

Section C: Genetics and Plant Breeding

Title: Studies on the performance of different local Garlic genotypes in Jharkhand

Scholar: Musalamadugu Yaraswini

Supervisor(s): Dr. B.C. Saha

Garlic a famous cuisine crop grown widely all over the world exclusively in India ranked in the second position in production after China. In the Chhotanagpur region especially Jharkhand where vegetable production is rampantly done, there is wide use of chemical fertilizers that reduces the quality of both the produce and the cultivated soil. Also with the growing use of the hybrid varieties the local varieties which are having better traits like disease resistance etc. are becoming wiped out. In this context, attempts have been made combining solutions to both the problems by conducting a varietal trial using alternative farming approaches using a liquid organic nutrient solution known as Jeevamrit. In 60 experimental plots by employing 20 varieties namely RC-1, RC-2, RC-3, RC-4, RC-5, RC-6, RC-8, RC-9, RC-12, RC-13, RC-15, RC-20, RC-21, RC-22, RC-26, RC-43, FG-17, FG-18, FG-20 and A1. The experiment was designed after Randomized Block Design. The studied growth and yield attributing characters revealed that maximum yield was recorded by the treatment (RC-8] (82.16 + 0.73) g plat") because of its high growth-enhancing composition. Considering the whole observations RC-08 and RC-15 performed the best. The expression of different studied growth traits performs independently under the influences of organically designed treatment conditions.

Conclusion: Garlic lines were subjected to Jeevamrit nutrient solution treatment from which, the line RC-8 with maximum growth and yield was reported in the study.

Section D: Soil Science and Agriculture Chemistry

Title: Use of cow urine in agriculture for sustainable crop production: A review

Scholar: Chhandos Pramanik

Supervisor(s): Dr. Badole Shrikant Purushottam

The indiscriminate use of agrochemicals since green revolutions resulted in an adverse effect on the soil fertility, crop productivity, quality of products, and more specifically on the environmental system. The current scenario under such situations firmly emphasizes the need to adopt eco-friendly agricultural practices for food production by considering the sustainability of soil and environment. Organic Agriculture is now becoming mainstream all over the world. Among different organic sources, cow urine is a unique product of dairy which have huge property such as manure, antimicrobial agent, and disinfectant. It contains 95% water, and 2.5% urea and the remaining 2.5% contains mineral salts, hormones, and enzymes. In organic farming, cow urine is used for the preparation of a number of growth promoters and biopesticides, which are effective in improving soil fertility, and management of a large number of pests and diseases in varied groups. It is also considered a natural disinfectant and pest repellent and forms the main component of Panchagavya, an organic crop booster prepared and sprayed by Indian farmers. Therefore, the use of cow urine provides a better alternative to synthetic chemicals which are expensive and pose a potential danger to the farmers, marketers, consumers, and the environment. Favourable effect of cow urine application has been reported in enhancing the productivity of different crops *viz.* maize, mustard, rice, etc. Further research is required to prove its qualities and benefits.

Title: Use of Cow Dung Microflora: For Sustainable Agriculture : a Review

Scholar: Goutam Basak

Supervisor(s): Dr. Badole Shrikant Purushottam

Cow dung is being used since ancient times in agriculture as it has played a significant role in crop production. It not only improved soil fertility and crop productivity but also enhanced the soil quality and soil health for sustainable crop production. In addition to that, it promotes crop growth and protects from several plant insects and pests. Cow dung microflora covers agricultural, biotechnological, and environmental applications. In this review project work, we try to summarize the application of dung microflora and cow dung in an agricultural domain like biocontrol, growth promotion, organic, sulphur oxidation, phosphorus solubilization, and biochar, bio composting, bio formulation, and underlying mechanisms involved in these

processes are discussed. The significance of cow dung applications in tropical agriculture in the context of climate change is briefly highlighted.

Title: Organic Manure and their Impact on Agricultural Crop Production: A Review

Scholar: Gourav Bhakat

Supervisor(s): Dr. Badole Shrikant Purushottam

After the green revolution, due to the continuous application of chemical fertilizer and a negligible amount of organic manure soil fertility has declined drastically and shows multiple deficiencies. The application of organic manures to agricultural soil provides organic matter and valuable nutrients, improves soil structure, increases its water holding capacity, and stimulates soil microbial activities. Indian soils being very poor in organic matter and major plant nutrients, the addition of regular doses of organic manures in requisite quantities can help restoration of soil health and also compensate for the loss of basic nutrients every year from the soil due to uptake of crops. Therefore, the use of organic manure is extremely essential for better crop productivity and maintaining the fertility of soil to enhance sustainable crop production.

Title: Soil Acidity and Its Management Options in India: A Review

Scholar: Suprabhat Mal

Supervisor(s): Dr. Badole Shrikant Purushottam

Soil acidity is a major problem in many regions of the world including India which severely limits crop production. In India, around one-third of the cultivable land is affected by soil acidity. In this review, we try to understand the soil acidity, extent, causes, effects, and management practices. Liming is the widest practice for the amelioration of acid soils. Though, the recommendation of a large quantity of lime based on lime requirement is not appropriate for the resource-poor farmers. They required simple and sustainable management technologies for the amendment of acid soils and improving the crop yield of their choices. In this review work, efforts have been made to provide information on possible options such as the application of low-cost liming materials (like FYM, compost, vermicompost, green manure, crop residues, etc.), industrial wastes (like basic slag, lime sludge, and press mud), integrated nutrient management (lime in combination with organic manures and mineral fertilizers) and selection of acid-tolerant crops and cultivars for the management of acid soils and enhancing crop productivity and thereby sustaining crop yield. Further, research is needed by considering all these aspects together for developing context-specific acid soil management technologies in India.

Section E: Plant Pathology

Title: Mass production of *Trichoderma viride* using grains as substrate

Scholar: Binay Kumar Barma

Supervisor(s): Dr. Pankaj Kumar Mishra

The present investigation entitled “Mass production of *Trichoderma viride* using various grain substrates” was carried out in the Plant Pathology Laboratory, RKMVERI, Ranchi, Jharkhand. *Trichoderma viride* used as biocontrol agent for the management of several soil borne plant diseases such as fungal wilt, damping off, collar rot, and charcoal rot. Four different grains rice, wheat, maize and sorghum were used for mass multiplication of *Trichoderma viride*. Highest colony forming unit reported in sorghum (39.33×10^7 cfu/g) followed wheat (31.33×10^7 cfu/g) and least count reported in rice (25.33×10^7 cfu/g).

Title: “Mass production of *Trichoderma viride* using various Organic Substrates

Scholar: Bindesh Bediya

Supervisor(s): Dr. Pankaj Kumar Mishra

The present investigation entitled “Mass production of *Trichoderma viride* using various organic substrates” was carried out in the Plant Pathology Laboratory, RKMVERI, Ranchi, Jharkhand. *Trichoderma viride* used as biocontrol agent for the management of several soil borne plant diseases such as fungal wilt, damping off, collar rot, and charcoal rot. Four different solid organic matters were used for mass multiplication of *Trichoderma viride*. Highest colony forming unit reported in poultry manures (12.50×10^7 cfu/gm) followed by vemicompost (11.00×10^7 cfu/g), FYM (6.75×10^7 cfu/g) and least count reported in garden soil ie 6.75×10^7 cfu /g.

Title: Mass production of *Trichoderma viride* using various organic Substrates

Scholar: Bipan Pal

Supervisor(s): Dr. Pankaj Kumar Mishra

The present investigation entitled “Mass production of *Trichoderma viride* using liquid organic substrates” was carried out in the Plant Pathology Laboratory, RKMVERI, Ranchi, Jharkhand. Five different liquid organic matters were used for mass multiplication of *Trichoderma viride*. *Trichoderma viride* used as biocontrol agent for the management of several soil borne plant

diseases such as fungal wilt, damping off, collar rot, and charcoal rot. Highest colony forming unit reported in wheat boiled water extract (35.667×10^7 cfu/g) followed by rice boiled water extract (31.000×10^7 cfu/g), cow dung slurry (15.667×10^7 cfu/g), whey water (5.667×10^7 cfu/g), cow urine (0.4×10^7 cfu/g) and least count 0.000 reported in sterilized water.

Title: Mass production of *Trichoderma viride* using vermicompost

Scholar: Bisram Bediya

Supervisor(s): Dr. Pankaj Kumar Mishra

The present investigation entitled “Mass production of *Trichoderma viride* using vermicompost” was carried out in the Plant Pathology Laboratory, RKMVERI, Ranchi, Jharkhand. *Trichoderma viride* inoculum multiplied on wheat grains. *Trichoderma viride* used as biocontrol agent for the management of several soil borne plant diseases such as fungal wilt, damping off, collar rot, and charcoal rot. Fully colonized wheat grains used as inoculum for multiplication on vermicompost. Five inoculum dose (weight basis) 50gm, 40gm, 30 gm, 20gm and 10gm used for mass multiplication in vermicompost and counting colony forming unit. Among various inoculum quantity used for multiplication, maximum growth was observed in tray contains one kg vermicompost with 50 g inoculum (13.33×10^7 cfu/g) followed by one kg with 40 g inoculum (12.00×10^7 cfu/g), 30 g inoculum (10.33×10^7 cfu/g), 20 g inoculum (8.33×10^7 cfu/g) and least count reported in 10 gm inoculum i.e., 6.00×10^7 cfu/g.

Title: Studies on *Pythium aphanidermatum* causing damping off disease of chilli (*Capsicum annum* L.)”

Scholar: Rishav Ghosh

Supervisor(s): Dr. Pankaj Kumar Mishra

The damping off disease of chilli caused by *Pythium aphanidermatum*, has emerged as a serious problem in most of the chilli growing area of India, leading to considerable yield loss in chilli production. The intensive survey of Ranchi district of Jharkhand recorded 25.78 percent disease incidence during 2020-2021. Seven isolates of *P. aphanidermatum* were found to be pathogenic under artificially sick pot condition. Aggressiveness study of *P. aphanidermatum* revealed that, isolates were variable in their aggressiveness. It was observed that isolate PA2 from Bagda showed highly aggressive (55.25%) disease incidence and PA3 from Tigra location found less aggressive and causes minimum disease incidence (7.00%). Hence, Bagda isolate (PA2) can be used in breeding programme for the evaluation of chilli varieties against damping off disease.

Section F: Entomology

Title: Effectiveness of Different Botanicals against Shoot and Fruit Borer and Whitefly Infesting Brinjal in two Different Seasons

Scholar: Rahul Bepari

Supervisor: Dr. Vishal Walmik Dhote

The experiment was conducted to study the effectiveness of different botanicals against shoot and fruit borer and whitefly infesting brinjal. The experiment was conducted at two different locations namely, farmer's field at Adityapur village of Bangaon block of North 24 Pargana (West Bengal) and faculty centre of Agriculture Rural and Tribal Development, Ramakrishna Mission Vivekananda Educational and Research Institute, Morabadi, Ranchi during post kharif and summer respectively. The seven different treatments viz. fermented Dashparni 10% (T₁), Fermented Dashparni 15% (T₂), Fermented Dashparni 10% + Neem oil 0.5% (T₃), Neem oil 0.5% (T₄), Instant Dashparni 10% (T₅), Instant Dashparni 10% + Neem oil 0.5% (T₆) and control (T₇) were evaluated against target insect pests. During the experiment, diversity of different arthropods visiting the crop was recorded and found that fourteen different species of insect visited the crop. Among the different insect pests, jassid, hadda beetle, aphid, leaf roller, shoot and fruit borer, whitefly and ash weevil found infesting the crop during both the seasons. Activity of predator, lady bird beetle also noticed. Among the different selected treatments, treatment, T₃ was found significantly superior in reducing the fruit infestation by shoot and fruit borer followed by T₁, T₄, T₂, T₆ and T₅. Also all the treatments were effective over control in reducing the infestation of whitefly during both the seasons. Among the selected treatments, T₄ was the most effective treatment followed by T₃, T₂, T₁, T₆ and T₅ in reducing the infestation of whitefly. The highest marketable fruit yield was recorded in T₃ followed by T₂, T₁, T₄, T₆ and T₅. All the selected botanicals were effective in managing the infestation of shoot and fruit borer and whitefly infesting brinjal.

Title: Biological Studies of an Invasive Insect Pest Fall Armyworm, *Spodoptera frugiperda*, J.M Smith Infesting Maize in Jharkhand

Scholar: Deb Sajal Ghosh

Supervisor: Dr. Vishal Walmik Dhote

A field survey was conducted to examine the infestation of invasive insect pest, Fall Armyworm, *Spodoptera frugiperda* during August, 2019 at Divyayan Krishi Vigyan Kendra, Ranchi. During

the survey, the infestation of invasive insect pest was noticed on maize. The larvae were found boring into central shoot and feed internally from top to downward and also causes skelotonization. The different stages of larva were collected and were carried to the laboratory of Ramakrishna Mission Vivekananda Educational and Research institute (RKMVERI) for rearing to study the life cycle of the pest. During the study it was found that the life cycle was completed in 36- 40 days under laboratory conditions. It is also noticed that larva can damage the cob.

Title: Bio-rational approaches for the management of Diamondback moth (*Plutella xylostella*) infesting cabbage

Scholar: Sourav Pathak

Supervisor: Dr. Vishal Walmik Dhote

The experiment was conducted at Divyayan Krishi Vigyan Kendra, Morabadi, Ranchi, during October to January 2018-19 employing golden acre variety of cabbage. During the experiment, different insect-pest like Bihar hairy caterpillar, *Spilosoma oblique*, Diamondback moth (*Plutella xylostella*), Cabbage Aphid (*Brevicoryne brassicae*), Cabbage butterfly (*Pieris rapae*), Tobacco caterpillar (*Spodoptera litura*) and Rice bug (*Leptocorisa varicornis*) and three natural enemies viz. Ladybird beetle (*Cheilomenes sexmaculata*), Cricket, *Gryllus sp.* and spider . were noticed visiting cabbage were found visitin teh crop. The maximum larval population of diamondback moth was recorded during 1st week of January (1st SMW). The maximum, minimum, average temperature and maximum relative humidity had positive correlation whereas minimum RH, wind speed, rainfall had negative correlation with the mean population of diamondback moth during the entire cropping seasons. Among all the seven selected treatments, Dashparni 5% + Karanj extract @ 0.2% was recorded to be the most superior treatment for controlling the diamondback moth. Maximum yield of cabbage was recorded in the plot treated with Dashparni 5% + Neem oil @ 0.5%. On the other hand, highest benefit: cost ratio was obtained by application of Dashparni 10%.

Title: Bio-efficacy of some plant extracts against aphid (*Lipaphis erysimi* K.) infesting mustard

Scholar: Buddhadev Jana

Supervisor: Dr. Vishal Walmik Dhote

The experiment was conducted during November-2018 to February-2019 at the Faculty Centre for Agriculture, Rural & Tribal Development, Ramakrishna Mission Vivekananda Educational and Research Institute, Morabadi, Ranchi to study the efficacy of different plant extracts against

aphid (*Lipaphis erysimi* K.) infesting mustard. Eight treatments viz.: T₁: Dashparni @ 5%; T₂: Dashparni @ 10%; T₃: Dashparni @ 5% + Neem oil @ 0.5%; T₄: Dashparni @ 5% + Karanja oil @ 0.3%; T₅: Neemastra; T₆: Papaya leaf extract; T₇: *Verticillium lecanii* 1.15% W. P @ 4 gm/ lt of water and T₈ absolute control were selected for the study by employing Randomized Block Design with three replications. Among these all treatments, *Verticillium lecanii* was most superior with 1.76 aphids per top 3 cm shoot followed by Dashparni @ 5% + Neem oil, Dashparni @ 10%, Papaya leaf extract, Neemastra, Dashparni @ 5% and Dashparni @ 5% + Karanja oil. In case of yield the T₇ recorded significantly highest yield of 2.12 t/ha. The highest benefit: cost ratio of was obtained from treatment T₇. During the study, the correlation between population build-up of aphid and weather parameters was studied and noticed that population of aphid was negatively correlated with maximum and minimum temperature, minimum humidity, rainfall and positive correlation with maximum humidity and wind speed. The arthropod diversity of crop included eight insect pests i.e., Aphid, Diamondback moth, Sawfly, Pointed bug, Stink bug/ shield bug, Leaf webber, Hairy caterpillar and Looper, seven beneficial insects like Green lacewing, Praying mantis, Lady beetle, Marmalade hoverfly, *Diaeretiella rapae*, Honey bee and Cricket.

Title: Efficacy of Different Bio-pesticides against Brinjal shoot and fruit borer (*L. orbonalis*)

Scholar: Ramjeevan Mahto

Supervisor: Dr. Vishal Walmik Dhote and Dr. Rajesh Kumar

The experiment was conducted at the experimental field of faculty centre for Agriculture, Rural and Tribal Development, Ramakrishna Mission Vivekananda Research and Educational Institute, Morabadi, Ranchi during February to July, 2018 to study the efficacy of bio-pesticides and plant extracts against shoot and fruit borer and aphids infesting brinjal. The selected treatment were Dashparni 10%, Dashparni 15%, Brahmastra 10%, *B. bassiana*, *Pongamia oil* (0.2%), *V. lecanii* (4 ml/ l of water) and a control. Considering the fruit infestation (on number basis) application of *Pongamia oil* was significantly superior (5.11 % fruit infestation) in reducing the infestation followed by *V. lecanii* (7.42%), Dashparni 10% (9.93%), Dashparni 15% (11.07%), *B. bassiana* (11.12%) and Brahmastra 10% (12.33%). On the basis of fruit infestation (on weight basis), application of *pongamia oil* was the best treatment (4.78 per cent fruit infestation) followed by *V. lecanii* (6.09%), Dashparni 15% (8.98%), Brahmastra 10% (9.56%), Dashparni 10% (10.55%), and *B. bassiana* (12.82%). The data collected on infestation of aphid indicates that all bio-pesticides and plant extracts treatments were significantly effective over control in minimizing the infestation of aphid. The treatment with *V. lecanii* was most superior followed by *B. bassiana*, Dashparni 15%, Brahmastra 10%, *Pongamia oil*, and Dashparni 10%.

Title: Bio-rational Management of Brinjal Shoot and Fruit borer

Scholar: Debsajal Ghosh

Supervisor: Dr. Vishal Walmik Dhote

Brinjal shoot and fruit borer is a key pest of brinjal and causes a huge damage and loss to the crop. The large amount of insecticides is being used for the management of the pest. This may lead to the development of resistance in pest, pesticide residue in fruit and also toxic to natural enemies. So, it is the need of time to find out the alternative to minimize the use of chemical/ inorganic insecticides. Considering the above need, an experiment was conducted at the experimental plot of Ramakrishna Mission Vivekananda Educational and Research Institute, Morabadi, Ranchi, Jharkhand, India, during Zaid season of 2018-19. Experiment was laid in Randomized Block Design (RBD) with seven treatments and three replications. The infestation of shoot and fruit borer (*Leucinodes orbonalis* Guenee) was recorded at each harvesting to evaluate the efficiency of the different bio pesticides. On the basis of fruit infestation, it is evident that the application of Bt was the best treatment in minimizing the fruit infestation which is at par with Dashparni 10% + NSKE (5%) followed by Dashparni 10% + Karanj oil and Dashparni 10%. All the treatments were significantly superior over the control in reducing the pest infestation. The highest yield as well as benefit: cost ratio was recorded from *Bt* treated plots.

Title: Population dynamics and bio-rational management of mustard aphid infesting mustard

Scholar: Tridib Paul

Supervisor: Dr. Vishal Walmik Dhote

In the context of Jharkhand, the farmers are mainly small and marginal, they are characterized as lacking of the resources. The people cannot afford the cost required for the cultivation in conventional method, so the use of organic input is an effective alternative to minimize the cost required for cultivation and it is also an ecofriendly approach. Considering these factors, the experiment was conducted at the experimental farm of Divyayan Krishi Vigyan Kendra, Morabadi, Ranchi- 834008, Jharkhand, India, during Rabi Season of 2017-18. During the experiment it is noticed that the population of aphid infesting mustard was negatively correlated with both maximum and minimum temperature and minimum RH whereas, it is positively correlated with maximum relative humidity. The effectiveness of seven different treatments were evaluated including control viz: *Dashparni*5%, (T1), *Dashparni* 10% (T2), *Dashparni*5% + *Nem oil*@ 0.5% (T3), *Dashparni*5% + *Karanj oil* @ 0.2% (T4), *Dashparni*5% + *Tobacco extract* (T5) and *Verticillium licanii* (T6). The cumulative effect of different selected treatments indicated that T6 (*Verticillium licanii* @ 4 gm/ lt of water) was the best treatment for the managements of aphid infestation (66.74% reduction of population over control) followed by

T3 (*Dashparni* 5% + *Neem oil*). Among all the treatments, T6 recorded the highest yield (0.9 ton/ha) and also returns followed by *Dashparni* 10%.

Title: “Biorational management of fruit borer infesting tomato”

Scholar: : Manas Sardar

Supervisor: Dr. Vishal Walmik Dhote

The experiment was conducted at the experimental farm, RKMVERI, Morabadi, Ranchi, Jharkhand during summer, 2018 to study the effectiveness of different bio-pesticides against fruit borer infesting tomato. The eight different treatments *viz.* *Dashparni* 10%, *Dashparni* 5%, *Dashparni* 5% + *Neem Oil* @ 0.5%, *Dashparni* 5% + *Karanj Oil* @ 0.2%, *Dashparni* 5% + *Tobacco Decoction* 10% and *Bacillus thuringiensis* (*Bt.*) and untreated control were selected for the study. According to the observations and statistical analysis, T6 (application of *Bt*) was the most superior treatment and recorded lowest infestation followed by *Dashparni* (10%) (T1), *Dashparni* 5% + *Neem Oil* @ 0.5% (T3), *Dashparni* 5% + *Tobacco Decoction* 10% (T5), *Dashparni* 5% + *Karaj Oil* @ 0.2% (T4) and *Dashparni* 5% (T2). In case of yield obtained, T1 recorded highest yield followed by T5, T6, T2, T3 and T4. During the study, biopesticides were found effective against the fruit borer infesting tomato.

Title: Efficacy of Different Bio-pesticides against Mango Hopper

Scholar: Anant Kumar

Supervisor: Dr. Vishal Walmik Dhote and Dr. Rajesh kumar

The present investigation was carried out at the experimental farm, Divyayan Krishi Vigyan Kendra, Morabadi, Ranchi during Zaid, 2019 to study the efficacy of different biopesticides against mango hopper. During the experiment, sixteen different species of arthropod *viz.* mango hopper, mealy bug, aphid, jewel bug, lady bird beetle, spider etc were found visiting the field. The efficacy of seven different treatments *viz.* T1: - *Dashparni* 10%, T2: *Dashparni* 15% , T3: Alternate application of *Dashparni* 10% - *Verticillium lecanii* (1×10^8 cfu) @ 8g/ L twice. T4: - *Verticillium lecanii* @ 8g/L water, T5: Alternate application T₇: *untreated control* were evaluated against hopper. Among the different treatments, T₄ (12.15 mean hopper population/ panicle) was the best treatment and recorded the 82.38 per cent reduction of population of hopper over the control which was at par with T5 and both the treatments were significantly superior over other treatments. The second-best treatment was T5 (12.94 mean hopper population/ panicle and recorded the 71.25 per cent reduction of population of hopper) followed by T6 (13.12 mean hopper population/ panicle and recorded 68.92 per cent reduction of population of hopper), T2

(13.62 mean hopper population/ panicle and recorded 62.74 per cent reduction of population of hopper over control), T3 (15.14 mean hopper population/ panicle and 46.37 per cent reduction of population over control). The highest yield was recorded from the plants sprayed with *Verticillium lecanii*.

Title: Effectiveness of Different Bio-pesticides and Plant Extract against Aphid infesting Cowpea

Scholar: Kumar Subham

Supervisor: Dr. Vishal Walmik Dhote

The present investigation was carried out at the experimental farm, RKMVERI, Morabadi, Ranchi during Kharif, 2018. During the experiment, arthropod diversity was also recorded and it is found that 13 different species of arthropod viz. Aphid, Jassid, Lady Bird Beetle, Tobacco leaf eating Caterpillar, Red ant, Black ant etc. visited the field. During the season, cowpea was continuously attacked by two species of insect pests viz., Aphid and Tobacco leaf eating Caterpillar. The eight different treatments viz. Dashparni 5% (T₁), Dashparni 10% (T₂), Dashparni 15% (T₃), alternate application of Dashparni 10% + Neem oil 0.3% (T₄) alternate application of Dashparni 10% and Karanj 0.5% (T₅), Neem oil 0.3% (T₆), Karanj 0.5% (T₇) and untreated control (T₈) were evaluated against aphid. Among the different treatments, T₇ was the best treatment which was significantly superior over the other treatments followed by T₃, T₆, T₄, T₂, T₅ and T₁. From the present experiment it can be concluded that *Dashparni* can effectively be used either singly or in combination with other bio-pesticides like Neem oil and Karanj oil at an interval of 10 days for the management of aphid infesting cowpea.

Title: Biorational Management of Shoot and Fruit Borer infesting Brinjal

Scholar: Krishna Kumar Mahli

Supervisor: Dr. Vishal Walmik Dhote

The present investigation was carried out at the experimental farm, RKMVERI, Morabadi, Ranchi during summer, 2019. During the experiment, arthropod diversity was also recorded and it is found total 13 different species of arthropods were found visiting the field. Among the recorded species, 12 were hexapods and 1 spider. The hexapods are then categorized into different groups according to their activity like insect pest, predators, parasitoid, pollinators etc. Among hexapods, 10 different species were insect pest and 2 were predators. Other than hexapods, only Spider was found. During the study, seven different treatments viz. Dashparni 10% (T₁), Dashparni 15% (T₂), Dashparni 10%+Neem oil 0.5% (T₃), Neem oil 0.5% (T₄), Beauveria bassiana A.S 2% (T₅), Bacillus thuringiensis (Bt) 2% (T₆) and an *untreated control* (T₈) were evaluated against shoot and fruit borer. Among the different treatments, Dashparni

10%, Dashparni 15% and combination Dashparni 10% and neem oil were effective against the pest in reducing the infestation. The highest yield and benefit was recorded in Dashparni 10% followed by Dashparni 15% and combination Dashparni 10% and neem oil.

Title: Studies on Biology of Pulse Beetle (*Callosobruchus Maculatus*) on Stored Pea under Laboratory Conditions

Scholar: Tiasha Roy

Supervisor: Dr. Vishal Walmik Dhote

Pulses are the second most important group of crops all over the world next to cereals. Among the different pulses, pea is one of the imperative pulse crops being grown as vegetable and also for seed purpose. But during storage it attacked by several storage insect pest. Pulse beetle, *Callosobruchus maculatus* (Coleoptera: Bruchidae) is one of the devastating pests of stored pulses. The biology of pulse beetle (*C. maculatus*) was studied under laboratory condition at Ramakrishna Mission Vivekananda Educational and Research Institute, Morabadi, Ranchi (Jharkhand). During the study the pest was reared on pea under laboratory conditions. The incubation period was 4 days. The larval and pupal period varied from 16 to 18 days with an average of 17 days. The pre-oviposition, oviposition and post oviposition period was 6.5 hours, 7 and 2 days, respectively. The longevity of adult female and male beetle was 8.5 and 7.5 days, respectively. The total life cycle of *C. maculatus* was completed in 36 days.

Title: Toxicity of Different Plant Extracts against *Spodoptera litura* Under Laboratory Conditions

Scholar: Jayabrata Bardhan

Supervisor: Dr. Vishal Walmik Dhote

Tobacco leaf eating caterpillar, *Spodoptera litura* (Noctuidae: Lepidoptera), is one of the important polyphagous crop pest of almost 120 plant species of plants including main crops like groundnut, jute, lucerne, maize, soyabean, tea, tobacco, aubergines, capsicum, potato, cucurbits, cowpea etc. Several chemical pesticides had been used since 1940s for the management of this pest. But excess use of these synthetic pesticides resulted adverse effect on both environment and living beings. These effects diverted the attention of researchers and farmers to the use of botanical pesticides once again. The study was conducted to assess the toxicity of the leaf extract of Karanj, Datura, Caltropis, Promegranate and Papaya which are being used for the preparation Dashparni. During the study, the 100% mortality was recorded in three different treatments, Caltropis 25%, Promegranate 25% and Papaya 25% after 72 hours. The least

mortality was recorded in Karanj 20%. From the present study it can be concluded that all the plants have insecticidal activity and may be used effectively in the field either individually or in combination for management of different lepidopteran pests infesting different crops.

Title: Arthropod Diversity of Different Organically Grown Crops

Scholar: Anirban Ranjit

Supervisor: Dr. Vishal Walmik Dhote

The experiment was conducted to record the arthropod diversity of different organically cultivated crops during 2018-2019 at Ramakrishna Mission Vivekananda Educational Research Institute (RKMVERI, Ranchi, Jharkhand, 834008) and Divyayan Krishi Vigayan Kendra (DKVK, Morabadi, Ranchi, Jharkhand, 834008). The different selected crop were brinjal, okra, tomato, broccoli, cauliflower, cabbage, potato, French bean and chilli. The different major species of arthropods visiting brinjal were aphids, leaf hopper, grasshopper, shoot and fruit borer, mealy bug, spider, lady bird beetle etc. Okra was found visited by ladybird beetle, shoot borer, aphid, grasshopper, whitefly, mealy bug, etc. The different major species of arthropods visiting tomato were aphid. fruit borer, stink Bug. ladybird beetle. The different species of arthropods recorded from broccoli, cabbage and cauliflower were diamond back moth, aphid, whitefly, painted bug. The arthropods like aphids, whitefly, ladybird beetle were found visiting the potato. The arthropods diversity of french bean included aphids, grasshopper, leaf Roller, leaf miner. The different species of arthropods recorded from chilli were aphids, spider, whitefly, ladybird beetle, thrips and mites. Mustard was found visited by aphid, diamondback moth, ladybird beetle.

Title: Toxicity of Dashparni against *Spodoptera litura* under laboratory conditions

Scholar: Kallol Ghosh

Supervisor: Dr. Vishal Walmik Dhote

Spodoptera litura is a polyphagous insect pest that have become a significant pest in recent years. Different plant extracts either individually or in combination are being widely used for the management of different insect pests. The present experiment was conducted to assess the toxicity of two different formulations of Dashparni (prepared by two different methods) against *Spodoptera litura* under laboratory conditions at RKMVERI, Ranchi. The Leaf deep method was used for conducting experiment. The bioassay study of different preparations of Dashparni against *S. litura* revealed that all the three concentrations of instant Dashparni (10%, 15% and 20%) were effective in causing the mortality of the test species than fermented Dashparni.

More than 50% mortality was recorded in instant Dashparni except lower concentration (10%) just within 24 hours of exposure. After 72 hours of exposure, more than 90% mortality was recorded in instant Dashparni except lower concentration i e T₁ and more than 80% mortality was recorded in fermented Dashparni except lower concentration (10%).

Section G: Miscellaneous

Title: Effect of different substrates on the yield of Mushroom (*Pleurotus florida*)

Scholar: Arvind Kumar Paswan

Supervisor(s): Dr. Anirban Maji

Mushrooms with other fungi are something special in the living world, being neither plants nor animals. They have been placed in the kingdom of their own called the kingdom of Mycetozoa. There are more than 1000 of mushroom species around the world. Among them some species are cultivated and some are poisonous. *Pleurotus florida* (oyster mushroom) is important mushroom species and very popular in India. The production of *Pleurotus florida* is next to *Agaricus bisporus* (button mushroom) in the world. Under this circumstance, the present study was carried out at Ramakrishna Mission Vivekananda University to investigate better yield performance of the said species by using locally available materials having six different treatments namely, T₁ (mustard straw), T₂ (guava leaves), T₃ (kusum leaves), T₄ (sal leaves+paddy straw), T₅ (kusum leaves+paddy straw) and T₆ (paddy straw) with three replications in completely randomised design (CRD). Results indicated, when T₃ (kusum leaves) alone used as substrate takes longer days for development of spawn run as well as pinhead formation but, after addition of some T₆ (paddy straw), the days to spawn run reduced to almost half. In respect to fruit bodies and yield, mustard straw performed better than other substrates, whereas, paddy straw was more consistent performer for highest length of fruit bodies and highest weight of fruit bodies. The overall analysis concluded that best performer was mustard straw and farmers should advocate producing *Pleurotus florida* on this substrate. The significant positive and high association between days to spawn run and days to pinhead formation, number of fruit bodies and average yield advocated these characters should be considered for improvement of mushroom production.

Title: A study on waste water utilization through fish farming

Scholar: Biplab Sarkar

Supervisor(s): Dr. Anirban Maji

A study was undertaken in Bonhooghly, North 24 Parganas, West area to understand about the waste water utilization and the benefit that comes from fish farming. It was observed that total fifty farmers were involved in fish production and coverage of waste-water body was nearly about 30.54 hectare. Different fingerlings of fish species like, catla, rohu, mrigal, common carp, grass carp, tilapia were sown in the pond area in standard ratio thrice in a year. A good quantity

of marketable fishes was obtained from the pond four to five times in a week and harvested fishes were marketed in Kolkata and Howrah area to meet the demand of fishes. The demand of these fishes was very high to neighbouring areas. The study also revealed that providing minimum cost maximum returns were obtained by this technology. The farmers who used to cultivate fish in that particular area received job throughout the year. Moreover, the study pointed out that this technology was feasible as well as profitable to support livelihood for unemployed people.

Title: Performance of some quantitative characters of rice genotypes grown under rainfed condition

Name of the Scholar: Parth Sarthi

Supervisor(s): Dr. Anirban Maji

Performance of some traditional rice genotypes having seventeen quantitative characters were evaluated in the kharif season, 2011 in Jharkhand. Significant variation was observed in different component characters. Genetic variability and correlation coefficients were also estimated for these morphological traits. Highest GCV and PCV were reported for total number of productive tillers/hill, number of unproductive tillers/hill, number of seeds per panicle, days to maturity, straw yield and yield per plant. High heritability was observed for all the traits except, harvest index. High heritability accompanied by moderate to high genetic advance as percent of mean was observed for plant height, number of tillers per plant, panicle length, leaf blade length, leaf width, 100 grain weight, grain yield per plant and straw yield. Grain yield per plant was positively and significantly associated with days to 50 % flowering, days to maturity and other seven characters. Most of the traits showed high additive gene action and simple pedigree selection would be rewarding for these characters. Character association both at genotypic and phenotypic level indicated selection can be done for the each and individual characters for trait-based crop improvement and for further hybridization programme.

Title: Participatory approach for collection of germplasm (seed): experiences with farmers in remote tribal villages in Angara block of Ranchi district and Murhu block of Khunti district, Jharkhand

Scholar: Parth Sarthi

Supervisor(s): Dr. Anirban Maji

India is a great centre of diversity for different crop and plant species. Many crop and plant species were probably originated in this region. Two hot spots of bio- diversity has already present in our country. Moreover, existence of diversified nature of eco-regions along with different crop

genetic resources has made our country resourceful. The eastern part of our country, Jharkhand, is considered as one of the richest sources for genetic stocks like land races, primitive cultivars, weedy forms of wild species etc. The tribal and remote area of Angara and Murhu blocks in Jharkhand has enormous potentiality of such types of genetic materials. The farmers of these two blocks of different villages knowingly or unknowingly still cultivating such traditional genotypes for consumption and maintaining their livelihood. Collection, trapping, documentation and sharing knowledge with the farmers who are cultivating such types of genetic materials, is one of the challenging tasks to the scientists and plant breeders, otherwise such type of valuable genetic resources could be extinct or loss forever. At present, farmers of those areas are taking up modern varieties in favour of indigenous or primitive cultivars that have different important characteristic features which may play a vital role in future agricultural development and food security would have been lost for us in this century, and more are threatened. Seeing such situation, the investigation has been made on participatory collection of germplasm (seed) in Angara and Murhu block of Jharkhand and comparatively studied. From the studied areas twenty-two rice, four maize, two bajra, two finger millet, three coarse millets, two mustard, one niger, three urd, two arhar genotypes were collected through participatory approach among the farmers. The experiences of farmers during farming and regarding different quantitative and qualitative parameters were also recorded. The study revealed that these collected genotypes could be the valuable resources in the crop improvement programme. Therefore, collection, testing, documentation and conservation should be taken to conserve such types of endangered or threaten crop genetic resources for future generation.

Title: Tribal medicine: resources, processing and treatment

Scholar: Ramprakash Kumar

Supervisor(s): Dr. Anirban Maji

An investigation was conducted in tribal dominated blocks of Angara, Burmu, Ormanjhi, Kanke and Silli blocks of Ranchi district to collect the information about the resources, processing and treatment tribal medicine used against different diseases. The study indicated that local doctors (baidya) were very much aware of the herbal resources for preparation of drugs in those respective areas. The diverse natural plant resources were utilized by the baidya and collected from forest as well as the village surrounding areas. The novel innovation as well as indigenous technology used to save the tribal people from different diseases generation after generation. As their day-to-day need was totally dependent on the forest and they obtain food, medicine, shelter and other food materials from plants. It was well established fact that their vast knowledge and wisdom in respect to plants is noteworthy. During the course of survey, the

descriptions including vernacular names, botanical names, and parts of plant used and processing technology were also documented. The study indicated that processing of these medicine was very simple and doses given to the patients according to the age. It was interesting to note that prepared drugs can be stored for long time. It has been observed that the traditional knowledge on use of medicinal plants is disappearing fast among the younger generation mainly due to the fact that the pertinent knowledge is not properly passed on them by knowledgeable elderly persons. Therefore, younger generation of the areas should be encouraged by the Government to protect and cultivate these valuable herbal plants before they get lost due to the impact of modernization and also due to deforestation.

Title: Study on paddy-cum-fish farming and its economics

Scholar: Ranik Seth

Supervisor(s): Dr. Anirban Maji

An investigation on the economics of paddy-fish farming system was conducted in the block of Moyna under East Midnapore district of West Bengal. The study was carried out among 35 farmers and average land holding was observed 28.34 ha. The study revealed that farmers of this respective blocks followed paddy-fish farming by simultaneous and rotation techniques. About 62.85% farmers were under the age group of 21 to 60 and their education level was below matriculation. The cost of the paddy cultivation was Rs. 32,128.30/ha., cost of the fish cultivation was Rs.1,43,255.95 and land rent cost was Rs 245670.99. Therefore, the total cost of cultivation by this method was Rs. 4,21,055.24. Profit was estimated 60% over total income. The study also pointed out the surplus labours of the local area had better employment opportunity through this farming system.

Title: Pulse production; problems and prospect in some villages of Jharkhand

Scholar: Ravindra Nath Mahto

Supervisor(s): Dr. Anirban Maji

The present investigation was carried out two villages namely; Dombodih and Bhuyandih in Tamar block of Ranchi district to know the situation of present pulse production and their problems. Fifty farmers were taken for study and twenty-five from each village. The analysis indicated that most of the respondents were male (94%) and rest were female (6%). The education standard of most of the farmers was within 10th-12th class. The maximum farmers had the small land holding size where they cultivated different pulse crops. In respect to individual land holding pattern, a farmer of Dombodih village was quite high as compared to Bhuyandih

village. The average land holding for each farmer was recorded 1.7 acre. Different pulse crops like, arhar, lentil, gram and mungbean were grown in the respective villages. The overall average income through pulse production was estimated Rs. 69,260.

Some problems like, lack of improved varieties, poor nourishment and cultivation in marginal lands, no control measures in disease and pest attack etc. were identified in pulse cultivation. To counteract these situations initiatives should be taken up by the government through training and demonstration to increase awareness in the farmers regarding pulse crops.

Title: Impact assessment of seed village scheme implemented by Divyayan Krishi Vigyan Kendra, Morabadi, Ranchi

Scholar: Rudrajit Sarkar

Supervisor(s): Dr. Anirban Maji

Despite a far-reaching demand of improved seed in household level, the formal seed sector has been incapable of providing good quality seed in a required amount and in a timely manner. So, there was a need of a comprehensive seed production programme in ground level which would ensure the full participation of farmers. Thus, Seed Village Scheme was carried out with the objective of organising seed production cluster, increasing seed production, meeting local demand, increasing seed replacement rate as well as introduction of new crops.

Divyayan Krishi Vigyan Kendra, Morabadi, Ranchi initiated the Seed Village Scheme in 2006 in 16 villages of Jharkhand. In this context, present study has been carried out to assess the impact of this seed village scheme implemented by Divyayan KVK in four villages (Mahuatungri, Soba, Khakhra and Kharkutoli) of Angara and Burmu blocks of Ranchi District. The crops cultivated under the scheme were pea, French bean, cowpea, groundnut, ginger, elephant foot yam, cucumber and bottle gourd. Total cultivated land was covered for seed production purpose in 57.1 acre of farmers' field of respective four villages. In this study, it was observed that the seed production programme was terminated as the farmers refused to continue the programme due to severe drought in the year 2009 and 2010. Moreover, the hailstorm in the year 2006 and 2007 reduced the yield to a great extent in the villages of Burmu block. However, a positive change in the package of practices of the farmers was observed. Besides, this seed production cluster of French bean, ginger and groundnut was observed to be developed. Lack of perception and motivation was also a major factor to reduce the seed production. The seeds were ultimately brought to the KVK where the seed processing unit was established and the TFL seed was named as Divya Seed. For the betterment of the scheme, it is recommended that good irrigation structure should be constructed and a clear-cut road map should be prepared to uplift the present situation of scientific storage and government seed certification.

Title: Optimization of hardening process of tissue culture Banana plantlets for better survival rate.

Scholar: Mayank Kumar Dwivedi

Supervisor(s): Mrs. Neha Rajan

The experiment has been conducted during October 2015 to June 2016 at Ramakrishna Mission Divyayan Krishi Vigyan Kendra, Morabadi, Ranchi-834008 to study the “Optimization of hardening process of tissue culture Banana plantlets for better survival rate”. Four treatments viz. T₁. Coco pit + soil + vermin compost, T₂. Coco pit + soil, T₃. Vermin compost + soil, T₄. Vermin compost + coco pit. And the same composition of media has been repeated in treatment T₅, T₆, T₇, and T₈ which was covered with plastic. From this result, we can say that the composition used in treatment-5 in which all the materials Soil, Vermicompost & Coco Pit are mixed in the same ratio (1:1:1). Which survival percentage is high but in all the treatments it is found that plastic-covered plantlets have shown better results in comparison to non-plastic cover.

Title: Effect of Botanical Pesticides on Diamond Back Moth and Aphid Infesting Broccoli

Scholar: Nabin Das

Supervisor(s): Dr. Rajesh Kumar

After the green revolution in agriculture, India has shifted its way to the conventional method of farming which is based mainly on chemicals. But later on, due to misuse and overuse of chemicals the toxicity in agriculture field is now a matter of great concern as the cost of cultivation has increased and the productivity of farms is decreasing. The farmers of the Jharkhand are mainly small and marginal farmers; they are characterized as lacking of resources. These people cannot afford the cost required for the cultivation in the conventional method, so the use of organic input is an effective alternative to minimize the cost required for cultivation. Considering these factors, an experiment has been conducted at the Experimental farm of DIVIYAN Krishi Vigyan Kendra, Morabadi, Ranchi-834008, Jharkhand, India, during the Rabi season of 2015-16. The Randomized block design was adopted along with seven treatments (made up of some easily available materials like cow dung, cow urine, chilli, garlic, some of the plant leaves). The changes in the population of Diamond Back Moth (DBM) and the aphid population were recorded at the 1st, 3rd, and 5th day after each spray to evaluate the efficacy of the pesticides and the treatment solutions were sprayed at 7 days interval. After the first spray of the chilli garlic extract treatment (T2) the pest population was reduced [by 54%] over the control population which goes on increasing with each spray and at the last spray there was about [92%] reduction in DBM population density over the control. The Chilli- garlic extract [T2] emerged as the best treatment for controlling DBM attack on Broccoli, followed by Dasparni + tobacco stem (500 g/

lit) [T6]. The aphid population was recorded at 3.11 aphid/plant lowest at the second treatment at the fifth day of the sixth and fourth spray, but the highest percentage reduction (73%) over the control population was recorded in the case of the sixth spray. The highest yield, as well as the benefit-cost ratio, was recorded in the case of T₂, Chilli-garlic extract[4.6), followed by the T₆, Dasparni-tobacco stem extract [4.2], lowest benefit-cost ratio was found (3.0) in the untreated control (T₇). The experiment concluded as the use of botanical pesticides can also increase the yield significantly and can be helpful for obtaining better economic returns.

Title: Income and Livelihood Pattern of Tribal People of Jharkhand

Scholar: Puja Kumari

Supervisor(s): Dr. Asim Kumar Mandal

The present investigation was carried out in two different villages namely Bariband and Matkoma village under Bariyatu block of Latehar district of Jharkhand from January-2015 to May-2015 with the help of questionnaires and interviews among the selected farmers.

The farmers studied belong to marginal, medium, or small categories. The topography of the studied area is undulated comprising low, medium, and upland situations. The selected farmers grew several agricultural crops and had animals as allied resources to sustain their livelihood. The most important crops are paddy, maize, potato, tomato, etc. Agricultural crops were mostly consumed by the farmers themselves. For meeting the cash requirements of the family maize as well the animal is sold.

Income and livelihood patterns play an increasingly important role in managing the lifestyle sources of income of the farmer. Research is needed to ensure that new project draws upon lessons from their predecessor's experience. The quantitative and qualitative evaluation methods, which traditionally have been used separately, both have strengths and weaknesses. Combining them can make evaluation more effective, particularly when constraints to study design exist. This paper presents the income and livelihood patterns of tribal people of Balumath Block, Letehar district, Jharkhand.

Title: A Study on Skill Development and Employment Generation through Lac Cultivation in Tribal Areas of Khunti District

Scholar: Ramjeevan Mahto

Supervisor(s): Dr. A. K. Singh

The present study entitled “A Study on Skill Development and Employment Generation through Lac Cultivation in Tribal Areas of Khunti District” was carried out at Rania block of Khunti district of Jharkhand during the agriculture year of 2016. The study is based on the data collected from randomly selected 63 households (trained and untrained) through a well-structured questionnaire and personal interview method. It was found that out of a total of 63 identified households, 41% and 32% of households belonged to small and medium categories and 19% and 8% were large and very large categories respectively. The age-wise distribution of sampled households varied from 29 years to 50 years. Overall, households belonged to the age group of 45 years. The educational backgrounds of the head of the households were very low. The average landholding size varied from 2.44 acres to 5.5 acres across various categories of households and the landholding size of the households increased as the number of lac host trees increased. Average annual income per household varied from * 27000 to 58000 across various categories of households. The study revealed that there was a positive impact of training on lac growing households in terms of host utilization, livelihood conditions, and income and employment generation. The host utilization has been found to increase significantly after training of households in comparison to untrained households. A significant shift from lower production group to higher production group has been observed by trained households. The share of lac income in total income has increased 27.4% in the case of trained households while 9% in the case of untrained households over the year. More increase in employment generation and net returns were found in lac cultivation for trained lac-growers. A higher level of brood lac production resulted in self-sufficiency in brood lac and more utilization of host trees for lac cultivation. A higher benefit-cost ratio was found in trained than untrained households for lac cultivation on all the lac hosts. The disposal pattern of crop outputs was found that 73.4% of phunki was sold to paikar and rest quantity was sold to the small trader, 62.3% of scraped lac was sold to the big traders, 15.7% to paikar, and 21.9% to the small traders and 85.2% of brood lac sold to the NGOs or any organization and rest 14.8% to villagers or relatives. Households utilized the technologies in lac cultivation such as phunki lac removal was adopted by 100% of households. 52 % of trained and 5 % of untrained households cultivated lac by proper pruning. Nearly 38% of trained and 6 % of untrained adopted the technique of bundling of brood lac and tagging on the plant.

Title: A Study on Traditional Farming Practices in Latehar District of Jharkhand.

Scholar: Savita Oraon

Supervisor(s): Dr. Asim Kumar Mandal

This study aimed to have first-hand information on traditional farming practices and socio-economic characteristics of the farmers of Matkoma and Bariband village under the Bariyatu block. Primary data was collected in 2015 at Bariband and Matkoma village. The information was collected from purposively selected farmers. The data collection techniques included a household survey with the help of a pre-designed schedule, focused and personal interviews and guided field walks. The collected data were processed and analysed categorically to arrive at the conclusion. The finding shows that in Bariband and Matkoma village most of the farmers belong to small and marginal categories. Farming is entirely dependent on monsoon rain. Paddy is the main Kharif crop. During rabi wheat and potato are grown by a few farmers with limited facilities for irrigation. Paddy, wheat, and potato are mainly consumed by the farmers themselves. Maize is another crop grown mainly for sale, though a small quantity of produce is consumed. Sale proceeds from maize and animal resources particularly, cow and buffalo milk, goat, hen, pig add to their main cash income. The literacy rate is higher than the national average in both the villages. There is little imbalance in the sex ratio, but the villages complement each other. A number of constraints including migration during no crop season, no facilities for higher education, and irrigation facilities were observed.

Title: Effect of organic farming on chemical and biological properties of soil under rain-fed conditions of soil

Scholar: Sohini Deb

Supervisor(s): Dr. Ajeet Kumar Singh

Organic farming practices enhance the activities of soil microorganisms that's why soil biological properties have been improved through organic agriculture. These microorganisms provide soil and plant with different kinds of nutrients in various forms. That also improves soil fertility and crop health.

Due to organic agricultural practices, the chemical properties of soil are also improved towards better soil health and crop quality. Organic farming systems maintain the required range of pH for growing different crops. Organic agricultural practices also increase the availability of organic carbon in the soil.

Organic farming enhances overall soil health and fertility by growing healthy crops in a low cost and without harming the quality of crops and our environment.

Title: Effect of liquid organic manure on growth, yield, and fruit quality of tomato

Scholar: Suman Guchhait

Supervisor(s): Dr. Brijesh Pandey

The present investigation under the project title “Effect of liquid organic manure on growth, yield and fruit quality of tomato” was carried out at Divyayan KVK, Morabadi, Ranchi-834008, Jharkhand, India, to find out and observe the influence of different liquid organic manure on growth, yield and fruit quality of tomato cv. Laxmi (5005). The treatments were: T1 = Panchagavya (3%); T2 = Shasyagavya (10%); T3 = Poudh Sanjeevani (10%); T4 = Beej Sanjeevani (20%); T5 = Seaweed extract fertilizer, T6 = Cow urine (10%) and T7 = Control. The growth, yield, and fruit quality of tomatoes were influenced by the application of liquid organic manure. In this context, T₁ (panchagavya (3%)] emerged as the best treatment where a maximum fruit yield of 18.46 t/ha but the highest benefit-cost ratio of 3.52 was recorded in T₆ (10% cow urine). Higher yield may not be associated with the higher quality attributes, thereby, when quality traits were taken into consideration it was observed that different treatments were performed independently. Soil physio-chemical properties are increased by the application of liquid organic manure. As a consequence, liquid organic manure not only increases the growth, yield, and fruit quality of tomatoes but also improves soil physio-chemical properties.

2.

Division of Rural and Tribal Development

Section H: Rural and Tribal Livelihood

Title: Non-Farm Employment in Non-Timber Forest Product Based Enterprise: A Study on Leaf Plate Making

Scholar: Ramkrishna Mahto

Supervisor(s): Dr. P. Dash Sharma and Dr. Dipankar Chatterjee

The present research is an endeavour to explore the potential of Non-Timber-Forest Product based enterprises with special reference to leaf plate making. The study has been carried out in the Angara block of Ranchi district in Jharkhand. The prime objective was to identify the better strategy to develop leaf plate making as a viable source of income and as an instrument for the empowerment of rural women. The study entails the production and marketing paraphernalia, activities of different actors associated with these activities as well as the threat and opportunities associated with this livelihood. Finally, some recommendations have been made for the better utilization of the Sal leaf as a resource for the improvement of earning opportunity.

Title: Economic Upliftment through Pig Rearing and Pig Farming in Angara Block, Ranchi, Jharkhand

Scholar: Ramprakash Kumar

Supervisor(s): Dr. Dipankar Chatterjee

Crop–animal system plays an important role in the mixed, small-farm households. Livestock convert plant materials of low nutritive value to high quality products such as meat and milk and return nutrients to the soil in the form of manure. This synergistic interaction between livestock and crops improves the sustainability of the farming system and maintains or improves soil fertility. Considering the above backdrop Angara block of Ranchi district of Jharkhand has been selected to understand the potentiality of pig farming as a supplementary source of livelihood for the villagers. The block is dominated by the tribal population namely Bedia and Oraon. The tribal communities keep pigs, chickens and other livestock because they are the part of tradition and culture. These communities lack income opportunities and suffer from seasonal unemployment. Many of these household lack basic necessities and they have very limited chances for education. To transform this situation the research intends to explore the potential of pig keeping system for augmenting livelihood of the rural areas.

Title: Watershed Development Project and Village Livelihood: A Comparative Assessment of Two Villages of Silli Block of Ranchi, Jharkhand

Scholar: Arun Baraik

Supervisor(s): Dr. Dipankar Chatterjee

The present research is an endeavour to explore the role of watershed development project in augmenting rural livelihood. The study has been carried out in two villages, one watershed village (Nawadih) and the other is non-watershed village (Harwadih) to get a comparative picture. The result shows that the sustainable management of natural resources especially bringing in diversified livelihood in a remote watershed with poor infrastructure could provide livelihood opportunities in a village (Nawadih) and people need not migrate. Watershed development played a vital role in the Nawadih village. Institutional development particularly formation of SHGs at the village level and capacity building helped substantially to improve livelihoods. The local institutions like watershed committee, SHGs, helped to mobilize financial flow with lower transaction costs. Other activities like awareness building along with capacity building initiatives have increased as a spill over. Agriculture is a main source of livelihoods in both the villages, however, with capacity building and higher collective action in Nawadih and through watershed development initiatives substantial gains in agriculture production were achieved and incomes have increased over last few years substantially. The community empowerment and diffusion of new source of livelihoods opportunities in the village of Nawadih, have enhanced the ambit of livelihoods of people in the village. The better livelihoods opportunities have changed the purchasing power of households resulting higher investment in agriculture and allied activities. New employment opportunities and diversification of income along with supplementary irrigation have substantially reduced the vulnerability of drought and brought substantial multi fold impacts on the livelihoods.

Title: Non-Timber Forest Products (NTFPs) for Food and Livelihood Security: A Study in the Tribal Village of Jharkhand

Scholar: Chandan Singh Wadde

Supervisor(s): Dr. Dipankar Chatterjee

The present research is an endeavour to explore the importance of NTFPs in providing food and livelihood security among the tribals. The study has been carried out in Khirda village under Bero block of Jharkhand which is predominantly inhabited by the Oraon community. The tribal communities in the study region mainly depend on NTFPs for their livelihood and earn substantial income from these products. The NTFPs extracted are *Sakhua* leaf, *Ber*, *Aonla*, *Jamun*, *Rugra* (wild mushroom) honey, *Kendu* leaf, medicinal plants etc. These resource

extractions are done for both commercial and subsistence purpose. The demand for these products is often seasonal in nature and depends on natural growth and regeneration, which makes their productivity unpredictable. Collection and selling of NTFPs is an important source of income and it contributes to food security of the people dependent on this by enhancing their income and in turn increasing their purchasing power, which creates economic access to food. So far very few studies have been done in the study area focusing poor situation of tribal economy. This study tries to fulfil this gap by analyzing the contribution of NTFP towards food and livelihood security.

Title: Visible Yet Invisible: Rural Women's Contribution in Livelihood through Unpaid Household Work

Scholar: Arindam Ghosh

Supervisor(s): Dr. Dipankar Chatterjee

While some research has been conducted on the issue of the unpaid work performed by women, very few studies has been conducted to attempt to arrive at a reasonable estimate of the approximate monetary value of the work done by women without pay in India. Such a figure could help address the problem of undervaluing women and contribute to discussions on the actual role of women in the society and thus the importance of rectifying the discrimination which women face from before their birth until their death. This research is thus intended to address a major research gap and to respond to the consequences of treating millions of hard-working Indian women as economically unproductive and no more valuable than beggars and prisoners. This study found that a typical woman's day starts at about 5 a.m. and ends after 10 p.m. In addition to their unpaid household activities, women often spend six to eight hours per day on paid activities. This double burden left such women with little time for themselves.

Title: Crafting as Tribal Livelihood: A Study on Bamboo Craftsman of Angara Block, Jharkhand

Scholar: Mangat Ram Nureti

Supervisor(s): Dr. Dipankar Chatterjee

India has the largest concentration of tribal population in the world. The tribal are the children of nature and their lifestyle is conditioned by the eco-system. India due to its diverse ecosystems has a wide variety of tribal population. The tribal handicrafts are specialized skills which are passed on from one generation to another and these handicrafts are means of livelihood of the artisans. However, in absence of any organized activity in this sector and the products not being adequately remunerative, there is a possible likelihood of the artisans taking up alternate

livelihood options (which may involve migration as well). In such a case this age-old activity will die its own death. At this stage it is very imperative to understand the problems faced by this sector and suggest the strategies for development of tribal handicraft based on which certain policy level interventions need to be taken by the government to sustain the traditional tribal handicrafts. This project finds out different problems associated with Mahali craftsmen engaged in producing bamboo handicrafts in the Kuchu village of Jharkhand. The main objective of the study is to assess the bamboo craft as livelihood options for the Mahali tribal community of Kuchu village, Angara, Jharkhand. Mahali has a distinguished craft heritage. Their rare artistic skill has been streamlined in the manufacture of exquisite household pieces. However, the artisan community faces a number of problems and need intervention to improve their quality of life. The study highlights that the community of the studied village suffers from the supply of raw materials, profitable marketing opportunity, proper skills and awareness related to product development. This project, through primary research also finds out other structural and functional problems associated with the community and suggests solutions which can be extrapolated for different artisan community.

Title: Watershed and Livelihood: Assessment of Two Micro-Watersheds of Angara Block, Ranchi, Jharkhand

Scholar: Jagdish Kumar Mahto

Supervisor(s): Dr. Dipankar Chatterjee

Watershed projects play an increasingly important role in managing soil and water resources throughout the world. Research is needed to ensure that new projects draw upon lessons from their predecessors' experiences. However, the technical and social complexities of watershed projects make evaluation difficult. Quantitative and qualitative evaluation methods, which traditionally have been used separately, both have strengths and weaknesses. Combining them can make evaluation more effective, particularly when constraints to study design exist. The present research is an endeavour to explore the impact of watershed project in increasing the livelihood assets of a rural community. The study has been carried out in the framework of two micro-watershed villages (Rupru and Dhurletta) of Jharkhand. The study reveals that the project plays an important role in creating livelihood assets in both villages. In both villages, agriculture is the main source of livelihoods, however, with capacity building and higher collective action in Dhurletta and through watershed development initiatives substantial gains in agriculture production were achieved and incomes have increased over last few years substantially. The community empowerment and diffusion of new source of livelihoods opportunities in both villages have enhanced the ambit of livelihoods of people. Migration is significantly reduced after the project implementation. The study suggests that gender balance need to be established

with improved technologies and interventions to reduce drudgery along with impetus to female literacy, primary enrolment, health services etc.

Title: Migration and Livelihood: An Exploratory Study on Rural-Urban Migration in Jharkhand

Scholar: Arun Baraik

Supervisor(s): Dr. Dipankar Chatterjee

Rural-urban migration is increasingly becoming an important livelihood strategy in rural India, particularly in rural Jharkhand. The present research has been carried out in the purposively selected remote village and road-side village for documenting factors for and patterns of the rural-urban migration investigating the impact of rural-urban migration on the local households' and analysing migration-related threats encountered by the migrants in urban areas, as well as their coping strategies. A myriad of migration theories was employed to understand factors behind migration. A qualitative approach was adopted, although data was both qualitatively and quantitatively analysed. Respondents were both randomly and purposely selected and in-depth interviews were conducted with 50 migrants of remote village and 50 migrants of road-side village. The study revealed that the villagers have been migrating to nearby town/ city mainly due to the household poverty emanating from the decline of agriculture enterprise, prompted by climate change, insufficient access to land, livestock diseases, unemployment and resource conflicts. Rural-urban migration was catalysed by inconsistent land and development policies, social networks, migrants and households' aspirations and technology, notably improved communication and transportation networks such as mobile phones and road networks. Finally, it is essential to analyse all of these factors together with livelihood conditions and to assess access to each strategy in rural areas. Doing so indicates that it is necessary to consider a wide range of influential factors to gain any adequate understanding of labour migration.

Title: Farm, Farming and Well-Being: A Comparative Study of Agricultural Practices of Tribal and Non-Tribal Farmers in Tikra Toli, Ratu, Ranchi, Jharkhand

Scholar: Balram Mahto

Supervisor(s): Dr. Dipankar Chatterjee

Farm, farming and well-being are interrelated. If somebody wants to improve the livelihood status of the farmer one can't escape any of these. The present study is an effort to explore the interrelation of those three components by comparing the farming practices of the tribal and non-tribal farmers. In order to achieve the objectives, 100 farmers of Tikra Toli village of Tigra Panchayat were randomly selected from both communities. They were interviewed using

pre-tested schedule. Data were analysed using excel 2007. Study was limited in sample size, selective geographical region, cross-sectional design, and statistical application. The study reveals that majority of the farmers were literate and well experienced in farming but having lack of training and access to the extension services. The tribal have more land holding than non-tribal but cultivate crops in the less area. Due to the rapid increase in the number of borewells the ground water level is decreasing day by day, which hampers the marginal farmers who depends upon the wells for their cultivation. About all the agricultural inputs were available in the nearby shops. Shopkeeper proved as the important source of credit for the marginal and small farmers. The village is full with natural vegetation. Result of the study will contribute to designing in awareness and interventional programmes and brings out the brief scenario of the farmers of the region.

Title: Impact of Getalsud Dam Ecology on Sustainable Livelihood of the Villagers of Getalsud

Scholar: Niraj Oraon

Supervisor(s): Dr. Arpana Sharma and Dr. Sudarsan Biswas

Getalsud Dam is an artificial reservoir situated in Ormanjhi, Ranchi, Jharkhand. It was constructed across the Subarnarekha River and was opened in 1971. It is a popular picnic spot for the residents of Ranchi and Ramgarh district. The dam provides fishing opportunity on a small scale to the local people of Rukka. The main purpose of the dam is to fulfil the drinking water requirements of the residents of Ranchi. Apart from that, it is also used for industrial purposes and generating electricity but it is now suffered from water hyacinth infestation that depletes oxygen level. Sustainable livelihood is a significant challenge for rural households as resource degradation is an acute problem in a rural area. In an era where climate change and environmental variability is having an enormous impact on livelihoods and well-being of rural households. The study was carried out in the framework of Getalsud Village of Angara block in Jharkhand state as well as catchment area near Getalsud Dam. The village and dam catchment areas were selected on the basis of the dam's ecological flora and fauna available them. The research was principally guided by the qualitative methodology supplemented by some descriptive statistics. The Getalsud dam catchment area was randomly divided into four different sites on the basis of dense vegetation. A total of 8 randomly selected quadrants, were used to access plant species diversity and composition with the help of the species-area curve method. All the species observed from quadrant were recorded under different categories. Soil and Water quality analysis were also done to find on several classes of ecological indicators. The data collected from Getalsud village includes 100 randomly selected household survey with the help of scheduled, personal interview, participant's observation, guided field work and

local knowledge of villagers for their sustainable livelihood, etc. From the survey, primary and secondary data give detail picture of their livelihood pattern which is dependent mostly on natural vegetation near dam sides. It has been finding out how all these changes and development along dam side influence the sustainable livelihood of villagers and the social and economic impacts of these declined resources on their life. The present study shows that Vegetational growth along the Getalsud dam is dominated by the plants that usually grow on moist habitats until their climax position and developed secondarily under the influence of soil and living factors. Frequency and density of plant species calculated represent the occurrence of a large number of species in smallest percentage group while a large number of species occur only sporadically. The species occurring in 80 – 100 % may be regarded as dominant and co-dominant, while those found in the first group may be regarded as accidental. The vegetation pattern along the dam side is heterogeneous in nature. There is a correlation between the occurrence of weeds sp. with mildly acidic PH and EC of water and soil. Slightly acidic PH and EC of water and soil have an impact on most of the crop yields, soil microbial processes, plant nutrient availability and soil activity that influences key soil processes. It has been analysed from the survey of households residing along the dam catchment area that declination in the natural vegetation affects their livelihood pattern due to the replacement of common tree species with the growth of exotic weeds. This affects land fertility that plays an important role in influencing trends of livelihood sources. These developments lead to the declination of sustainable livelihood resources of villagers which forced them to search alternative source of livelihood.

Title: A study on agro-technology and its impact on the livelihood of Oraon community of Ranchi, Jharkhand

Scholar: Sumit Kumar

Supervisor(s): Dr. Dipankar Chatterjee

It is usually held that technology not only brings economic advantages but is also accompanied by social costs as well as benefits. Therefore, the issue of the relationship between technology and society continues to be a challenging and rewarding area of scientific inquiry. This study tries to explore the agro-technology and its impact on the livelihood of the Oraon community of Ranchi, Jharkhand. The study has been carried out in the framework of a Chitarkota village of Ratu block, Ranchi district inhabited by the Oraon community- the traditional agriculturist. The study attempts to show about the availability of agricultural technology among the Oraon community and also the number of people engaged in traditional farming practices. Moreover, the impact after the adoption of agricultural technology among the Oraon community on their livelihood promotion was also depicted. The study concludes that their agricultural practices of

the studied community have shifted from traditional to modern in various aspects although some practices like sowing and harvesting are still going on following traditional method. The study identified various factors that impose constraints for the adoption of new agriculture technology like lack of credit availability, irrigation, information, and skill, etc. So, proper intervention like easy credit availability, proper irrigation system, extension, and training program may create a favourable situation to improve lifestyle and wellbeing of the Oraon community.

Title: A Study on Livelihood Pattern and Socio-Economic Status of Asur Community of Jobhipath village, Gumla, Jharkhand.

Scholar: Nakul Munda

Supervisor(s): Dr. Dipankar Chatterjee

Asur is a Particularly Vulnerable Tribal group inhabiting in the Pat area regions of the Netarhat Plateau, in the district of Gumla, Ranchi. The Asur communities were traditionally iron smelters. The present study attempts to throw a light in the current Socio-economic status and livelihood pattern of the Asur community people inhabiting in the Village Jobhipath. The study is carried out in the Village Jobhipath. The research adopts both qualitative and quantitative methods. The data collected from both primary sources by household survey schedule, interview, observation and secondary sources like journal, books, previous papers etc. The data is described and processed to arrive at conclusions. The study finds that the current livelihood of the Asur is dependent on agriculture and mining labour. The Socio-economic analysis reveals that the sex ratio is better in the village, village contain growing young population, female illiteracy is high, majority of population dependent on primary occupation as agriculture, family mostly nuclear. The study concludes that the Asur living in the pat areas and adopted agriculture as their livelihood and also working as wage labour to meet their economic needs. The socio-economic status reveals that they are under poverty and still deprived to fulfil their basic needs. This indicates that some specific focused policy is needed to improve their conditions.

Title: Migrant Workers in Lockdown: Sufferings, Precursors and Solutions

Scholar: Abhimanyu Bardhan

Supervisor(s): Dr. Rajeev Kumar and Dr. Dipankar Chatterjee

Migrant workers constitute the backbone of the Indian economy as migration is a livelihood strategy for millions of people in India. Although the lockdown in India was arguably an effective strategy to control the pandemic, its implementation was abrupt and underprepared. The immediate challenges faced by these migrant workers after the lockdown were related to

food, shelter, loss of wages, fear of getting infected, and anxiety. In this backdrop, the present study attempts to describe the situation of migrant laborers stranded in lockdown, the enabling factors, and available schemes and relief packages to tackle it. This study is purely based on secondary sources. It incorporated review of previous studies and description of secondary data. The thematic analysis of a YouTube video describing the plight of migrant laborers stranded in lockdown was done. It was observed that due to covid-19, there was economic crisis which led to deprivation of basic necessities of migrant workers followed by poor response of the government which were the over-arching themes of the study. Further it was expressed that unprepared system, logistic problems, violation in covid protocols led to severe repercussions on migrant workers. The findings of the study can be utilized to generate data on volume and characteristics of the migrants required to transfer the benefits of social welfare schemes for present and future management needs.

Title: Interstate Migration from Jharkhand During Covid Crisis: Compelling Factors and After Effects

Scholar: Amallesh Mahto

Supervisor(s): Dr. Rajeev Kumar and Dr. Deep Narayan Mukherjee

Interstate migration for work is largely concentrated in urban areas, and urban inequality has been a main driver of overall inequality. Occupational continuities of the urban poor point to a chronic nature and reproduction of the gap between the urban elites and the urban workers. This is even more alarming as 86% of the Indian economy is driven by the informal workforce that contributes an estimated 50% of the GDP. The rural-urban migration showed a significant increase in the first decade of the millennium. The present study attempted to assess the enabling factors and outcomes of migration in Jharkhand using participant observation and five case studies. This study employed the combined qualitative methods of participant observation and case studies of migrant workers. Poor family support, lack of vocational skills, and low assets are the common compelling factors for interstate migration. Sound family support, multiple earners, and assets help to improve economic condition and restabilizing during the covid and post lockdown phase.

The findings of the study can be utilized to improve the condition of migrants and curb interstate migration.

Title: Role of Women in Agriculture and Their Contribution in Households Economy

Scholar: Rekha Kumari

Supervisor(s): Dr. Dipankar Chatterjee

Agriculture and allied activities continue to be a key sector of the economy of Jharkhand. About 75 percent of the population of Jharkhand lives in rural areas; a large section of the population living in villages depends on agriculture and associated activities for their food and livelihood and employment and incomes; for them agriculture is a way of life. The present study was pertained to whole of the Jharkhand state for achieving the specific objectives of analysing role of women in agriculture and allied activities. Around 31 years of average age was found in overall sampled respondents, around 63% of respondents were under 18-30 years of age, 25% were under 31-50 years of age and around 13% were above 50 years of age. Most of the respondents (80%) belong to STs and 77% were married farmers, 22% were unmarried farmers. The average family sizes of the respondents were 5.4 members. Most of the respondent's households were medium farmers (57.50%). The total average annual income of the respondents was about Rs. 82000 per annum. The highest income received by respondents was about Rs.42000 from agriculture. The average expenditure of respondents was about Rs. 84000 per annum. An average of 110 hours was given by women farmers in kharif season, 90 hours in Rabi season, and 47 hours in summer season in different farm operations during the entire cropping period. An average of total 53.50 hours was given by overall sampled respondents in animal rearing activities in a week. Highest 25 hours was given for feeding their animals. The average annual employment gained in a year was Rs 9297 where harvesting operations of crops takes highest time and produces highest income from labour (3.11MDs and Rs. 933.38 labour wage). Most of the sampled respondents were gave first priority of problems to lack of finance followed by other household responsibilities (Constraints on time and mobility), Health and safety issues, Lack of awareness, Low wages and incentives, none recognition despite of active contribution/participation, Lower access to modern technologies and Gender biasness.

Title: Rural Tourism: Impact, Need, Issues & Opportunities in Jharkhand context

Scholar: Subhadip Sarkar

Supervisor(s): Dr. Dipankar Chatterjee

This study depicts the importance and the need of rural tourism in Jharkhand context. The study was conducted in three renowned tourist spots of Ranchi district. This study mainly aimed to focus on identifying need of the rural tourism, scope and impact of it on local people directly related to the tourism business. Due to the pandemic situation (COVID19) the study went on the basis of secondary data and telephonic interview of the people in those areas who are involved

in tourism business over the spot. It has been found that tourism marketing is the thing which should be promoted for the sake of tourism development. Few issues were identified during the study and the possible solutions are chalked out to prevent those issues. It has been found that the rural tourism has a serious impact on life of local people as it generates job opportunities and helps to earn a reasonable income. Moreover, tourism helps to preserve the rural culture and heritage and facilitate the rural people to explore their hidden potentiality before the outsider urban tourists.

Title: Livelihood sustainability through ecosystem services: A case study of village

Tulbul, Gomia block, Dist. Bokaro, Jharkhand.

Scholar: Laxmi Kumari

Supervisor(s): Dr. Arpana Sharma and Dr. Sudarsan Biswas

The natural environment provides a wide range of benefits to people. The multiple benefits that people derive from ecosystem are called ecosystem services like clean water, food, Honey, timber, cultural landscape, soil formation etc. Rural communities, especially poor and marginal farmers are facing greater vulnerabilities to their livelihoods. Their vulnerabilities arise from combination of several ecosystem service's degradations. The debate over the ecosystem services utilized by rural communities for their livelihood sustainability forms the background of the present research. The study was carried out the framework of village 'Tulbul' of Gomia block in Jharkhand state. The village was selected on the basis of dominance of all four parts of ecosystem services (ES) i.e. Forest, natural resources, water resource, cultural landscape, dam which is a major source of livelihood for the villagers. The research adopts both qualitative and quantitative techniques in data collection and analysis. Considerable efforts were made to study the utilization pattern of ecosystem services among rural communities residing in the Tulbul village. This study has tried to explore the importance of several types of ecosystem services present near Tulbul village that acts as resource for livelihood. The finding shows that about 80% of selected rural communities of the village depends on [PS]provisioning services (fishing, agriculture, hunting and wood collection, business of ornamental plants) for their livelihood. 60% of them depends on [RS]Regulating services (plant resource, natural resource, animal resource and water resource). 15% of households earn from cultural services [CS] (Tenughat cultural heritage, Tenughat tourism and cultural landscape). 90% of overall community expects from supporting services[Ss] (government, NGOs formal institutions) to provide better resources for their livelihood sustainability. Nowadays their ecosystem services especially the provisioning services (PS) are on the verge of extinction, due to change in the nearby society, development in coal mining area, deforestation. These creates a big question for livelihood

sustainability to the rural community of Tulbul village. The study concludes that despite the presence of ecosystem services near village, livelihood opportunities become declining day by day due to lack of knowledge about proper utilization pattern. It has also been observed that changes made during the last 5yrs. The primary occupation of most of villagers are agriculture so, deforestation, crop failure, establishment of colliery belts and depletion in quality of water resources affected livelihood. So, it is the duty of government, non-government organizations & formal institutions to consider livelihood problems of the villagers before any development work. In the light of the above conclusion, it could be recommended that the better livelihood programmes should be made by the government that focuses more attention in this area and provide necessary livelihood opportunities for the villagers.

Title: Livelihood Planning in a Watershed Village: A Study in *Sirka-Sonuabera* of Angara block, Ranchi.

Scholar: Krishnapada Sarkar

Supervisor(s): Dr. Dipankar Chatterjee

The present research is an endeavour to explore the bio-physical and socio-economic characteristics of the selected village to determine the livelihood assets. The data gathered has served as basis in the preparation of a Community Development Plan for Sonuabera village. In addition, this will provide guideline in plan implementation as well as serving as a basis for determining the different changes or accomplishments to be made. This study was conducted during 2013 at Sonuabera village. The information was collected from both randomly and purposively selected respondents. The data collection techniques include the household survey with the help of schedule, focused and personal interview, participant observation, guided field walks etc. Considerable efforts were made to prepare a livelihood project for alternative income with a view to understanding the suitable plan base of the communities residing in the village. This study has tried to explore the linkages between subsistence economy and utilization and conservation of natural resources in the village. The findings show that in village most of the farmers belongs to small and marginal category. Based on the findings, I have prepared two suitable livelihood plan for the village. The purpose of this project was to empower the community to have a clear understanding of their problems and realistic solutions to those problems.

Title: Role and effectiveness of NGOs in Rural Development: A study on two reputed NGOs of Ranchi District of Jharkhand

Scholar: Suresh Kumar Mahto

Supervisor(s): Dr. Arunava Sengupta

The present investigation was carried out in two NGOs villages of Angara block of Ranchi district during February-2013 to June-2013. Role of non-governmental organizations (NGOs) in rural development was analysed through this investigation was completed through questionnaire and personal interview among the selected farmers. Major rural development programmes of the NGOs were agricultural programmes, health programmes, human resource development programmes, community development and industrial and trade programmes. Majority of the beneficiaries, non-beneficiaries, workers of NGOs and workers of other development agencies considered rural development works of the NGOs as effective for rural development. Studies reveal that the NGOs can play a vital role in the development. The role of state in the planning process, political parties, participation, active participation of grassroots organizations, role of donor agencies etc. are important for ensuring people participation and socio-economic development of the people. Poverty eradication, Human Resource Development (HRD), health care, environmental protection, protection of human rights, empowerment of women, child and weaker sections, ushering in silent revolution etc. are some of the importance goals of NGOs. This study was based on NGOs functions including villager's socio-economic changes, health and sanitary condition, economic security, education and status of self-employment, increase in irrigated area, animal resources and Cropping Intensity, increase in yield of the crops under Demonstration and changes in crop management practices, the operational constraints in the functioning of NGOs and perception of the beneficiaries. However, this study also points out that expecting radical's social change through voluntary effort is also a kind of day-dreaming and add that the socio-economic structure and states positives attitudes towards NGOs also contribute for its growing role in the development process.

Title: Organic Tomato (*Lycopersicum esculentum*-Mill.) Cultivation Practices: A Participatory Adaptive Trial

Scholar: Sudarsan Biswas

Supervisor(s): Dr. Arunava Sengupta

The study was conducted at a tribal dominated village of Ranchi district of Jharkhand (India) surrounded by hills and dense forest. The main occupation and source of income of the villagers is mainly from agriculture and allied activities. This region receives on an average about 1200 mm annual rainfall but water scarcity prevails due to sloppy undulating topography and sandy

nature of soil for four months in a year. Twenty small and marginal farmers were selected for conducting a participatory adaptive trial on cultivation of tomato (*Lycopersicum esculentum*-Mill.) by following organic farming practices. Significant results were found for different parameters of tomato which ultimately ensured a higher yield (1.24 times more than conventional practice) and low cost of cultivation (cost is 1.17 times more in case of conventional practice) than conventional practice. The organic cultivation packages of practices were environment friendly, reduced cost of cultivation, ensured higher productivity and increased profitability. There were two organic solutions: Shasyagavya and Virus Damanam played a magical role of this success.

Title: A comprehensive study on the vegetable marketing networks in Ormanjhi Block of Ranchi District, Jharkhand

Scholar: Ratilal Munda

Supervisor(s): Dr. Arunava Sengupta

This study revealed marketing network prospects and constraints of the vegetable growers. It is assumed that ineffective marketing network is among the major barrier towards remunerative price of vegetables. A lot of other factors are also responsible for better functioning of marketing network. Small vegetable growers had limited accessibility to effective marketing network. The major characteristics in marketing of vegetables were perishability, seasonality and variability. Farmers were unable to gain the utmost in the existing conventional marketing network, although the prices of vegetables were high in the cities or towns. Major portion of market margin of the vegetable trade was cornered by middlemen and other stakeholders. Due to existence of a greater number of middlemen margin money of vegetables was high and deferred according to different marketing channels. Co-operative marketing society, super marketing chain *etc.* were the emerging marketing chain which best access the farmer in gaining remunerative price of farm commodities. The effective marketing networks not only help farmers in best disposing vegetables but also in better utilization of available resources and efficient farm management. This effective network also helps consumers in obtaining fresh vegetables at reasonable price. The effective marketing networks were able to foster good relation between producer and consumer. In the sector of rural development, the marketing network have a significant role in the promotion of the available resources. With the proper utilization of available resources, the economic status of villagers improves which ultimately accelerates the demand for other basic needs in society.

Title: Skill Development and Employment Generation through Lac Cultivation in Tribal Area of Ranchi District

Scholar: Saheb Mondal

Supervisor(s): Dr. Arunava Sengupta

The present study entitled “Skill Development and Employment Generation through Lac Cultivation in Tribal Area of Ranchi District” was carried out at Angara block of Ranchi district of Jharkhand during agriculture year of 2019. The study is based on the data collected from randomly selected 100 households (trained and untrained) through well-structured schedule. The study revealed that there was positive impact of training on lac growing households in terms of host utilization, livelihood conditions, and income and employment generation. The host utilization has been found to increase significantly after training of households in comparison to untrained households. A significant shift from lower production group to higher production group has been observed by trained households. The share of lac income in total income was 23% in the case of trained households while 12% in the case of untrained households. More increase in employment generation and net returns was found in lac cultivation for trained lac-growers. Higher level of brood lac production was resulted in self-sufficiency in brood lac and more utilization of host trees for lac cultivation. Higher benefit cost ratio was found in trained than untrained households for lac cultivation on all the lac hosts. The disposal pattern of crop outputs was found the same because due to lack of organized market, both the trained and untrained households sell their product in the local market. It was observed that the main problem of trained households was lack of finance for operating lac cultivation, shortage of brood lac for untrained households and lack of finance for overall households. Thus, the dissemination of lac cultivation technologies and strengthening of value chain and farmers’ industry linkages may play a key role to harness the opportunities available for the forest and sub-forest dwellers, lac processors, manufactures, exporters and other stakeholders. Gainful employment can be generated for migrating youths while also providing quality output to the hands of the consumer.

Title: Livelihood analysis of Oraon Dominated tribal Village of Jharkhand.

Scholar: Brikodar Mahto

Supervisor(s): Dr. Arunava Sengupta

The study aimed at the livelihood sources analysis and constraints of an Oraon tribal dominated village in Bero block of Ranchi district Jharkhand. Traditionally, Oraons are agriculturist by nature cultivating cereals along with pulses. They are also involved in vegetable cultivation and engaged in rearing livestock and sell them whenever they need extra money for wedding

or medical emergency. More than 70% people migrate for more than six months starting from the month of November to May. They return as soon as the monsoon sets in and the start ploughing their land to grow crops. Many rural development programs like MGNREGA also provide employment opportunities. A calculated intervention in their existing farming system and better integration with different components of farming system including proper use of natural resources will definitely have positive impact on their livelihood. They are involved in agriculture and prefer to remain in their own land and Oraon are considered to be more advanced among the various tribal groups of Jharkhand.

Title: Livelihood analysis of Munda Dominated tribal Village of Jharkhand.

Scholar: Pankaj Kumar Karmali

Supervisor(s): Dr. Arunava Sengupta

The study aimed at the livelihood sources analysis and constraints of a Munda dominated village in Angara and Tamar blocks of Ranchi district Jharkhand. With agriculture being the main source of livelihood, the rate of migration is relatively high. The study focused on socio-capital and cultural understanding of the Munda in livelihood development. They are also involved in agriculture activities vegetable cultivation and engaged in rearing livestock. They are involved in Non-Timber Forest Produce (NTFP) also provide employment opportunities. A calculated intervention in their existing farming system and better integration with different components of farming system including proper use of natural resources will definitely have positive impact on their livelihood. They are involved in agriculture and prefer to remain in their own land and Munda people spend much less on education of their children as compared to spending for social functions.

Title: A Study on Lac Cultivators of Rural Jharkhand with Particular Reference to Khunti District

Scholar: Dilip Kumar Mahto

Supervisor(s): Dr. Arunava Sengupta

The present investigation was carried out at two villages of Karra and Murhu block of Khunti district during February-2013 to June-2013. This investigation was completed through questionnaire and personal interview among the selected farmers. Lac is considered to be an important cash crop by the poor cultivators (usually the tribal inhabitants) in almost all the major lac-growing states of the country. This study indicates that the main source of income of lac dominated villages is lac production. It also reports their socio-economic structure,

livelihood through lac cultivation along with technology adoption, prospect, marketing of lac and constraints. Now-a-days lac cultivation has become very popular all over the world due to its uses, a source of high income, suitable for ST (Scheduled Tribe)/SC (Scheduled Caste) categories people etc. Scientific methods of lac cultivation provide high income and reduce risk.

Title: Lac based handicraft products and its role in the development of tribal community

Scholar: Rainu Ram Netam

Supervisor(s): Dr. Arunava Sengupta

The present investigation was carried out at Bishanpur village of Torpa block of Khunti district during February-2014 to April-2014. This investigation was completed through questionnaire and personal interview among the selected handicraftsmen and customers. This study reported that the major income generating source is lac-based handicraft products as well as agricultural activities. It also reported their socio-economic condition, livelihood options through lac handicraft products along with technology adoption, marketing of lac-based handicraft products. Now a day's lac-based handicraft products are running well and it is a good source to enhance income as compare to selling unprocessed raw lac. Scientific methods of lac processing skill help to generate high income and reduce poverty in the rural area. Mahila Vikas Kendra Torpa District of Khunti plays a very important role in development of lac-based handicraft products in Bishanpur village through using their available natural resources.

Title: Eminence of Goat Rearing in some villages of Bero Block, Ranchi district, Jharkhand

Scholar: Kuldeep Kumar Chek Baraik

Supervisor(s): Dr. Arunava Sengupta

The farmers of Bero Block rearing goats in both small and large scale and average number of goats per farmer were 19.56 goats. But, local breed of goats was reared by majority of the farmers. The main problem during rearing is lack of money. Goat meat has great demand in the study area. The demand reaches its peak especially during the local festivals. It has been observed that the marketing prospect is there but the villagers could take the vocation seriously. They rear goat as a part of their tradition but they did not take this as a principal source of income. Some farmers have started rearing goats of improved breed but they did it without targeting the potential of local market. Thus, small scale goat rearing has a enough potential from the perspective of its demand in the local level and can be highly profitable business.

Title: Milk Procurement procedure: Opportunity and Challenges in the context of Nagri Block, Ranchi, Jharkhand

Scholar: Amit Kumar

Supervisor(s): Dr. Arunava Sengupta

The empirical study was conducted with a broader objective: To provide some concrete suggestions which may contribute to bring positive changes in the life of rural masses. Medha is working well in Harhi village. In village level there is a Automatic Milk Collection Centre (AMCU). Milk procurement system based on Integrated Milk Management Software (IMMS) linked with Jharkhand Dairy Project is a complete transparent system at the grass root level. It has a good payment system. Most of the primary milk producer rear cows for commercial purpose in the village. It has been a primary source of income. The study has tried to focus on the problems faced by the primary producers as well as a clear picture of the marketing channel has been displayed. Finally, some recommendations have been given based on the opportunities for further development.

Title: Eminence of pig farming in some villages of Ranchi district, Jharkhand

Scholar: Deepak Pahan

Supervisor(s): Dr. Arunava Sengupta

The study was conducted in Bero block of Ranchi district. Although agriculture is the main occupation of the farmers in the state of Jharkhand, pig rearing is also an important source of subsidiary income especially among the tribals. Pig and pig meat can be easily sold in the local market and it has a good demand. The problems in pig rearing are improper bank linkages for bank loan and farmers are not exposed to different schemes related to pig farming. It was observed that pig farming and pig rearing is very good option for landless farmer as well as marginal and small farmers. Tribals rear pigs in traditional way and scope for breed improvement, feed combinations and so on can go a long way for the benefit of the farmers.

Title: Eminence of poultry farm in some villages of Ranchi district, Jharkhand

Scholar: Arbind Oraon

Supervisor(s): Dr. Arunava Sengupta

The study was conducted in Angara and Bero blocks of Ranchi district. Although agriculture is the main occupation of the farmers in the state of Jharkhand, poultry is also an important source of subsidiary income especially among the tribals. Poultry products can be easily sold in the

local market and it has a good demand. The problems in implementation of a poultry farm are improper bank linkages for bank loan and farmers are not exposed to different schemes related to poultry farming. It was observed that poultry farm is very good option for landless farmer as well as marginal and small farmers. Tribals rear poultry birds in traditional way and scope for breed improvement, feed combinations and so on can go a long way for the benefit of the farmers. Consequently, increased availability and affordability of animal protein will help to improve their status of improper nutritional diet.

Title: A comparative analysis of wheat and paddy farmers of Karanpur village of Bhabua district of Bihar

Scholar: Abhishek Chatterjee

Supervisor(s): Dr. Arunava Sengupta

The study established that the general believes that big farmers with more resources would have better CB (Cost Benefit) ratio could not be proved. On the other hand, it was established that small farmers and medium farmers at better CB ratio for both the crops paddy and wheat. This was due to less cost involved in production of wheat and paddy with and paddy as family level was given more. The study reveals that with regard to irrigation of facilities cropping intensity and cropping pattern there was not much difference between small medium and big farmers so it can be strongly felt process of agricultural development the need for taking measures to ensure the benefit of the new technology has spread to the bulk of farming population and not limited to big farmers only.

Title: Production of Mushroom spawn (*Agaricus Bisporous*) by Organic means.

Scholar: Ekata Konar

Supervisor(s): Dr. Sudarsan Biswas

The present study has been conducted to examine the effect of neem oil and bioagent for the preparation of *Agaricus bisporous* spawn. A comparative study is done as control of water only and conventional with the sterilization by the traditional method of boiling. Though I have only experimented on only 1 variety of mushroom that is the bottom mushroom, which is the most commonly used or consumed mushroom. The gram-negative bacteria called *Bacillus nakamurai* can be used in sterilization as it would hinder the attack of the most commonly affected fungus causing green mould. A higher concentration of this bacteria is found more effective as the antagonistic substance will be produced at a larger amount. 10% is more effective than 1%. Other than this some other biopesticide that can be used is the neem oil or the mahaneem, this

comprises the *Azadiracthin* which is present in neem plant and has anti-fungal. But it is seen to work better at a higher dilution. As a result, 0.01% is better off than 0.1%. Only water is open to the attack of the fungus. As a result, 1 of my replications got completely contaminated and failed to produce proper spawn. Whereas in the scenario of conventional means of boiling a large amount of the nutrients are drained off from the grain as result the growth rate is low due to the loss of required nutrients. This might not have a high incidence of fungus attack but definitely, the production is low and slow. Thus, from the experiment, I can state that the best way to produce spawn is by the use of antagonistic bacteria. As these bacteria 's proper concentration would produce the best spawn both in terms of yield and in case of time.

Section I: Social Issues, Social Intervention and Impact Studies

Title: Condition of Women Labourer in India: Propellers and Enablers

Scholar: Virendra Kumar

Supervisor(s): Dr. Rajeev Kumar and Sri Amitava Dutta

The studies at global level revealed that women labour force is lower than their men counterpart; there are multiple socio-economic factors behind it. Those women, who are joining work force, mainly do the menial job. They receive fewer wages and face many sorts of exploitations. This study attempts to highlight the conditions of women laborers in India.

This study employed the review of previous literature, analysis of secondary data obtained from NSO, NSS, and census, a single case study obtained from electronic media was analysed in the context of present study. Findings reveal that work participation of women is lower throughout the world, and it is because of social stereotype and gender discrimination. At work place women labourers faces various kind of exploitation ranges from physical, emotional, social, economic, and occupational. Women labourers are not fully aware with their rights because of low literacy. The findings of this study hold the implication for policy maker for drafting regulations which can facilitate women right at workplace and its proper implementation.

Title: A situational analysis on violence against women due to alcoholism among Munda tribe in Kucchu Panchayat, Angara Block, Ranchi District

Scholar: Susmita Chakraborty

Supervisor(s): Sri Amitava Dutta

The present study was conducted in some of the selected villages that were Kamta, Badri, and Dimra under Kucchu Panchayat, Angara Block, Ranchi district. However, the objectives of the study is to identify the occurrence of violence against women by the addicted male folk and also to find out the reasons behind such violence and to arrest the violence in future. However, the researcher adopted both participatory and non-participatory research method in her research work. Along with interview and observation method, she adopted Participatory Rural Appraisal (PRA) and Focus group discussion (FGD) mode of participatory method. At the end of the study, it was unfolded that the intoxicated Munda male were very much prone to commit physical, social and mental torture against the women. The women were very much vulnerable and were hardly in the position to raise their voice against such evil practices. Even in some cases men

were also found as the victims of social violence. At the end, the researcher thought, that a lot of scientific investigations were required for overcoming such problem and to provide protection, care and safety to such helpless women who have been torturing in a regular manner by their alcoholic counterpart. A lot of research work, along with strong application of law and order with the meaningful contribution from social workers, development initiators, anthropologist together may arrest such problem and minimizing the suffering of tribal women in future.

Title: Self-Help Groups in Rural Jharkhand: Group Formation, Conflict Resolution, and Impact on Economic Activities

Scholar: Kumari Bindeshwari

Supervisor(s): Dr. Rajeev Kumar and Dr. Dipankar Chatterjee

A Self- Help Group is a voluntary association of 10 to 20 members (mostly women from similar backgrounds) who pool in their financial resources to avail credit from Microfinance Institutions, NGOs, and Banks. The SHG promotes its members to regularly save a small amount of money and then lends this money together with money availed from Bank to the needy members. In the background of theories and existing literature on the formation of SHGs, the present study focusing to understand the functioning and the conflict resolution in SHGs in rural Jharkhand.

This is qualitative research involved the findings extract from participant observation among the member of SHGs. The SHGs was initially formed due to political intervention and are benefited, gradually democratic norms are set up in the group, some business was started, experienced woman is encouraged by JSLPS for the different designations, work of treasurer has changed accordingly, political dominance is seen in some groups and there is a huge impact on the economic condition is seen after joining the SHGs. These findings will be useful in improving the functioning and productivity of SHGs.

Title: An Investigation for Understanding occurrence of Violence against Women in India

Scholar: Mahasweta Dolai

Supervisor(s): Sri Amitava Dutta

The present study was conducted with the help of secondary information like book review, scientific research articles etc. The researcher had the objective of identifying reasons behind violence against women in India. The researcher was also interested to identify the types of violence occurs against in India. Researcher wanted to contribute her academic input for arresting some problem in future. At the end of the study the researcher found that violence against women was very common all over the India. Women irrespective of their caste, class are

being tortured by their husbands and other family members, male members mainly along with the women members also. They were physically, mentally and sexually being tortured. Now the researcher suggests that end of study. The researcher suggests meaning full intervention of law authority and application of laws in some neglected manners along with strong intervention of NGO and government officers is required for arresting such problems in future. Researcher also appreciates the research work from social worker, sociologist, anthropologist is rural development professional on violence against women. Well to helpful to minimize the problem in future.

Title: Witch Hunting Related Crimes in Jharkhand: Enablers, Victimization and Aftermath Conditions

Scholar: Priya Kumari

Supervisor(s): Dr. Rajeev Kumar and Sri Amitava Dutta

WHRC (Witch-hunting related crimes) is one of the gruesome atrocities against indigenous women, and those are observed around the world. Witch-hunters exclusively target indigenous women. WHRC is a violent form of witchcraft belief. The belief in magic and witchcraft is common to all societies in the world. In this backdrop this study aimed to describe the victimization process, enabling factors, and aftermath condition in WHRC (Witch-hunting related crimes) in Jharkhand. This study is purely based on secondary sources. It incorporated review of previous studies and description of secondary data. This study employed the thematic analysis of newspaper clippings reported incidents on WHRC.

The study found, majority of the victims are middle or old aged persons, most of them are women. Study concludes that majority of the cases the process of victimization occurs through accusing and building allegations on the victims like tragic deaths, calamity, non-healing of wounds, poor growth. The enabling factors for most of the cases were have been deep rooted cultural beliefs, superstition, power politics, patriarchal mind set and the ulterior motive is to confiscate property. The findings of the study can be utilized to study the sufferings of victims and mind set of perpetrators, process of witch labelling in WHRC.

Title: A study on influence of alcohol for occurrence of violence against women in West Bengal

Scholar: Amit Ruidas

Supervisor(s): Sri Amitava Dutta

The present study was conducted with the objective of to reveal the types of violence occur due to alcoholism, to study the reason for occurrence of violence against women, how to overcome violence against women. The researcher conducted his study from secondary source of information and he has gone through several literature research article, books for this purpose. At the end of this study, he found that violence against women was highly influence by alcoholism. The women are being torture as physically, mentally, sexually depending upon the alcoholic nature of their husband and closely members. So the researcher feels that a strong and social work intervention will be helpful to minimise such problem in future. He also felt that effective implementation of law and order, several programme and more researcher work in the field will be helpful to minimising research problem.

Title: Alcohol and Tobacco Consumption and its Relation with Domestic Violence in Jharkhand

Scholar: Gambhir Mahto

Supervisor(s): Dr. Rajeev Kumar and Sri Amitava Dutta

India is one of the largest producers of alcohol in the world. In the South Asian region, it contributes to 65% of production and nearly 7% of imports. Chronic and excessive alcohol intake has a hazardous impact on human health and society. the pattern of drinking along with the type and amount of alcohol varies considerably concerning a person's socioeconomic status, cultural and regional background. Though NDUS reported Jharkhand as a low alcohol-consuming state, nonetheless, alcohol and tobacco hamper the community health and well-being. The study aimed to assess the occurrence of alcohol and tobacco consumption and its relation to domestic violence. This study assessed the secondary data obtained from NFHS-4. Study reveals that in Jharkhand, tobacco consumption is more in rural regions. Both genders consume alcohol and tobacco but males drink 10 to 15% more alcohol than females. Incidence of physical and sexual violence increases with a higher frequency of alcohol intake. The findings of the study can be utilized to the reduction of alcohol and tobacco consumption and improve community health and well-being.

Title: A study on occurrence of violence against women due to alcoholism in India

Scholar: Rahul Prakash Niraj

Supervisor(s): Sri Amitava Dutta

The present study focuses the occurrence of violence against women due to alcoholism has been conducted with the objective of finding out the types of violence occurs against women and the reasons for occurrence of such violence. Moreover, the researchers wanted to address the problems in future. However, we conducted the study with the available secondary resources, review of articles, journals and at the end of the study we found the violence against women is very common in all over India and most of the cases occur due to alcoholism or other reasons too. Women are regularly being tortured by her husband, in-laws, relatives without any reason. Study also found that violence against women is increasing tremendously day by day. At the end, researchers suggest that meaningful intervention of law and order is the need of hour for minimising violence against women. Women should get education; they should be empowered in such a way that they can raise their voices against such evil practices. Moreover, social worker, social scientist, social professionals should come forward and contribute their meaningful interventions for overcoming such heinous practices. Alcohol-related violence impacts on physical, mental and sexual health. Alcohol misuse is a prominent feature of many types of violence including violence in public settings, sexual violence and domestic violence especially against women. The findings of the study can be utilized to improve the poor conditions of the women who are witnessing the violence and many of them just could not be able to express their problems.

Title: Study of unexplored tourist places in Jharkhand

Scholar: Ankit Kumar

Supervisor(s): Dr. Dipankar Chatterjee

Tourism is essentially an expression of a natural instinct for learning, experience, education and entertainment. The motivating factors for tourism include social, religious business interest and quest for knowledge. The economic implications of this phenomenon are wide ranging and capable of influencing the development process. Tourism contributes positively to reconcile economic development and alleviate poverty by creating resources through economic activities. It adds to the foreign exchange earnings, contributes to Government revenue, spreads economic and social benefits to under-developed areas, generates income and creates job thereby raising living standards of the stakeholders. The main purpose of the study is to know about tourism development opportunity of unexplored tourist place and also know the potential of tourism.

The study concludes, Jharkhand tourism has vast potential to develop offbeat or unexplored tourist place to generating employment and earning large sums of foreign exchange besides giving a fillip to the state's overall economic and social development. The findings of the study can be utilized to improve the off-beat tourism in Jharkhand.

Title: Victim of the system: A study on crime committed by children and child victims with special reference to the Ranchi district of Jharkhand, India

Scholar: Aranya Ribhu

Supervisor(s): Dr. Dipankar Chatterjee

The Ranchi District is highly prone to child trafficking and juvenile crime, and this has been one of the major reasons for choosing Ranchi as the place for the research to explore juvenile crime, especially among the children. This study basically focused on identifying the pattern, nature and causes of juvenile crime and explored its network to organize such processes as well as documenting the process of rehabilitation in juvenile homes. The places of field work in collecting data have been selected purposively, especially focused on the juvenile crime areas. The data for this study have been collected from the juvenile home Dumerdaga of Ranchi District and the rehabilitation centre of an NGO (non-governmental organization) Bhartiya Kisan Sangh. Focus group discussion and case studies have been conducted with the girls and women of Kishori Niketan. To uncover the network and source of the organized crime, in-depth discussion has been conducted with the victims and resource persons. After interviewing 50 delinquents, it was found that the most vulnerable children are in the age group between 16–18 years. The study reveals that rape is seen as the most frequently committed crime followed by theft and murder respectively. Lack of education and awareness is observed as the major reason for turning children into delinquents. In most of the rape-cum-murder cases, it is seen that juveniles get involved in such crimes because of lust or friendship with the other sex. Theft is the second largest crime committed by children. It is the lure of easy money which causes them to indulge in theft. Children at this age need proper counselling and guidance from their schools and parents to be on the right track. Schools should conduct more and more recreation programmes, whereas parents need to talk with and be friendly towards their children and guide them to take the right way to earn money. Schools should guide their students to make education their priority. This chapter attempts to study the crimes committed by children and to give suggestions on the corrective actions to be undertaken for the purpose. Better recreation programmes by the NGOs and better rehabilitation facilities by the government will help in reducing the number of delinquents in the near future.

Title: SHG and Social Capital: A Study on the Role of SHGs in Providing Non-Economic Benefit to the Beneficiaries

Scholar: Naresh Kumar

Supervisor(s): Dr. Dipankar Chatterjee

The concept of social capital is gaining more and more importance in social science research for various reasons. The study was carried out in a purposively selected twenty SHG groups distributed in four villages namely Badri, Hundrujara, Reshambanadag and Ramdagga of Angara block, Jharkhand. The present study is an attempt to contribute the knowledge base by exploring role of SHGs in creating social capital. The study can contribute to the strengthening of decision makers and development workers' understanding of the issues which concern the rural community of Jharkhand, to be adopted in their greater development goal. More importantly, it is hoped that this research can contribute in part, to a greater level of participation of women in livelihood management and that the state government and relevant agencies can begin to appreciate the role of rural women in decision making and promote community development in the Jharkhand.

Title: Crafting for Survival: A Study on Livelihood Strategies of an Artisan Community of Jharkhand

Scholar: Pritom Das

Supervisor(s): Dr. Dipankar Chatterjee

Across the nation, the pattern of traditional craft and paintings varied from the society to societies, which were the integral part of their culture. For centuries, traditional craftsmen of the nation have stayed in the cave of deprivation, have maintained their distinctive culture, have sustained on their traditional knowledge system. Historically speaking, almost all walks of life, tribal painters and craftsmen stored their experiences. Chotanagpur Plateau of Jharkhand is not merely popular for its mineral resources, but it is also popular as it is the sprang land of the various indigenous community. Since time immemorial, Jharkhand has its own culture. It is told that 'Dokra' art is connected like an umbilical cord with their culture. The name 'Dokra' or Dhokra was used originally to indicate a sect of metal craftsmen who well were known for their metal craft. Dokra now refers to a metal craft which is tribal in origin practised by Malhar and Birhor tribes of Jharkhand. The study is a modest endeavour to highlight the craft and culture of 'Dokra' artisans. It also thoroughly analyses the impact of '*Jharcraft*' on the life and livelihood of the 'Dokra' artisans. Snow ball sampling is used to collect data. The total number of 40 families was selected. Efforts were made to interact with the major players in the Dokra craft to

get insights into the trade and the historicity of the same. 67 people of these 40 families were working as Dokra artisans. The study was conducted at the selected villages of Mandu block, Jharkhand. The findings of this study have been discussed after analysis of the collected data through interview of the 'Dokra' artisans on the subject and were subsequently summarized. The findings had been summarized after throwing light on all the major aspects of the study. The conclusion and the suggestions were made to make a positive change in rural society.

Title: Intangible Cultural Heritage of a Performer Community with reference to their Livelihood: A Study on Patuas (Bede) of West Bengal

Scholar: Arindam Ghosh

Supervisor(s): Dr. Dipankar Chatterjee

Intangible heritage is a growing concept of emphasis in international communities. This study will define intangible heritage and focus on the performing arts of *Patua* community of West Bengal. *Patua* community is famous for the *patachitra* designing and playing *pats* in front of the audiences of rural Bengal. But during investigation, it was found that this community are also expert in snake charming and some sections of *Patua* earn their livelihood by snake charming. Thus, snake charming and *pat* playing is two of the most significant manifestations of performing art that requires investigation to document the intangible living heritage of that performer community. The present research was carried out in the selected villages of Murshidabad district of West Bengal using qualitative interviews and non-participant observations to gain an insight into their practices through investigating certain practitioners. This study particularly explores the livelihood management and knowledge transmission that ensure their artistry and skills are transmitted, contributing to the dissemination of intangible heritage. Finally, the study concluded with few suggestions to safeguard the living heritage of the studied community.

Title: Internal Migration in Jharkhand: A Village Level Analysis

Scholar: Faruk Molla

Supervisor(s): Dr. Dipankar Chatterjee

Internal migration of labour for employment has become one of the most durable components of the livelihood strategies of people living in rural areas. Migration is not just by the very poor during times of crisis for survival and coping but has increasingly become an accumulative option for the poor and non-poor alike. The present research has been carried out in the purposively selected off-road villages and road-side villages for documenting factors and patterns of the

rural-urban migration investigating the impact of rural-urban migration on the local households' and analysing migration-related threats encountered by the migrants in destination, as well as their coping strategies in different rural contexts. The research is principally guided by mixed method of research. Respondents were selected from migrant household from both locality and in-depth interviews were conducted. The universe of the research includes 100 households from two villages of roadside location and 100 households from two off-road villages. The study revealed that the pattern, duration and impact of migration show difference in terms of the locality of the villages is concerned. The study also revealed that off road villagers have been migrating to nearby town/ city mainly due to the household poverty emanating from the decline of agriculture enterprise, insufficient access to land, unemployment and resource conflicts while the road side villagers adopted migration as an accumulative strategy to augment the cash requirement. This paper shows why some groups of people have succeeded in entering accumulative migration pathways while others have been excluded. The findings help us to understand that migration patterns and impact are determined by people's access to resources, the (institutional, infrastructure, market) environment, intra-household relations, wider social relations, and not just the productivity and demand for labour in an area. Based on the findings, recommendations such as initiation of development projects based on the identified needs of each of the rural communities in the study area are made.

Title: SHG and Social Inclusion: A Study in the Rural Context of Jharkhand

Scholar: Praveen Kumar

Supervisor(s): Dr. Dipankar Chatterjee

Women are the subject of discrimination and their sad plight are manifested by the denial of access to remunerative employment, equal wages, and lack of freedom in decision making both at the family and extra family level. Thus, they are the victim of both economic and social exclusion. Since independence, government has implemented several inclusive policies for women empowerment but the outcome seems unsatisfactory. Recognizing the imperative need for upliftment of women in the society much importance is given for empowerment of poor women in rural areas. The emergence of SHG model of microfinance has proved a panacea for the rural women. The article specifically aims at assessing the potential of SHG to reach out to the excluded category of the society and examining how far such a programme has succeeded in inclusion of women both financially and socially. The study has been carried out among the sample women SHGs selected from the Ranchi district of Jharkhand and the data has been collected with the help of relevant qualitative tools. For the purpose of the research, both SGSY promoted and SBLP promoted SHGs has been selected to get a comparative picture.

The data analysed through before-after approach shows that the SHG membership has changed the outlook, decision making ability, awareness level, confidence level, level of participation and financial status of the women and their family. The work finally addresses the problems associated with the SHGs and suggests suitable measures for their augmented role in the inclusion process.

Title: Impact Assessment of a Sansad Adarsh Gram Panchayat of Jharkhand: A Case Study of Soso village (Nawagarh Panchayat), Ranchi

Scholar: Subhojit Das

Supervisor(s): Dr. Dipankar Chatterjee

‘Saansad Adarsh Gram Yojana’ has aimed to cater overall well-being of selected Gram Panchayats (GPs) through the convergence of programmes under the guidance of Hon’ble Members of Parliament both the Rajyasabha and Loksabha. The initiative is about improving access to public services and community action for social and economic development so that these villages become role model worth emulation by neighbouring Gram Panchayats. Nawagarh Panchayat also adopted the same model under the aegis of Ramakrishna Mission Ashrama, Ranchi where a number of socio-economic developments are going on through direct or indirect implementation of different Government projects. The study was carried out to showcase the effect of ongoing development activities in the panchayat. The study reveals that the female population is less in number rather than male population except Adivasi community as the community have more education than others so they do not seek boy child more than girl child as the other communities. The frequency of joint families is very less and Adivasi communities mainly due to their rigid ethnic family culture where there is increasing tendency towards nuclear family. As there is more availability of cultivable land most of the families are involved in agriculture whereas Adivasi communities show diversification in occupation. Most of the farmer households are belonging under Bedia tribe engaged themselves in agriculture and allied sector. The average income of the villagers is Rs.10000/month which can be considered as good in rural area. The village is small in size almost 150 household are there in the village. There are 15 SHGs in the village and every woman of a family is attached with one SHG group. The meeting of SHG group twice in a month. The meeting of gram sabha conducted one times per month. There are 2 big water tanks available in the village which are operated through solar system. Safe drinking water is

available from these 2 tanks. For irrigation, irrigation pump will made in near future for that fund is submitted in the Nawagarh panchayat. All types of survey related to the irrigation pump is done successfully. Locations are also selected for the irrigation pump, but for pandemic

situation the work is not started yet. There are also 10 community tube wells for safe drinking water. Cultivation is done mainly in the monsoon season. Many of the villagers are taken training from Divyayan Krishi Vigyan Kendra in which they have training about organic farming, apiculture, and in veterinary sector. In the present generation many of the rural youth are getting government job they are very much educated. The literacy rate almost will be 100 percent in the next future because every guardian want that his son/ daughter must be go to school. From the forest department, a park is making in the village for preserving the forest area and for the employment generation for the villagers and this work is done through the governance of Sunil Barnwal (Principal Secretary of ex-Chief minister Sri Raghubar Das). A night school is also continued in the village almost all the children of that village are going to that school and it is done by Ramakrishna Mission, Ranchi. The villagers have good knowledge about Swami Vivekananda's concept and all children of the village have knowledge about Swami Vivekananda's thought about the rural area which will help the village become a modern village in near future.

Title: Impact of Rural Tourism in Jharkhand

Scholar: Supratik Chakraborty

Supervisor(s): Dr. Dipankar Chatterjee

This report depicts the importance of rural tourism in Jharkhand context. The study was conducted in three renowned tourist spot of Ranchi district. This study mainly aimed to focus on identifying need of the rural tourism and impact of rural tourism on nearby villages. The study went on the basis of interaction with the respondents who are involved in tourism business over the spot. Perception study of guest and host as well are also made through proper schedule. It has been found that tourism marketing is the thing which should be promoted for the sake of tourism development. Few troubles were identified while conducting the study and the possible solutions are chalked out to prevent those problems. It has been found the rural tourism has a significant impact on life of local people as it generates job opportunities and help to earn a reasonable income. Tourism helps to preserve the rural culture and heritage and more over facilitate the rural people to explore their hidden potentiality before the outsider urban tourists.

Title: A Study on the Assessment of Mid-Day Meal (MDM) Scheme in Rural Areas of Jharkhand

Scholar: Bhuneswar Bediya

Supervisor(s): Dr. Dipankar Chatterjee

The present investigation was carried out at different schools located at the villages of Angara blocks of Ranchi district during January 2013 to May 2013 with the help of schedule and by conducting interview among the selected villagers. Six schools from six different villages namely Masinya, Gandhigram, Lembhatoli, Sivatoli Maheshpur and Soso were selected for the study. Almost all selected schools come under the rural area. The study aims at analysing the impact of MDM in increasing enrolment rate, role of MDM in improving nutrition status of the students' base on primary data collected from six schools. The study reveals that MDM programme increased the percentage of enrolment and nutrition status of the students. MDM is a motivating factor for the children to attend the school. Data also reflects that the MDM has reduced the burden of the parents of providing one time meal to their children. It is found to be a great support to the families especially of low socio-economic status. Despite the positive impact, there are lot of difficulties faced by the schools are also highlighted and suggested suitable measures for their improvements.

Title: Trafficking of Women in Jharkhand

Scholar: Susmita Chakraborty

Supervisor(s): Dr. Dipankar Chatterjee

Trafficking can occur within a country or trans-nationally. It is also called modern-day slavery, whereby the victim himself or herself "accepts" his / her situation due to the lack of substantial choices and ways out of poverty. Human trafficking on the other way is a crime against a person because of the violation of the victims right through coercion and exploitation. It is not always happened forcedly, sometimes it has been done due to the financial need of a family or a person. But anyway, it is an issue that is not good for any society or any region or religion. How trafficking is done it's not just the matter but the question is that why it is happened. After getting the appropriate information about it, we have the way to stop it effectively. Hence the study of trafficking and their rehabilitation is more important. The present study is an endeavour to prepare the profile of selected trafficked women, then documents their experiences, find out the problems faced by the women after being trafficked followed by the process of rehabilitation of the trafficked women. The study also tries to explore the social acceptance and social status of the trafficked victims and the process adopted by the trafficker, The study was mainly based on qualitative aspect and quantitative analysis where questionnaire and detailed personal interview have also been done in this study, the study materials or data are collected from several person

through snow ball method like Chanho police station, Para legal volunteer (PLV), and the rescue person and many more. The study was conducted on the Ranchi district of Jharkhand state. Some of the rehabilitation centres were visited purposively, Kishori Niketan is a rehabilitation centre run by an NGO, Bharatiya Kisan Sangh (BKS) which provide rehabilitation and at the same time enhance their skills so that they can be self-dependent. This study also suggests some suitable measures to reduce the menace of women trafficking.

Title: Ethnic Identity and Livelihood: A Case Study on Lodha tribe of West Bengal

Scholar: Prasun Sadhukhan

Supervisor(s): Dr. Dipankar Chatterjee

Lodhas had been leading a hunting and persecuted existence for decades. They have lived a life of abject poverty and severe adversity through a span of hundred years. The prolonged stigmatization of ‘Criminality’ has ostracised them from the organized society. Post-colonial India detached their mark through revocation of the CTA act in 1952, transforming them from Scheduled Caste (ST) to Scheduled Tribe (ST) and Primitive Tribal Group (PTG) to Particularly Vulnerable Tribal Group (PVTG). This paper analyses this identity crisis of Lodha along with subsequent livelihood transformation. Many sequential events one after another made them ‘enforced criminals’ on situational context, with no other alternative means of subsistence and livelihood. As we know that criminality is not hereditary and thus the criminal propensity of the Lodhas is more due to the loss of their traditional means of livelihood. The once hunting and gathering forest tribe, Lodha were dislodged and displaced

from forest leading to their transformed livelihood to non-agrarian daily wage labour. The pattern of their general economic life reveals few subsidiary livelihoods are directly linked with the economy of their surrounding ecology. Thus, the transformation of subsistence strategy has resulted in an incipient disintegration of the fabric of traditional societal structure

of the Lodha community.

Title: Rural Digitization: A Comparative Study Between Two Different Villages of Ranchi District

Scholar: Subhash Ghosh

Supervisor(s): Dr. Sudarsan Biswas

A comparative study has been conducted between two different villages of Ranchi district in Jharkhand for the purpose of rural digitization, the attitude of the people towards e-services and

utilization patterns of ICT tools and the use of e-services ICT tools. Digitization has brought significant changes in the action and behavior of the individuals. For the purpose, two villages were selected randomly in Ranchi district. The data were analysed using SPSS 16.0 and MS-Excel 2010. The questionnaire has been designed in such a way that all the respondents are covered. The significant difference has been found in terms of digital literacy in both the villages, Kamta and Chiterkota respectively. The outcome of this research provides proper information and recommendation for digitization in both the villages. Both the villages lack in terms of financial inclusion, availability of different ICT tools, digital literacy, basic e-governance, and e-services.

Title: Demographic-Ecological Study of Khond Tribe of Eastern India

Scholar: Ranjan Das

Supervisor(s): Dr. Dipankar Chatterjee

Khond is a tribal community mostly found in eastern part of India. The present study is an attempt to document the demographic and ecological perspectives of this tribal community through literature review. The study clearly states that from year 2001 to 2011 the population of Khond increases in the three states of Jharkhand, West Bengal and Orissa except Bihar. The female population increases with increase in population in these three states except Bihar where female population declines. The growth rate of the population in Orissa has been increased from 16.61% in 2001 to 2011 in Jharkhand, it was 12.75 %, in West Bengal. The sex ratio from year 2001 to 2011 increases in the states of Jharkhand, West Bengal, & Orissa except Bihar. Total Literacy rate Increases from year 2001 to 2011 in all the four states. The religion statistics represents apart from Hinduism; Christianity is widely accepted religion. Social Life of Khond reveals patriarchal family & Kinship relations, marriage customs changes with time, youth dormitories arises as development and creational centers, with time changing housing patterns, dress and ornaments explains their social heritage and importance. Economic life and activities is based on shifting agriculture and forest based produces. The shifting agriculture provides food subsistence and forest-based produce provides source of economic generation for trade in markets for buy day to day activity needs. Political Structure of the Khonds based on Mutha systems according to it tax collections, law and order was maintained in their society which now comes under Panchayat Raj Institutions. Religious Practices of Khonds was unique. It directly linked to origin of the tribes and every element in their environments has religious values and importance. *Meriah* - a human sacrifice ritual which gives them a historic identity which now shifted to animal sacrifices with intervention of British agencies and Government Interactions. The study concludes that the Khonds binds themselves with their environment

very interdependently and adapts to the changes happening within their society. The social life, economic life, political structure and religious life are interrelated and interdependent to each other.

Title: A Situational Analysis on Deviant Behaviours of Alcoholic Munda Youth in Dungra Village in Khunti District of Jharkhand

Scholar: Hiranmoy Mandal

Supervisor: Mr. Amitava Dutta

The present study was conducted at Dungra village of Khunti district, Jharkhand with the objective of identifying the reasons behind intaking of alcohol among the Munda Youth. Another objective of the study was to know about the deviant behaviours of the alcoholic male in their day to day lives and to finding out the suitable measures for arresting the problem. However, Participatory Rural Appraisal, Interview, Survey and Case Study methods were adopted for gathering suitable and relevant information. At the end of the study, it had found that the Munda Youth of the studied population were alcohol prone and were carried out different kind of deviant activities which were harmful for them, their families and for the community at large. The researcher felt that social work intervention may arrest such problem in future.

Title: Health Problems of Alcoholic Munda: A Case Study at Kucchu Panchayat, Angara Block, Ranchi

Scholar: Mahendra Karmali

Supervisor: Mr. Amitava Dutta

The present study was conducted at Jharkhand under the district Ranchi, block Angara, panchayat Kucchu and the villages covered were Kamta, Badri, and Dimra. The objective of the study was to find out the reasons for health problems occurred among the munda tribal group of people of studied villages and for that the present researcher adopted the participatory methods of research work like PRA and FGD along with those he also adopted interview, observation, case study and interview methods for his present research work. At the end of the research, it was found that most of the tribal Munda male folk used to consume alcohol and they considered it as a part of their tradition and culture. So, it was common for everyone in the entire studied villages where they used to consume alcohol as their traditional behaviour and practice. They used to take alcohol during several festivals and for entertainment along with that they also said that they used to prepare alcohol for overcoming their physical pain which they used to feel every day after the laborious jobs. However, the researcher found other related problems

occurred due to alcoholism like violence against women, social conflict and other social evils. At the end the researcher thought that alcohol was the part of their lives so it was very difficult to eradicate the practicing of alcohol intake among the tribal groups but sincere efforts on the behalf of the anthropologists, social workers, rural development professionals should be given to explore the problems faced by such ill-fated tribal group and to support their services for providing protection, care and welfare of the said group of people.

Title: A Study on Occurrence of Deviant Behaviour and Violence against Women by Alcoholic Tribal Male at Kamta Village, Kucchu Panchayat, Ranchi, Jharkhand

Scholar: Kumari Khushbu Singh

Supervisor: Mr. Amitava Dutta

The present study was conducted at Jharkhand under the district Ranchi, block Angara, panchayat Kucchu, village Kamta. The objectives of the study were to finding out the types of occurrences of violence against women, to unfold the reasons for occurrence of violence against women and to know about the sufferings of victims at Kamta village. Present researcher adopted the participatory methods of research work like Participatory Rural Appraisal (PRA) and FGD along with interview, observation, case study and interview methods for her present research work. At the end of the study, it was found that alcohol played a crucial role and highly influenced the behaviors of male for conducting deviant behaviour with the women which included physical, mental and social violence which were acted as obstacles against the growth of the women. However, researcher felt that a strong social work interventions was required for providing safeguard to such women against such violence.

Title: A Situational Analysis on Occurrence of Violence Against Women by Alcoholic Males: 'A Study on Tribals from Dimra Village, Kucchu Panchayat, Ranchi, Jharkhand

Scholar: Manisha Tirkey

Supervisor: Mr. Amitava Dutta

The present study was conducted at Dimra village, Kucchu panchayat, Angara block, Ranchi district, Jharkhand. The objectives of the study were to finding out the types of occurrences of violence against women due to alcoholism, to understand and unfold the reasons for occurrence of the same against women. to know about the sufferings of victims and to arrest such violence in future. However, the present researcher adopted the participatory methods of research work like Participatory Rural Appraisal (PRA) and Focus Group Discussion (FGD) along with interview, observation, case study methods for her present research work. At the end of the study, it was

found that most of the tribal men consumed alcohol because of their tradition and custom. Consumption of alcohol was common among the tribal and it was a part of their lives so it was very difficult to eradicate it. The study revealed that the consumption of alcohol by men was causing violence on women and these women wanted to stop this evil practice. Men harassed women after being intoxicated, tortured them both physically and mentally. Women were not in the position to raise their voice because of their poor social status and illiteracy. However, the researcher thought that a lot of scientific investigation and social work intervention was needed to overcome such problem and for providing protection, care and to the victims who were extremely vulnerable and helpless.

Keywords: Tribe, Violence, Woman, Alcohol

Title: Occurrence of Deviant Behaviour and Violence Against Women by Alcoholic Tribal Males: A Study on Tribal from Badri Village Kucchu Panchayat Ranchi Jharkhand

Scholar: Kumar Preetam Puri

Supervisor: Mr. Amitava Dutta

The present study was conducted at Badri village under Kucchu Panchayat, Angara Block, Ranchi district. The objectives of the study were to identify the occurrence of violence against women by the addicted male folk, to understand and unfold the reasons behind such violence, to know about the sufferings of the victims and finally to arrest the violence in the future. However, the researcher adopted both participatory and non-participatory methods in his research work. The investigation revealed that alcoholic tribal males were very much prone to commit both physical and mental torture against women. The victims were very much vulnerable and hardly were in the position to raise their voice against such violence. According to the investigator a lot of research work, along with the strong intervention of law and order and the meaningful contribution from social workers, development initiators, anthropologists together may arrest such problem.

Title: Impact of Watershed Management on Rural Livelihoods in Angara Block of Ranchi district, Jharkhand

Scholar: Amit Ruidas

Supervisor: Dr. Deep Narayan Mukherjee

This study was carried out to know the impact of the watershed in the Angara block of Ranchi district, Jharkhand. Two villages (Burakocha & Vagnabera) were selected through purposive sampling. The respondents were selected through simple random sampling and the information

was collected from 60 respondents through pre tested schedule. For analysing the data frequency, average, and percentage were adopted. With the implementation of watershed of 71.66% households got the benefit of the availability of irrigation water and for drinking water that was 88.33%. They were cultivating all three seasons of agriculture and yield was also in a good position. Livestock population was also in good strength. Living condition was better in the area. Hence it was clear that the watershed created great livelihood opportunities.

Title: Impact of alternative irrigation systems on cropping pattern of small and marginal farmers in Ranchi district of Jharkhand

Scholar: Sangita Maity

Supervisor: Dr. Deep Narayan Mukherjee

The present investigation was carried out at two villages of Tirlakocha and Piprabera of Angara block, district of Ranchi. During March 2019 to June 2019. This investigation was completed through questionnaire and personal interview among the selected households. This study was completed for the impact of alternative irrigation systems in the cropping of small and marginal farmers. The project report indicates the impact of gravity irrigation on farming system. It also reports their socio-economic structure, livelihood, cropping pattern after or before gravitational irrigation systems, requirements of water and constraints. Now a day's ,gravity irrigation system has very popular all over the hilly region due to its uses, a source of high income, suitable for rural and tribal people of Jharkhand. scientifically it provides a high yield and reduces risk. Farmers got training from Ramakrishna Mission for better agricultural practice due to gravity irrigation. Ramakrishna Mission Ashrama, Divyayan Krishi Vigyan Kendra, Morabadi, Ranchi – 834008, plays a very important role in developing gravity irrigation systems in many villages of Jharkhand.

Title: Impact of cooperative milk collection camp on socio-economic conditions of farmers in Hooghly district of West Bengal.

Scholar: Santanu Sana

Supervisor: Dr. Deep Narayan Mukherjee

The study examined the impact of cooperative milk collection camp on socio-economic conditions of farmers in Hooghly district of West Bengal. The farmers cooperatively collect milk in the cooperative milk collection camp namely Bholanath Dairy and collected milk were sent to Arambagh chilling plant. The primary data were collected from 60 cooperative farmers and 10 agricultural farmers through purposive random sampling method. For identifying the extent

of coverage of the camp cooperative secondary data were collected from the camp secretary. The findings showed that in a small duration a huge number of farmers had attached with this camp. Now this camp covers 7 villages of 402 milk farmers and total milk collected in last 6 months was 216000 litres. Most of the milk producing farmers under the collection camp were from Chiladangi and Haruah villages because those are the adjoin villages of the collection camp. The average herd size per family was 1.28 for local cow and 0.92 for crossbreed cow. In costs and returns section of milk production, the major items of variable costs incurred were feed which includes green fodder, dry fodder concentrates and grains. The total variable cost incurred by dairy farmer per animal per year was ₹30894.00. The major items of fixed cost of dairy farm is depreciation on animals and depreciation of building. The total cost was ₹34491.55. The gross return obtained per animal per year was ₹51450.00. Lack of technical facility, high cost of cattle feed, improper grading; measurement & timings of milk collection in the camp were the major problems of the dairy farmers. The study farther showed that the families which were attached with dairy activities side by side of agriculture generated more income than solo agricultural families. It also found that the number of dairy farmer decreased in the cooperative milk collection camp with the increase of distance. So this model might be started in every village. There was also a scope for reduction in cost of milk production by using modern methods and technologies of dairy farming that was completely absent in the study area.

Title: Impact of Beekeeping Farmer Producer Organization (FPO) in Socio Economic Development of the Members

Scholar: Meenakshi Kumari

Supervisor: Dr. Deep Narayan Mukherjee

Though India has become self-sufficient in food production, Indian farmers are still poor. They face multi-fold problems of lack of technical knowledge, information, marketing skills and their resources to meet the requirement of formal markets. As a result, they fail to efficiently market their produce. One of potential alternatives for efficient marketing is mobilizing farmers for group action for arranging inputs and marketing their produce in a collective way through FPOs. The main philosophy of FPOs is to collective farmers and generate income, saving and increase productivity. The specific objectives for the present study were: (i) To profile the existing organizational structure of the beekeeping FPO. (ii) To identify the economic factors affecting performance of the beekeeping FPO (iii) To identify the economic constraint and suggest suitable measure for sustainable growth of FPOs. The producer companies are just like cooperatives, but they are registered as companies. No non- producer can be a member

of the company. They get together, they combine their share capital, register as a company, employ a professional to run the company and do value addition, whatever is possible. In this context, it is felt necessary to probe into organizational structure, capacity building, internal controls and forward linkages of farmers producer companies. Farmer Producer Organization offers variety of services to its members. The set of services included: Input supply, Financial, Technical, Insurance, Procurement, Packaging, Marketing and Networking. It is noted that FPOs provide end to end services to its members covering almost all aspects of cultivators. The most important factors contributing to success and sustainability of FPOs were regular auditing, access to credit facilities, providing extension support to their members like training, demonstration etc., helping the farmers in marketing variables like grading and packaging of the produce. The major constraints at farm level were technical constraints like lack of proper infrastructure and computer illiteracy, labour and economic constraints like unavailability of labour during harvesting and lack of technical skills of labour, marketing constraints like distant market and high cost of transportation and perishable nature of products. To overcome these constraints certain suggestion was provided such as: Proper development of infrastructure of FPOs, proper guidelines of FPOs for computer literacy, proper guidelines should be given to raise technical skills of the labours, Cold storage facilities should be provided to each and every FPOs dealing with perishable commodities and many more.

Title: To study the impact of beekeeping FPOs in the socio-economic development of the members

Scholar: Srabasti Sen

Supervisor: Dr. Deep Narayan Mukherjee

Although India has become self-sufficient in food production, Indian farmers are still poor. They face multi-fold problems of lack of technical knowledge, information, marketing skills and the resources to meet the requirement of formal markets. So they fail to efficiently market their produce. The FPOs are groups of rural producers coming together to form an organization in order to pursue specific common interests of their members, developing technical and economic activities that benefit their members and maintaining relations with partners operating in their economic and institutional environment. Therefore, the farmers should have a clearcut concept of the genesis, mission, objectives and institutional mechanism adopted by the Farmer's Producer Organizations (FPOs). The study was done with the objective of studying the socio-economic factors that affects the organizational structure of the FPO so that the problems in marketing of honey can be eliminated. In order to replicate some other successful models of FPOs in different parts of the country, we need to identify and isolate the factors for example like the

socio-economic factors which contribute to its success and sustainability. The study came to the conclusion with the fact that the important factors contributing to success of the organizations were adoption of improved technology and modern infrastructure, well established links with market, certification of the produce and access to credit facilities. The study also gave us understanding that the working of the FPOs also depends on the numbers of members, villages covered, outlets, and activities undertaken by the organization. These also lead to employment generation and rise of annual turnover of the FPOs. The FPOs serves as a potential alternative to improve the socio-economic condition of the farmers. The study revealed that the membership in the FPOs directly affects the socio-economic conditions of the people. It was also studied that the income was higher in comparison to the non-members, thus leading to food security and social empowerment. The efficiency of the performance of the FPOs also gets retarded due to the presence of constraints. The study also revealed that lack of automation and technical backwardness are most severe constraint for FPOs. Some of the other constraints were financial constraint, lack of Government price policy, lack of crop insurance facilities and difficulty in meeting export standards. But it was also seen that the marketing constraints were very less for the members of FPOs in comparison to the non-members.

Title: A Study on the causes and consequences of High School drop-out in Ranchi District of Jharkhand

Scholar(s): Kumar Subham and Kumari Swan Saumya

Supervisor(s): Dr. Arunava Sengupta

Education deepens people's understanding of themselves and the world, enriches the mind by broadening one's experiences, and improves the choice they make as consumers, producers, and citizens. Education strengthens the ability to meet their wants and those of their family and society. Concerns over the dropout rate have been escalating nationwide. This present study has projected the situation of children out of school in two villages under Angara block i.e., Hundru and Bisa and two villages under Ormanjhi block i.e., Gurgai and Jaidiha in Ranchi District, Jharkhand. Regarding the factors contributed for children to drop-out from school, the main reasons include low or no interest in studies, early marriage, financial problem, school is far, do not like school, family problems, sickness and so on. Presently, enormous effort has been taken to strengthen the school and education systems whereas the families of children out of school are in the dark state. This shows that whatever effort is taken to put the children in school all goes in vain due to poor base at home, where the children need to spend their 'after school time' for learning. Data were gathered using semi-structured, open-ended interviews conducted among purposively selected participants. This study's findings and conclusions confirm that

family background, personal and school characteristics are all related to early school leaving.

Title: A Comparative Study of Drop-outs in two different panchayats in Ranchi district, Jharkhand

Scholar: Prajna Parinita Das

Supervisor(s): Dr. Arunava Sengupta

Education is about widening knowledge and understanding themselves as well as the world. The problem of dropout has been a concern and this has aroused the need for different measures to tackle dropout problem. This study went on the basic status of dropout, causes of early school; dropout, nature of economic activities and social activities they are engaged after dropout etc. The study findings revealed that family background, personal interest, school distance is related to early school dropouts.

Title: Ensuing School dropout among girls and finding the roots of this dropout scenario, in two blocks of Jharkhand

Scholar: Ankita Konar

Supervisor(s): Dr. Arunava Sengupta

The project paper titled “Ensuing School dropout among girls and finding the roots of this dropout scenario, in Two villages of Jharkhand” pertains to studying and understanding the reasons for school dropout among women in two villages namely- Chuttu village and Tirlakocha village of Angara block, Ranchi district of state Jharkhand. The entire data was collected using individual interview schedules prepared by the researcher and focused group discussions taken place in the area. After vivid and in-depth study of the same, the reasons for school dropout were pointed under ten main headings and a potent solution was tried to be provided in lines with the new education policy, 2020. A small sample size of 20 respondents was chosen to collect the data due to high surge of COVID-19 second wave. In spite of all these, the objectives formulated for the study were tried to be addressed at the most, and the hypothesis testing was also followed using Chi-Square test of hypothesis. Through the testing, the null hypothesis was rejected and alternative hypothesis was accepted. After drawing a conclusion to the project, and having great future expectations from the news educational policy, 2020 we have also given suggestions on the work and provided hints for future area of study in this field

Title: A Comparative Study of School Dropout Among Girl's in Two Different Panchayats in Latehar district of Jharkhand

Scholar: Semali Munjini Oraon

Supervisor(s): Dr. Arunava Sengupta

Education is about widening knowledge and understanding themselves as well as the world. The problem of dropout has been a concern of nationwide. This aroused the need for different measures to take dropout problem and also the factors associated with it. This study was undertaken in five villages of two Blocks under Latehar district, Jharkhand, among the local tribal communities. This study went on the basic status of dropout, nature of economic activities and social activities they are engaged after dropout etc. Data were collected using personal and associational interview, case study, observation conducted among purposively selected participants. This study's findings and conclusions confirm that family background, personal interest, school distance is all related to early school leaving

Title: A Study on the Trends of Migration in India

Scholar: Soumya Roy

Supervisor(s): Dr. Sudarsan Biswas

The present study was conducted to know the migration trend of farmers and agricultural labours in various states of India during the past few years. The data was collected from standardized sources like various journals, websites, newspapers and books for the study. The data collected were tabulated and analysed using appropriate statistical tools. In this paper, we have discussed the primary causes of Migration? How many migrated? What effects does this have? This paper will cover the migration of persons within states or between the states. From the study, we found that with regard to gender differential though 69.33 % of the respondents were male and belonged to the medium income group both of them were either male or female internally migrated. Most of them belonged to the medium farming experience category. More than half that is almost 66.00 % of the migrants were inter-district migrants falling under rural to urban migration and around 73.00 % of them were seasonal migrants. They migrate due to poor economic conditions and to get a regular income to sustain their living. The migration of young males is highly prevalent and is correlated with the water depletion, land scarcity, and family ties to workers who have previously migrated to urban areas. Among them with traditionally little or no land ownership, migration rates are much higher. These results suggest that social and economic factors, like landholding size, and social networks, mediate the ability of households to respond to groundwater depletion, population density increases, and the spread of diseases due to migration to urban areas.

Section J: Rural and Tribal Health

Title: Maternal Health in India: Antecedents and Existing Policies.

Scholar: Pratibha Kumari

Supervisor(s): Dr. Rajeev Kumar and Dr. Dipankar Chatterjee

According to the Goal-3: health care, preventing maternal mortality, and improving the quality of maternal and child health have been the global target. Maternal health is a critical component to ensure the health of children as well. Moreover, maternal and children health are essential indicators to measure the development of any nation. The problem related to maternal health is poor nutrition, early pregnancy, involuntary conception, and death of mothers during pregnancy. There is a direct impact of poor maternal health on the growth and survival of children's (Sustainable Development Goals). In this backdrop present study attempts to describe the condition and associated factors of maternal health in India. This study illustrated the condition of maternal health through review of existing literature, description of secondary data, and a single case study. Result shows that the most common direct causes of maternal injury and death are excessive blood loss, infection, high blood pressure, unsafe abortion, and obstructed labour, as well as indirect causes such as anaemia, malaria, and heart disease. Most of the maternal deaths are preventable with timely management by a skilled health professional working in a supportive environment. The findings of the study can be utilized to improve the maternal initiatives and increase of the coverage of awareness

Title: Nutritional status among Children and Adolescents; Factor and Remedies.

Scholar: Amit Singh

Supervisor(s): Dr. Rajeev Kumar and Sri Amitava Dutta

Nutrition and health is a major goal of sustainable development goals of united nation. The major portion of population belong to the youth. The overall health of youth determines their productivity and it is linked with the overall development of the country. The poor nutritional status of adolescents is a major health concern. In this backdrop present study attempts to present the existing scenario of nutritional status of children and adolescents, the causative factors, and available government policies to tackle it. Method: This study is purely based on secondary sources. It incorporated review of previous studies and description of secondary data. There is application of qualitative methods in this study: one case study obtained from electronic source and a content analysis of you tube video. Result shows that sizeable number of

children and adolescents are suffering from malnutrition; however existing government policies such as ICDS decreased the malnutrition. Poor literacy, low socio-economic status, gender discrimination, and poor implementation of existing schemes are the main cause of prevalent malnutrition among children and adolescents. The findings of the study can be utilized to improve the functions of nutritional related initiatives and increase of the coverage of awareness.

Title: A Study on Health Status and Health Seeking Behavior among the Tribal Peoples of Medini Village in Jharkhand

Scholar: Puja Rani

Supervisor(s): Dr. Dipankar Chatterjee

The common beliefs, customs and practices connected with health and disease have found to be intimately related with the treatment of disease. The health problems of rural especially of the tribes need special attention because the tribal people have distinctive health problem, which are mainly governed by their traditional beliefs, practices and ecological conditions. Some tribal groups still believe that a disease is always caused by hostile spirits or by the breach of some taboo. The present project work analyses the socio-economic and cultural onslaughts, arising partly from the erratic exploitation of human and material resources, have endangered the naturally healthy environment. The present study explored the community perspective towards the causes of various diseases prevalent and the health and health seeking behavior among the tribes. The study was conducted in the Madini village of Silli Block in Ranchi district of Jharkhand taking 50 households respondent using random sampling method. Both qualitative and quantitative data was analysed in the backdrop of the project objectives. Quantitative data was tabulated and statistically analysed using SPSS software. The study has revealed that the cause of illness and healing system are found to be associated with the magical religious beliefs and it was also revealed that the factors like age, sex, education of the patient. Types of illness, severity of diseases, health care facility, belief regarding the cause of diseases and previous experiences affects selection of different ways of treatment and finally the study concludes with the relevant finding that the villager's responses towards illness behavior is guided and conditioned by their culture.

Title: Dietary Habit, Nutritional Awareness, and its Association with Socio-Economic Condition of Rural Women in Jharkhand

Scholar: Upendra Kumar

Supervisor(s): Dr. Rajeev Kumar and Dr. Dipankar Chatterjee

Nutrition is essential for growth and development, health and wellbeing. Eating healthy diet contributes to preventing future illness, improves quality, and length of life. Maternal and child health is an important component of a sustainable development goal. Several studies reported poor nutrition of women leads to poor health of mother and children as well. In the backdrop of previous evidence, this study undertakes to assess the dietary habit, nutritional and health awareness, and its association with socio-economic factors. 100 women of various villages of Nawagarh Panchayat were selected randomly. They were interviewed using a pre-tested interview schedule. Data were analysed using SPSS 20 version. Study reveals that majority of women were aware of correct nutritional information, but their BMI was noted below 18 kg/m², which indicate significant mal-nutritional among rural women. There was a significant association of education level with awareness level. The total dietary habit was found associated positively with a total family income of respondents. The result of this study will contribute to designing nutritional awareness and interventional programs.

Title: Awareness, Attitude, and Practice of Family Planning Methods among Rural Women of Jharkhand

Scholar: Janak Mahto

Supervisor(s): Dr. Rajeev Kumar and Dr. Dipankar Chatterjee

Family planning methods play a vital role in population stabilization. Due to less or no awareness toward family planning method, having myths or misconceptions, and non-practices of contraceptives, there is an unwanted family expansion which poses a burden on family and causes poor nutrition of children. In this backdrop present study attempts to assess the awareness, attitude, and practice of contraceptives among rural women. This is a cross-sectional study, 100 women of rural Jharkahnd, belong to reporductive age group of 18-50 were interviewed through pre-tested semi structured interview schedule. Most of the sampled women were of tribal ethnicity, Sarna or Hindu religion, mean age of 30. Most of them were literate and engaged in agricultural work, (63%) of them were aware of family planning methods; their motive for family planning was to limit the family size. Result of chi square reveals the significant influence of literacy level in shaping positive knowledge, attitude, and behaviour for family planning methods. The findings of study can be utilized to improve the functions of family planning initiatives and increase of the coverage of awareness.

Title: A Study on Village-Sanitation in Two Distinct Villages of Ranchi District

Scholar: Santos Kumar

Supervisor(s): Dr. Sudarsan Biswas

Sanitary condition is very important for human beings. Good sanitary condition plays a vital role for the development of their life. If the sanitary condition can be good then the conditions of villager's will be in good condition. There were two distinct villages: one from semi-urban area and another from remote area have been selected to know the rural sanitary conditions. The study was conducted to know the sanitary practices prevailing in the villages for human health, and environmental health. It was also tried to explore the condition of safety and dignity of women in the villages. The consciousness and participation of villagers to make their village clean is also observed in the study. Finally, the researcher tried to find out the sanitary condition in the public places in both villages. The sanitary condition of the villages were not so good, they have lack of toilet facility and due to that they are bound to go outside for toilet. Building toilet and its use are very big challenges for all. The mentalities of the people were not fully developed for the use of toilet. Even, they do not aware about their self cleanliness. In the village people were reluctant to cleanliness of their village also.

Title: Gender Differences of Nutritional Status of Children and Adolescents in Jharkhand

Scholar: Anuj Goswami

Supervisor(s): Dr. Rajeev Kumar and Dr. Dipankar Chatterjee

School age is the active growing phase of childhood (Neb Guide Series, 2002). Primary school age is a dynamic period of physical growth as well as of mental development of the child. Research indicates that health problems due to miserable nutritional status in primary school-age children are among the most common causes of low school enrolment, high absenteeism, early dropout and unsatisfactory classroom performance. The present scenario of health and nutritional status of the school-age children in India is very unsatisfactory. The national family health survey (NFHS) data show that 53% of children in rural areas are underweight, and this varies across states. The percentage of underweight children in the country was 53.4 in 1992; it decreased to 45.8 in 1998 and rose again to 47 in 2006 (International Institute of Population Sciences, 2007). The study tries to assess the nutritional status of children and adolescents among both the genders in Jharkhand using the secondary data obtained from NFHS-4. Result shows that about 45 percent of the population in the age group of 15 to 19. BMI and haemoglobin level of females are lower than males. The findings of the study can be utilized to improve the functions of nutritional related initiatives and increase of the coverage of awareness.

Title: Children Health in Murshidabad (West Bengal): An Insight from NFHS-5 Data

Scholar: Probhash Ghosh

Supervisor(s): Dr. Rajeev Kumar and Sri Amitava Dutta

The childhood vaccination coverage of urban areas (76.2%) in West Bengal is less than total (79.5%) and rural (80.8%) coverage according to DLHS-4. Logistics and workforce for immunization have been issues of concern to public health managers. However, the latest issue of vaccine hesitancy has not been widely addressed in the Indian context. The study was carried out to assess the children's health status in Murshidabad District (West Bengal). Results reveal that more than two-thirds (69%) of children age 6-59 months are anaemic. Murshidabad has the highest number of anaemic children in West Bengal. Mothers' age between 30-39 and, less than 2years gap between children, and more than four children enhances the child mortality. These findings will help policymaker for revising the health policy to improve the children's health and decrease child mortality rates.

Title: A Cross road of Gender Discrimination and Maternal Health in Jharkhand

Scholar: Reetika Kumari

Supervisor(s): Dr. Rajeev Kumar and Sri Amitava Dutta

The World Health Organization (WHO) estimates that, of 536,000 maternal deaths occurring globally each year, 136,000 take place in India. Estimates of the global burden of disease for 1990 also showed that India contributed 25% to disability-adjusted life-years lost due to maternal conditions alone (World Health Organization, 2008). Unfortunately, there is little evidence that maternity has become significantly safer in India over the last 20 years despite the safe motherhood policies and programmatic initiatives at the national level. The study aimed to assess the relation of gender discrimination and maternal health in Jharkhand. Study reveals that in Jharkhand sex ratio is decreasing, quality of maternal health care increased in last decade, but a slight change in anaemic status of both the gender. Girls are more malnourished than boys. Obesity is increasing. The findings of the study can be utilized to improve the functions of nutritional-related initiatives and increase the coverage of awareness.

Title: A study on the impact of MGNREGA scheme on socio-economic status of the beneficiaries in some selected villages of Ranchi district, Jharkhand

Scholar: Adwitya Prakash

Supervisor(s): Dr. Arunava Sengupta

Most of the researchers have done their research work in different social aspect such as rural empowerment and so on. The study addresses impact of MGNREGA scheme on the economic status of beneficiaries regarding the implementation of the project. The participation of the village level workers made a significant impact on both social and economic aspects as well as providing employment opportunities. The result of the study revealed that MGNREGA have greater impact on both economic and social aspect of the beneficiaries in the increment of their income level as well as savings but it has got some procedural bottlenecks at the beneficiary selection stage.

Title: An impact assessment study on farmer's income and farm mechanization in Tikratoli, Ratu, Ranchi, Jharkhand

Scholar: Sudhir Kumar

Supervisor(s): Dr. Arunava Sengupta

In study it has been observed that there are significant changes in productivity and income of farmers of Tikra Toli village. Their primary occupation was agriculture as well as some farmers were doing animal husbandry. The cost of machine labour was the major component of the operational costs and it has decreased with increase in farm size. Machine labour employment has to be increased in small and medium farms and has to be reduced in large farms to increase gross returns. The total labour employment has increased with mechanization, only decreased in bullock labour. Farmers should take up large size production area to get greater gains under mechanized farm as in large farms the cost of production is low compared to small farms. Even though the production levels are good, the increased costs of input caused the negative effect on net returns since the sale price of vegetables has not increased on par with the input cost. Clear cut awareness should be provided to farmers of all remote places regarding any subsidy scheme before its time of implementation. Major constraints observed in mechanization were lack of suitable harvester, small farms, poor farmers, high price of machinery and delay in the supply of subsidized machinery.

Section K: Farming Systems, Indigenous Knowledge and Resource Management

Title: Problems & Prospects from By-products of Rice mills: A study of effect on rural ecology of village Bandhtoli, Nagri block, Ranchi, Jharkhand.

Scholar: Satish Kumar

Supervisor(s): Dr. Arpana Sharma and Dr. Sudarsan Biswas

Agriculture and agriculture related activities (such as food processing) constitute the main source of employment and income for rural population in our society. Rice milling is the oldest and largest agro processing industry wherein the rice grain is transformed into a form suitable for human consumption. Nagri block of Ranchi is famous for origin place of Subarnarekha River and along river side, several modern rice mills have been working since last few years. Every single village in the block has at least three modern rice mills for its processing. These mills release several tons of pollutants per day that not only affected agriculture lands but also create hazardous situation for rural livelihood. There are a knowledge gap and practical demand to understand the relationship between rural ecology and inhabitants living in rural areas. Hence, to study the local ecological problems and establish its linkage with environmental degradation and human wellbeing from the background of present study. The study was carried out in the frame work of village Bandh toli in Nagri block of Ranchi, Jharkhand. The village was selected on the basis of several rice mills working within 7 Kms area and nearby agricultural fields. Again, the village was randomly divided in to two different sits according to weedy vegetation. The study of 10 randomly selected quadrate were used to access plants species diversity and compositions with the help of species area curve method. PH and Electrical Conductivity (EC) of water were also calculated to correlate growth of weedy, invasive species with depletion of natural resources. In the present study, ecological data has taken for the calculation of frequency & density of dominant plant species from two different sits of the village. First site is the area where agriculture land is very close to the rice mills and second site is the field which is far away from rice mills dumping yards. The plant species were recorded through quadrate method. 24 different plant species were recorded each from 10 quadrate and arrange in tabular form to find out frequency and density of species. It was compared with Raunkiers frequency graph and was classified into dominant and frequency growing species. To find the reason for existence of present weedy vegetation, PH and EC of agricultural field and water resources were also calculated and compared with the frequency and density of observed plant species. 50 randomly selected households survey were also done to know the reason for loss in the field of agriculture, natural resources utilization pattern and effect of rice mills settlement on

their livelihood. Statistical analysis of primary & secondary data has thrown light on the socio-economic conditions, in future livelihood problems of the villagers as well as changes observed in rural ecology after development of several rice milling industries. The present study showed that growth of vegetation within selected two sites of the village were dominated by the plants that usually grow on dry and less fertile soils. Frequency and density of calculated plant species represented the occurrence of large number of species in smallest percentage group while few occurred sporadically. The species occurred in 80-100% may be regarded as dominant and co-dominant while those found in the first group may be regarded as accidental. The whole vegetation was heterogeneous in nature. It has been concluded that there is a correlation between acidic PH and EC of water with existence of only weedy and invasive plants because acidic PH and EC water adversely influences the soil microbial process & nutrient availability that results in crop failure and less productive agricultural land. It has been analysed from the survey of households residing near village of rice mills open dumping yards of rice mills, not proper out lets for disposal of water from rice mills and serve pollution results in regular crop failure and loss of natural resources. The elimination of local greenery has not given satisfactory food assets due to growth of invasive species is the main reason for migration of villagers to other places for livelihood. Proper disposal system and wastes recycling facility will have to develop before settlements of rice mills so that villagers as well as natural resources in nearby areas will no longer affect.

Title: Importance of Natural Resources on Livelihood of Tribal Communities in Soso village of Angara block

Scholar: Dhananjay Kumar

Supervisor(s): Dr. Arpana Sharma and Dr. Sudarsan Biswas

Men lives in nature and depends on the resource of nature for their livelihood. The progress of mankind depends upon the exploitation of different natural resources. The utilization of these resources properly is very important for the development of any area in the nation. The debate over tribal communities as conservator of natural resource forms the background of present research work. The study was carried out in the framework of Soso village of Angara block in Jharkhand state. The research was principally guided by qualitative methodology supplemented by some descriptive statistics. Considerable efforts were made to study the resource use patterns of tribal people with a view to understanding the traditional natural resources, based on the communities residing in the Soso village. This study has tried to explore the linkages between the subsistence economy and utilization and conservation of natural resource among the Soso villagers of the Ranchi, Jharkhand state. The findings show that the villagers are well

aware of the importance of the forest to utilize and management practices is a crucial factor in generating exhibit the exhaustive list of different plant and animal resources identified by the villagers along with their specific utilization. Women of this village are also aware of biological diversity and rich in indigenous natural resource and its management on which they depend for livelihood. The finding also highlights the classification of different resource made by the villagers from a purely utilitarian perspective that reflects their management skill achieved through lifelong experiential learning. The study concludes that despite growing interest and recognition of natural resource in research and development initiatives, it is imperative that advance can be made by scientific investigation of ecological phenomena while cashing on the wealth of natural resource that has developed through times.

Title: Men and Forest: A Study on Resource Utilization Pattern in Two Different Villages of Angara Block, Ranchi, Jharkhand

Scholar: Paramananda Nag

Supervisor(s): Dr. Dipankar Chatterjee

People in economically poor countries often depend on extracting resources from nearby forests for their livelihoods, whether for consumption or fuelwood, or as a source of income. In India, similar to many other countries, access to forest resources is changing, in part due to forest degradation and, more recently, due to the introduction of participatory forest management (PFM)—which changes the extent to which villagers are permitted to collect non-timber forest products (NTFPs) from village and government reserve forests. Forest degradation has influenced where villagers collect specific NTFPs, how long they spend both searching and collecting, the total amount that they consume, and their dependence on markets. The present study attempts to contribute the knowledge base by exploring the local people's knowledge concerning natural resource utilization and management in terms of spatial differences. The study attempts to uncover traditional cultural practices of the studied communities which encourage the use and management of local resources. The study can contribute to the strengthening of decision makers and development workers' understanding of the issues which concern the rural community of Jharkhand, to be adopted in their greater conservation goal. More importantly, it is hoped that this research can contribute in part, to a greater level of participation in conservation and that the state government and relevant agencies can begin to appreciate the role of rural community in resource management and promote community based conservation in the Jharkhand. In a broader context, this research contributes to a better understanding of the importance of maintaining cultural diversity amongst rural communities in order to promote sustainable management of natural resources.

Title: Ethno-Medicinal Practices by different Tribal Groups and their Present Status with reference to Jharkhand

Scholar: Anirban Kundu

Supervisor(s): Dr. Dipankar Chatterjee

Ranchi district of Jharkhand is inhabited by large number of different tribals communities. A study was carried out in some tribal dominated blocks namely, Angara, Burmu, Bero and Kanke on the ethnomedicinal plants, practices by the tribal people and their socio-economic condition to evaluate their present status with modernization and modern medicine man. Through schedule, personal interviews and interaction with them, a total number of 88 plant species used by the native tribals to treat different ailments of human beings and livestock were documented. The major ethnic groups in this area include Munda, Bedia, Mahato, Oraon, Birhor, Santhali and Ho. During the investigation, a well-developed system of ethnomedicine practices was found to exist among the tribals. The major plant part used was constituted by roots followed by leaves and stem. Menstruations, epilepsy, skin diseases, fever, cough, cold related diseases, Gastrointestinal ailments and dhatu syndrome were the major disorders treated by the use of medicinal plants in this area. Whole investigation was carried out on their customs, rituals also. Different community has different idea, opinion, believe on the causes of the disease. This study clearly shows that, there is a distinct gapping status between young generation of their family. It has been disappearing from them due to modernization of healthcare. Therefore, young generation of the areas should be encouraged by the government to protect and cultivate these valuable herbal plants and knowledge before they get lost due to the impact of modernization and also deforestation. This chapter has a vast area to explore more by authenticated research, and scientific study. Ethnomedicine is a core base of modern medicine system, it has a large scope to reopen the new limelight of life saving medicine in future.

Title: The Forgotten Partners: Role of Local Knowledge in Sustainable Management of Natural Resources

Scholar: Ramkrishna Mahto

Supervisor(s): Dr. Dipankar Chatterjee

Community-based conservation has arisen as an imperative neo-populist agenda in the recent debate and discourse on conservation and development. The success and sustainability of complex social-ecological systems such as community-based conservation is dependent on how effectively it can build resilience through various mechanisms within social-ecological systems. In this perspective, the present study used ethnographical study on human ecology to expose environmental ethics possessed by the villagers in terms of resource utilization and

management. This study demonstrated that the villagers attitude towards the environment change when changes occur in the society. It revealed that the romantic view of rural people as the guardians of the forest is not applicable in the present context as some people use the resources for the profit maximization. The ecological conservation not solely depends on the religious beliefs there are some other conditions that also influence the resource utilization and management. This study also demonstrates that the local Knowledge is a critical factor for sustainable development. Empowerment of local communities is a prerequisite for the integration of local knowledge in the development process. The integration of appropriate IK systems into development programs has already proved to contribute to efficiency, effectiveness and sustainable development impact. IK, like any other knowledge needs to be constantly used, challenged and further adapted to the evolving local contexts. The villagers do possess some significant knowledge, which is relevant in maintaining the biodiversity in their adjoining village areas. In final analysis it can be suggested that the villagers should be involved as partners in conservation with the condition that the social dynamics of the villagers is fully understood and that the both policy makers and the forest dependent peoples mutually benefit from conservation.

Title: Livelihood Sustainability through Indigenous Knowledge: A Case Study of a Sauriya Pahariya Village

Scholar: Rudrajit Sarkar

Supervisor(s): Dr. Dipankar Chatterjee

Indigenous communities depend directly on natural ecosystems for their livelihoods — wild plants and animals for food, for clothing, for fuel, medicine, and shelter. The economy, identity, and cultural and spiritual values, as well as the social organization of indigenous peoples, are closely linked to biological diversity and natural ecosystems. The world is going through a critical stage in its evolution. The global spread and application of new technologies influence ways of living and living standards in all corners of the globe. At the same time, a number of human-created crises are threatening the sustainability of local ecosystems. The deteriorating ecological situation, persistent poverty, social, political and religious tensions and the reduction of biological and cultural diversity present a poly crisis for which new answers are urgently needed. It is in this context the relevance of Indigenous knowledge has entered in the mainstream of sustainable development and biodiversity conservation discourse and the concept of endogenous development has received greater attention. Endogenous development refers to development that is mainly, though not exclusively, based on locally available resources, such as land, water, vegetation, knowledge, skills and competencies. External knowledge and

resources are often used as complements to local resources. The present research is an endeavor to document the customary practices based on indigenous knowledge of a *Sauria-Paharia* community in relation to their livelihood strategies for survival in a remote location. The research highlights the localized livelihood organization encompassing pattern of resource identification and use, 'local laws' of resource conservation, labor organization in terms of acquisition of specialized knowledge, continuity of knowledge through customary networks and distribution of knowledge in terms of age and gender. Despite the presence of all the strength required for the endogenous development, the villagers have to combat with the challenges imposed by the extraneous factors like religious conversion, increased rate of seasonal migration, culturally incompatible education system, intervention of development agencies and programmes and acculturation of the tribal society into the non-tribal framework through greater participation in different fairs and festivals of other ethnic and religious groups. Finally, the study tries to explore the possibilities of endogenous development in the changing scenario by rapprochement of persisting knowledge base of the community and the factors deviating the community from their customary practices that so far been successful in the local context.

Title: Alcoholism as Culture: A Comparative Study between Two Tribal Communities of Jharkhand with reference to their Livelihood

Scholar: Dhiraj Ghosh

Supervisor(s): Dr. Dipankar Chatterjee

This research is an endeavor to document the cultural aspect of drinking. The literature available to date mostly focuses on drinking as a problem rather than as normative behavior. The main objective of this research was to study the impact of alcoholism on socio-economic as well as the cultural aspect of two tribal communities of Jharkhand namely- Munda and Oraon. This comparative study was carried out in purposively selected four villages inhabited by Munda and Oraon communities. This study explicates that both communities use locally brewed liquor for various purposes. Concerning this, one may discern the following categories of constituents which make up drinking customs i.e. - social components addressing consumer and non-consumer and economic components – preparation, marketing, and at last I found the cultural components – customs, behavior, ritualistic purpose. In this study, I used different research tools- case study, observation, focused group discussion, and standard schedule to explicate the integration of drinking with the livelihood of studied communities. I observed that drinking local liquor is the tradition of tribal communities of Jharkhand. They also use it as medicine, for relaxation and personal pleasure. It was also observed that this drinking is so pervasive at the community level that the political parties are also using this as a tool to secure their vote bank by

offering communal feasts before the election. Finally, the study concludes that an understanding of the culture of drinking is necessary before implementing any anti-drinking program.

Title: Impact of Indian Forest Act (1927), JFMC and Forest Right Act (2006) on Tribal Community: A Case Study on Lodha Tribe of West Bengal

Scholar: Ritesh Raj

Supervisor(s): Dr. Dipankar Chatterjee

Forest plays an important role in enhancing livelihood requirements for rural community and in maintaining ecological balance. Over 53 million people in India, about 60% of the rural communities directly rely on forest for their day-to-day requirement. The bio-cultural knowledge of these ecosystem people has made them sustain their life through the ages. However, the ethnic minorities in rural India are characterized by geographic isolation as well as strong sense of socio-cultural exclusion. Their livelihood depends on utilizing timber and non-timber forest products (NTFPs) for various purposes viz. medicine, food, economic and other socio-religious purposes. However, it has gained importance in recent years in policy strategies of Government owing to its significance in life support substance to a large number of forest dwelling communities. Forest Rights Act (FRA) 2006 aims at considering the rights of the forest-dependent local communities in India. The enactment and implementation of historic legislation FRA 2006 facilitated the traditional forest dweller (Lodha community of West Bengal) land ownership to promote agriculture-based sustainable livelihood. However, inter-community conflicts over forest resource access, negligence of customary laws, and rejection of claims against land and forest rights have emanated as the consequence of the implementation of the forest rights act. Therefore, endorsing the secured livelihood and sustainable community development through executing FRA has come out as a vexing issue in the territory of Lodha tribal community. In this perspective, this present study explores the critical points, such as customary laws, inter-community conflicts including restricted access in the forest, and rejection of claims regarding to FRA implementation. Furthermore, it suggests a sustainable community development model that may further ameliorate in securing livelihood sustainability and accomplishing sustainable development goals at larger.

Title: Natural Resources Use Efficiency of Small Holding Tribal Farmer in Ranchi District. Jharkhand

Scholar: Akansha Kumari

Supervisor: Dr. Deep Narayan Mukherjee

Environment is nature's gift to be enjoyed and shared by all. India has abundant natural resource. People in economically poor country often depend on extracting resources from nearby natural resources for livelihood, Whether for home consumption, or as a source of income. Utilization pattern of resources by tribes in Jharkhand is change day by day same as other state due to Forest degradation, introduction of government programme (like-primary forest management), Industrialization. The present study attempts to uncover traditional culture based on natural resources of studied communities which encourage the use and management of local resources. The objectives of project are to study extent of ability of various natural resources natural resources in the study area, examine the extent of use of natural resources by the local community, to suggest majors for conservation and betterment of local natural resources. In Study area we observe people depend on natural resource for own consumption and for income, they don't have much idea about processing and increase value of product to increase income. The study can contribute to the strengthening of decision makers and development workers understanding of the issues which concern the rural community of Jharkhand, to be adopt in their greater conservation goal. More importantly, it is hoped that the state government and relevant agencies can begin to appreciate the role of rural community in resource management and promote community based conservation in the Jharkhand. In a broader context, this research contributes to a better understanding of the importance of maintainable culture diversity among rural communities in order to promote sustainable management of natural resource.

Title: A Case study of watershed development programme in Angara Block of Ranchi District in Jharkhand

Scholar: Swarnali Saha

Supervisor: Dr. Deep Narayan Mukherjee

This study examines the overall impacts of watershed in two villages of Angara Block, Ranchi district on the basis of economic, ecological and social indicators. Significant differences were found in income of the villagers, employment opportunities, water availability, increasing in the number of livestock etc. My study area was in Dhurleta and Bhognabera villages of Angara Block, Ranchi district. The multi stage random sampling method was adopted for collecting primary data by designing the sample from 45 respondents. This study shows that the socio-economic condition, cropping pattern and income of the villagers. In Tirlakkochoa village

watershed programme have been implemented by Divyayan KVK. Its impacts also come in Dhurleta and Bhognabera. Watershed helps to improve the socio-economic condition, changing in cropping pattern, employment generation, increasing in income and increase the livelihood opportunities. Watershed But the main problem of these villages that was scarcity of water and after watershed development programme this problem is reduced but has not been eradicated totally and people are not aware about it and they had no contribution on watershed developed model. That's why they were not getting all the benefits of watershed development programme. So at the end of my study my suggestions are increasing the governmental intervention, create awareness programme and they have to provide training on how to harvest rain water, use of Agricultural By product etc. to improve the condition of the villages by watershed. From the above study conclude that watershed management has a positive impact on such area which is totally depends on rain-fed condition.

Title: Impact of watershed development programme on socio-economic conditions of farmers in tribal villages of Ranchi District

Scholar: Md. Tanbir Mohsin

Supervisor: Dr. Deep Narayan Mukherjee

Six micro watersheds have been developed by Ramakrishna Mission in Angara Block of Ranchi District. Lapsar Dhurleta Vivekanand micro watershed was among of them. The main purpose of this WDP was to conserve the soil moisture and create an irrigation facility. This study attempted to gauge the impact of Lapsar Dhurleta Vivekananda Micro watershed. Four villages Tirlakocha, Dhurleta, Bhagnabera, and Borakocha were selected for this study. Total of 100 respondents were selected as sample size and multi-stage sampling process was adopted in identifying the villages. Firstly, by using stratified sampling method four villages were selected after those 100 respondents were selected from the study area through simple random sampling. The Study indicated that the watershed development programme has increased the income of the farmers through increasing crop production. Besides this equal importance was given to increase the farmer's income from horticulture and goatry. But less importance was given to fishery. Before the WDP nearly 45 % area of total land was cultivated but now it has increased to 65 %. The project could increase the income and employment opportunity of the households. The respondents of Tirlakocha were reported that after implementation of the micro-watershed their income from agriculture has been increased up-to 27 percent. The corresponding numbers for Dhurleta, Bhagnabera, and Borakocha were respectively 41%, 25%, and 25%. But only 55 % respondents were involved in the site selection process for implementing the water harvesting structures. Most of the respondents were reported that they did not contribute any money in

the project, but 75 percent respondents were reported that they provided manual labour in the Watershed Development Programme. Most of the respondents belonged to the marginal category so, they were unable to contribute money but through manual labour, they ensured their active participation in the WDP. However, the most critical factor is the increased income was not equally distributed to all section of people in the study area. Self-Employment schemes like village level small scale industries, post-harvest technologies, livestock, and poultry need to be developed.

Title: An Economic Analysis on Integrated Farming System Model of Burakocha village in Angara block of Ranchi District, Jharkhand

Scholar: Aditi Khan

Supervisor(s): Dr. Arunava Sengupta

The study of “An Economic Analysis on Integrated Farming System Model of Burakocha village in Angara block of Ranchi District, Jharkhand” was conducted in January 2018 to June 2018. For collecting the data different methods were adopted like quantitative (survey, personal interview) and qualitative (observation, case study) and PRA also. Through the survey, it was known that more than half of the villagers were literate but education standard was very poor. Farmers of this village practiced organic agriculture; besides they were also involved in lac cultivation. They also reared livestock. In this village, most of the 72% farmers were of small and marginal categories with land holding below 2.5 acres. Five major farming systems were documented and their economic analysis was undertaken. The most popular farming system of the study area was FS1 (combination of agriculture, horticulture: vegetables/orchard, lac insect rearing, goatery and poultry: $A+H_1+H_2+L+G+Po$) with B: C at 3.15. But from the study, it was established that most effective farming system in this area for the farmers was FS5 ($A+H_1+H_2+L$). This farming system generated the highest B: C of 3.38. Villagers were interested in new governmental schemes and were interested to accept new farm production technologies. Divyayan Krishi Vigyan Kendra (DKVK) intervened in the year 2017 and transformed it to organic village with a well-planned implementation strategy. Their farming income was low because of improper water and pest management, lack of marketing facilities and use of low-quality seed. It was necessary to overcome these hurdles and also to make the farmers adopt the best and most profitable farming system model for a strategy on sustainable livelihood through increased farm income.

Title: A Comparative Analysis Between Organic and Inorganic Farming: ‘Study on Some Selected Villages of Ranchi District, Jharkhand

Scholar: Bijaya Majumdar

Supervisor(s): Dr. Arunava Sengupta

Livelihood is the most powerful term which’s systematic application & strategic planning can solve major problems like poverty, hunger, health issues etc. Considering the perspective of Jharkhand agriculture is the major sources of income. Now-a-days all over the world is rethinking about organic farming & its valuable aspects. The study helps to meet the readers with a “so called not famous” villages of Jharkhand where people are consistently practicing organic farming. But the question mark always roaming in the wind that ‘Is it really helps to meet the economic concerns of the farmers?’. Here in this study the comparative analysis has been made between organic & inorganic framing to understand the question more properly. The research was carried out considering two different villages of Angara Block that is Tirlakocha and Bhognabera. There were lots of weapons to complete the research like open ended semi-structured questionnaire and personal interview, participatory rural appraisal (PRA) and focused group discussions. This project report indicates, majorly the basic perceptions of the farmers for choosing organic farming& inorganic farming and the analysis have been made regarding cost of production of the both organically made produce and inorganically made produces. Currently organic farming is very much popular in the villages but there are also some villages that are rigid to adopt organic farming. Major focus of the study has been given to identify the causes of that consequences.

Title: The study of Farming system model of Tirlakocha village under Angara block of Ranchi District, Jharkhand

Scholar: Shibam Dey

Supervisor(s): Dr. Arunava Sengupta

The shortcomings of the reductionistic, traditional, command-and-control approach to agriculture is increasingly evident. Farming system is one of the important solutions because in this approach, different enterprises can be carefully undertaken and the location specific system can be developed through holistic way to farming. This research was carried out at Tirlakocha village in the Angara Block of Jharkhand’s Ranchi district. Data was gathered from both primary and secondary sources, and tabular, functional, and linear programming approaches were used to evaluate it. Major farming systems identified in the study area were Farming system 1 - Cereals + Vegetables, Farming system 2- Cereals + Pulses, Farming system 3-Cereals + Livestock, Farming system 4- Cereals + Lac cultivation, Farming system 5-Cereals

+ Vegetables + Livestock, Farming system 6-Cereals + Pulses + Vegetables, Farming system 7-Cereals + Vegetables + Livestock's + Lac. Within the identified Farming Systems, cost and returns were worked out for the enterprises and optimization technique was carried out for all the identified Farming Systems. It was found that the marginal farmers realized maximum net income from Farming system 7 (C+V+L+ L₂ system).

Title: Integrated Farming System: An Economic Analysis of the Farmers of Burakocha, Angara, Ranchi, Jharkhand

Scholar: Saibal Roy

Supervisor(s): Dr. Arunava Sengupta

The study depicts the importance of Integrated Farming System (IFS) for small and marginal farmers in improving their quality of livelihood and productivity. This study was conducted in the Burakocha village of Ranchi district. This study was mainly done to do an economic analysis of IFS models adopted by the farmers of the village. 5 major farming system models were selected and the benefit cost ratio of these farming systems were calculated and compared to determine the best farming system. The most popular farming system of the study area is Paddy+ Tomato+ bottle gourd+ Lac+ Goatery+ Poultry (A+H₁+H₂+L+G+Po), Total Investment of this farming system is Rs 109748.00 and total Return is Rs 346550.00, so B: C= 3.15. But from the study, it is known that most effective farming system in this area for the farmers is Paddy + Tomato+ Bottle gourd+ Lac (A+H₁+H₂+L). Total Investment of this farming system is Rs 91073.00 and total Return is Rs 308450.00 so B: C= 3.38. The farmers need to have a proper plan in selecting the proper enterprises and use better pest management techniques and introduce use of Information and communication technology (ICT) for information on marketing and better farming techniques to increase productivity and income. This will increase the future scope of study on Integrated Farming System.

Title: The study of Farming system model of Tirlakocha village under Angara block of Ranchi District, Jharkhand

Scholar: Bidesh Das

Supervisor(s): Dr. Arunava Sengupta

Farming system is one of the important solutions because in this approach, different enterprises can be carefully undertaken and location specific model; can be developed through holistic way of farming. Major farming systems identified in the study area were Farming system 1 - Cereals + Vegetables, Farming system 2- Cereals + Pulses, Farming system 3-Cereals +

Livestock, Farming system 4- Cereals + Lac cultivation, Farming system 5-Cereals + Vegetables + Livestock, Farming system 6-Cereals + Pulses + Vegetables, Farming system 7-Cereals + Vegetables + Livestock's + Lac. Within the identified Farming Systems, cost and returns were worked out for the enterprises and optimization technique was carried out for all the identified Farming Systems. It was found that the marginal farmers realized maximum net income from Farming system 7 (C+V+L+ L₂ system). Farming system model seven gave the maximum net farm income.

Title: Study on the role of women in family farming: a case study of Badri village, Ranchi, Jharkhand

Scholar: Riya Singha

Supervisor(s): Dr. Arunava Sengupta

The study of family farming covers various elements from sociological perspective, family farm is associated with family values, such as solidarity, commitment and is identified with specific entrepreneurial skills. Gender role as a cause and consequence has been considered as a prior factor of sustainability of family farms. The study aims to highlight the role of women in family farms. The study emphasises to understand the gender dynamics and the role of women in farm related decisions. Success of small farm based interventions depends on the involvement of family labours. Thus, women have to play a crucial role in 'family farm' approach.

Title: "A Study on the practice of Indigenous Technical Knowledge (ITK) among the Farmers of Ranchi District, Jharkhand"

Scholar: Suvo Samanta

Supervisor(s): Dr. Sudarsan Biswas

The present study was carried out in three villages of Jharkhand namely, Barkigorang, Tirlakocha and Karamdih (Chanpi) of Ranchi district. The main motive of the project study was to find the different Indigenous Technical Knowledge (ITK) practiced by the farmers of Jharkhand. As these selected villages and the farmers there are practicing nature-based farming practices, here modern agricultural techniques were not been properly spread by date. So there was a huge chance of getting different ITK's which are practiced by them from times immemorial and this knowledge is transmitted generation after generation. The research concentrated on to find out the more number of ITKs which are practiced by the farmers. For that the Focused Group Discussion (FDG) approach to collect was adopted primary data. The chances of getting more ITKs were increased with the involvement of comparatively older populations. Many ITKs

was documented which were practiced by the farmers of these 3 villages of Jharkhand. They practice different ITKs in different agricultural practices for different crops. Out of these ITKs, some are very effective which helps them in managing their Crops in a very systematic way not only in the main field but also after harvest and storage. From this study, The study documented ITKs which they practiced during the time of land preparation, seed sowing, sowing time, in different intercultural operations, pest management, weed management, harvesting, and storage etc. for different crops like cereals, solanaceous crops, vegetables etc. This can knowledge spread among the other farmers of different areas of different states and they can be benefited by utilizing these techniques and agriculture can be sustainable in a holistic way.

Title: Role of Minor Forest Produces in the life of Tribes of Jharkhand: A Review”

Scholar: Ranit Dey

Supervisor(s): Dr. Sudarsan Biswas

Jharkhand is one of the biodiversity-rich states of India considering its cause, different physiographic, and climatic conditions. It is remarkable as a result of its natural people, mineral resources, and its tremendous boondocks resources. The NTFPs play a vital role in the rural economy and livelihoods of tribes in Jharkhand and hence employment through NTFPs-based value-added industries and their organized marketing system should be promoted. The bamboo items and advertising have various tasks to carry out in the comprehensive financial improvement of the nation, particularly with regards to the rustic population. Plant-inferred drugs have a significant spot in both customary and current clinical frameworks and Jharkhand is wealthy in therapeutic plants of assorted varieties. At the same time due to the large scale of deforestation and endangerment of endangered species the forest resources are faced with the threat. State and national level cooperative marketing development agencies have been engaging in the development and marketing of MFPs. Worth expansion of MFPs can build the market request and bring more benefits to the essential finders/cultivators. Multifarious developmental programs are running to uplift the socio-economic conditions of tribal people through the development of MFPs This part will talk about the accessibility of MFPs in Jharkhand and their job in the financial existence of the clans of Jharkhand. Realizing the continuous depletion of these valuable resources, attempts should be made for its large-scale cultivation and multiplication in order to meet its escalating demand as well as long-term sustainability.

Title: Practices of Indigenous Technical Knowledge in Agriculture: A Review in the context of India

Scholar: Bibhushit Angelo Tirkey

Supervisor(s): Dr. Sudarsan Biswas

India has a glorious past in the field of agriculture. Agriculture and animal rearing are the heritage of the Indian livelihood system. Therefore, still today the practice of traditional agriculture can be found in many parts of the country. This traditional way of farming practices often has a great scientific value. As the knowledge has been refined and generated after a long practice, it has an importance in modern agriculture and we, the people of the modern era must consider this valuable knowledge. Today, the scientific validation of such knowledge is asked for. The present study has tried to document several indigenous practices commonly practiced in the traditional agricultural system. Many ITKs have been documented and tried to have a scientific explanation of these traditional practices in this present study.

Section L: Rural Economics, Micro-Planning and Development Studies

Title: People, Economy and Society: Documenting Mahuatongri Village of Angara Block, Ranchi, Jharkhand

Scholar: Subhankar Chhandogi

Supervisor(s): Dr. Dipankar Chatterjee

Over the years it has been found that the impact on the various developmental issues have been generally not due to one or two schemes in particular but has been due to a combination of interventions from number of schemes / programmes. A workshop organized under the aegis of the Planning Commission in which the leading NGOs and other reputed institutions were participated, a view was taken to adopt an area-based approach for the evaluation of the impact of the various schemes of the Government of India. A long-term bottom-up approach is necessary for the implementation of any development scheme in a village for the sustainability and acceptability of the schemes. In order to get substantive understanding of the prevailing situation in the project area, the baseline information is of immense importance for the project implementation and the lessons for follow-up. It is for this reason the present study was carried out to document the Mahuatongri village of Angara block, Ranchi district, Jharkhand. The data analysis of this survey delineates the social and economic background of Mahuatongri, and provides a careful examination of strengths and vulnerabilities associated with this particular village. The method of analysis was both qualitative and quantitative. The population characteristics has been explained on the basis of age-sex structure, Population by Caste, Child Women ratio, Family type, Family Size, Household Income, House Type, Water resources, Daily Activity Calendar, Marital status, Land holding etc. to assess the overall socio-economic condition of the villagers. The agricultural aspects, health and educational scenario, religious life in the village and its association with different livelihood aspects and life cycle have been comprehensively analysed. Different development activities carried out in the village has been summarized and its impact over the villagers is discussed. Some specific suggestions are also provided on the basis of the findings for the holistic development of the village.

Title: Participatory Planning of Sirka-Sonuabera Village of Angara Block, Ranchi, Jharkhand

Scholar: Dhiraj Ghosh

Supervisor(s): Dr. Dipankar Chatterjee

Land and water are essential elements for the sustainability of the human being. Indiscriminate exploitation, injudicious and reckless use of resources for food, fodder and fuel has resulted in excessive soil erosion, deforestation and moisture stress. The end of result is resource poor situation leading to reduced food, fodder and fuel productivity. The new approach to development provides a paradigm shift in the traditional approach where the role of the government is changed from that of governance to facilitation. It envisages a bottom-up approach whereby the users' group themselves decide their work programme. In the above backdrop, a participatory exercise was carried out in the Sirka-Sonuabera village, which is a part of *Vivekananda JalchhajanSamity* Micro-Watershed project. The basic objective of this exercise was to frame a comprehensive land utilization plan to enhance the livelihood opportunities of the villagers using the benefit of micro-watershed project. The study highlights the bio-physical and socio-economic characteristics of the community to determine the problems encountered by the community and to recommend appropriate plans of action in addressing these problems through villagers' participation. Finally, a plan has been finalised with a hope that, it would change the livelihood condition of the community because participation fosters ownership of the people over resources and produce better results.

Title: Sustainable Model Village Planning of Jaspur Village, Angara Block of Jharkhand

Scholar: Raju Das

Supervisor(s): Dr. Dipankar Chatterjee

The present research was carried out at Jaspur village under Angara block of Ranchi district during January-2013 to May-2013 with the help of schedules and interview among the villagers of Jaspur, to observe the present status and make a sustainable planning. A small village Jaspur, is situated in Angara block of Ranchi district of Jharkhand, upholding with 220 population in 45 household having 131.57 sex ratio with 125 male and 95 female. There were three ethnic groups like Karmali, Mahato, Singh; the Karmali families (31) were more rather than Mahato (12) and Singh (2). The villagers were engaged with agricultural practice, welding works and allied works like labour etc. for earning livelihood. The more families were engaged with welding works (21). But they were economically very weak due to lack of proper management in any aspects of development. The village is full of natural resources. The main crops were cultivated like paddy, potato, tomato, cabbage, etc. The farmers were not practicing Integrated Pest Management, Integrated Nutrient Management, Organic farming, etc. They did not practice

sanitation properly, so prevalence of disease is occurred in the village. In educational status, the males (98) are more literate than females (53), but in total literacy (151) is high rather than illiteracy (69). They were rich in religious and cultural life. In Jaspur, a planning should be needed for the holistic development in sustainable way to change into a model village. The more important is that the village needs to be developed in livelihood security, conservation on natural resources, environmental protection, infrastructure development, improvement on practical education, awareness on health and sanitation as well as with the interest of government and the people's participation on planning to make a Sustainable Model Village.

Title: Participatory Planning in a Tribal Village: Mungadih of Angara Block, Ranchi, Jharkhand

Scholar: Jaydeep Utkarsh

Supervisor(s): Dr. Dipankar Chatterjee

This study aimed to determine the bio-physical and socio-economic characteristics of the Community, to determine the problems encountered by the community with emphasis on livestock, agriculture and livelihood and to recommend appropriate plans of action in addressing these problems. Field observation and interviews with key informants were conducted. The data gathered served as basis in the preparation of a Community Development Plan for Mungadih Village. In addition, this data provided guidelines in plan implementation as well as serving as a basis for determining the different changes or accomplishments to be made. The survey's results showed that there are many problems faced by the community, including low income, lack of capital and credit sources, low prices of products and business management. Several plans of action that were made and proposed included strengthening of the existing farmers' livelihood. The finding shows that in Mungadih village most of the farmers belongs to small and marginal categories. They are using traditional agricultural implements in their agricultural fields. The purpose of this participatory plan was to empower the community to have a clear understanding of their problems and realistic solutions to these problems.

Title: Participatory Planning of a Multi-Ethnic Village

Scholar: Subhankar Chhandogi

Supervisor(s): Dr. Dipankar Chatterjee

This study aimed to determine the bio-physical and socio-economic characteristics of the community, to determine the problems encountered by the community with emphasis on livestock, agriculture and livelihood and to recommend appropriate plans of action in addressing these problems. Several plans of action that were made and proposed included strengthening

of the existing farmer's. The data collection techniques include the household survey with the help of schedule, focused and personal interview, participant's observation, Participatory Rural Appraisal (PRA) tools, guided the field walks etc. Finally, the data were processed and analysed categorically to arrive the conclusion. A small village Mahuatongri is situated in Angara block of Ranchi district of Jharkhand, total of 56 households are living in this village. The village needs to be developed on human capital, survival strategy, environmental protection, infrastructure development, improvement of health, education and human security, livelihood and social security as well as with the interest of government and the people's participation to make a sustainable village development plan (VDP). The problems were identified for this from the discussions with the villagers. This study has tried to explore the linkages between subsistence the economy and utilization and conservation of natural resources among the Mahuatongri villagers. This plan also provide implementation as well as serving as a basis for determining the different changes or accomplishments to be made. The purpose of this Village Development Plan was to empower the community to have a clear understanding of their problems and realistic solutions to these problems.

Title: Participatory planning of *Tigratikratoli* village with reference to land use and crop cultivation

Scholar: Subhankar Chhandogi

Supervisor(s): Dr. Dipankar Chatterjee

The study was carried out in Tigra Tikra Toli village at Ratu block of Ranchi district, Jharkhand. The research is based on the data collected from randomly selected 50 households through structured schedule and personal interview. In case of population, about 54% are male and 46% are female. Out of total population 84% are followers of *Hindu* religion and 16% follows *Sarna* tradition. The primary occupation is agriculture *ie.* 78% households engaged in agriculture, 10% labours, 8% skilled workers and 4% engaged in other activities. Most of them are small and marginal farmers. About 31% households considers animals husbandry as their secondary occupation. The households use natural resources for food, fuel, medicine, fodder, furniture, agriculture implements *etc.* Mobile phone is the most frequently use mass media in the village. The villagers have very poor Knowledge on soil testing. Most of them use chemical fertilizers to increase the yield but it leads to reduction in quality of soil. Paddy is the most common crop to be grown in rainy season. Apart from paddy they grow maize, ginger, *foot yam*, cowpea *etc.* during the Kharif. In Rabi season they prefer to cultivate potato, beans, pea, Brinjal *etc.* as their main crop. Dug-well is the main source of irrigation but during summer most of the wells become dry so they didn't cultivate in large scale. Only few families having bore-well that they

use to cultivates crop like Lady's finger, beans, pumpkin, cowpea and maize etc. Bore wells are also used by the families having cultivable land adjacent to the bore well in lieu of 1/3rd share of their total income to the owner of bore well. The major problems faced by the farmers are water scarcity, poor infrastructures, less availability of electricity, and poor awareness about the ill impact of the chemical fertilizers.

Title: Yield Gap Analysis of different Rabi crops in Jharkhand

Scholar: Kumudini Oraon

Supervisor: Dr. Deep Narayan Mukherjee

This study aims to quantify the gap between current and potential yields of major crops namely wheat, chilli, cauliflower, bottle gourd and sugarcane in Jharkhand and the constraints that contribute to this yield gap. The study provides the average yield of demonstrated plot over control plot. The yield of crop varies due to soil fertility and different operation involve in agriculture. The yield gaps are mainly caused by socio-economic, credit institutional/policy related factors, extension services and lack of improved technology. Different strategies, such as integrated crop management (ICM) practices, timely supply of inputs including credit to farmers, research and extension collaboration to transfer the new technologies have been discussed as strategies to minimize yield gaps. Suggestions have been made to make credit available to resource-poor small farmers to buy necessary inputs. Efforts should be made to update farmers' knowledge on the causes of yield gaps in crops and measures to narrow the gaps through training, demonstrations, field visits and monitoring by extension agencies to achieve high yield. The adoption of various improved technology that helpful in reduce the yield gap if the farmer utilizes it properly.

Title: Yield Gap Analysis of Vegetable Crops in Ranchi District of Jharkhand

Scholar: Anupama Mahato

Supervisor: Dr. Deep Narayan Mukherjee

The yield gap of various vegetables crops was studied. Although the state Jharkhand grows huge quantities of green vegetables every year but still there are some gap in the yields of the crops. The major vegetable crops grown are potato, cauliflower, cabbage, onions, tomato, chillies, brinjal, bhindi, and leafy vegetables. The purpose of the study was to study existing yield level and the extent of yield gaps of different crops and to suggest measures for reducing the present level of yield gaps. The relationship of yield gap with variables of yield gap were studied. The study also described about the factors that cause yield gaps and strategies for minimising yield

gaps. The study revealed a total yield gaps of various vegetable crops. The yields gap are mainly caused by socio economic, credit policy related factors, extension services and lack of improved technology. Different strategies such as Integrated Nutrient Management practices, timely supply of inputs including credit to farmer's research and extension collaboration to transfer the new technologies have been discussed as strategies to minimise yield gaps. Suggestions have been made to make credit available to resource poor small farmers to buy necessary inputs.

Title: Yield Gap Analysis of Kharif Crops in Ranchi District of Jharkhand

Scholar: Dishani Mitra

Supervisor: Dr. Deep Narayan Mukherjee

To increase rice productivity from current levels, the yield gap, the difference between actual and potential yield, should be analysed. The challenges of global agriculture have been analysed exhaustively and the need has been established for sustainable improvement in agricultural production aimed at food security in a context of increasing pressure on natural resources. Whereas the importance of R&D investment in agriculture is increasingly recognised, better allocation of limited funding is essential to improve food production. In this context, the common and often large gap between actual and attainable yield is a critical target. Realistic solutions are required to close yield gaps in both small and large scale cropping systems worldwide; to make progress in this direction, we need (1) definitions and techniques to measure and model yield at different levels (actual, attainable, potential) and different scales in space (field, farm, region, global) and time (short, long term); (2) identification of the causes of gaps between yield levels; (3) management options to reduce the gaps where feasible and (4) policies to favour adoption of gap-closing technologies. A crop model was calibrated for the kharif crops of Ranchi district of Jharkhand. The validated model was used to simulate long-term yield for 14 locations under three management conditions (potential, water-limited, nitrogen-limited). The results show that the difference in yield is due to various reason. The water availability is a great factor that leads to huge yield gap. This indicates that farmers should emphasize more on management factors such as water availability, timing of nitrogen application, and selection of cultivars adapted for each environment to reduce yield gap.

Title: Market study of Honey in Ranchi district of Jharkhand

Scholar: Dibyendu Adak

Supervisor: Dr. Deep Narayan Mukherjee

This study focused on market analysis of Honey in Ranchi district. For this study 21 producers, 11 wholesalers and 7 retailers were taken as sample by snowball method of sampling. Data were collected through pretested schedule and analysed by different techniques like percentage, total marketing cost, marketing margin, producer's share in consumer rupee, Shepherd's approach, and Acharya approach. All the analysis was carried out on the basis of the production from 100 bee-box. There were 3 types of beekeepers – small (<50 bee-box), medium (50-100 bee-box) and large (>100 bee-box) according to their bee-box holding. Among them, medium beekeepers were in highest strength (47.62%). Two channels regarding marketing of honey were identified in the study area- one was producer to wholesaler to retailer (and sometime few wholesalers acted as retailers) and this is considered in the study and another channel is producer to Divyayan KVK but the constraint is that Divyayan accepts honey of their own trainees exclusively. Regarding production cost of honey, the beekeepers of the present study area bore very less amount of fixed cost in comparison with ideal practice. The marketing cost incurred by producers was higher in second channel that was nearly twice of the first channel but net return of farmers in second channel was also twice of first channel. Wholesaler was absent in second channel. Again marketing cost incurred by retailers was higher in second channel and marketing margin was lower in second channel. Marketing efficiency was higher in second channel (4.97 by Shepherd approach and 1.01 by Acharya approach) than first channel (4.13 by Shepherd approach and 0.38 by Acharya approach) and producer's share in consumer rupee was also higher in second channel (57.95%) than first channel (31.13%). Hence second channel is more efficient.

Title: Problems and prospects of non-farm entrepreneurship development with special reference to rural women

Scholar: Sutapa Ruidas

Supervisor: Dr. Deep Narayan Mukherjee

Women entrepreneurship make significant contribution to economic development. Female headed enterprises are growing all over the world and it is a well-known fact that many of the successful and largest enterprises are owned and run by women. In India, many women take up entrepreneurial activities, especially in small and medium enterprises. State like Jharkhand which aim to become the leading destination for entrepreneurial set-up, encourages rural women to become entrepreneurs, as entrepreneurship helps them to gain social standing. So,

an attempt was made to understand the present condition of non-farm entrepreneurship with special reference to rural women, to analyse their problems and prospects and to find out the future opportunities of these rural non-farm women entrepreneurship in Jharkhand. Based on secondary data collected from various articles, the study revealed that most of the rural women were indulged in old traditional lifestyle which is closely related to nature and entrepreneurial activities were more common among urban women rather than rural one. However, some rural women, who showed interest in entrepreneurial activities faced various problems, out of which the major problems were lack of access to finance, lack of market knowledge, low technological knowledge, low self-confidence, lack of skill and adequate education. There were even prospects like income opportunity and empowerment of women, various government and non-government agencies came to support and encourage them, to provide proper guidance and training. So that they will become confident enough to tackle any kind of business problem. The state government need to emphasis on training and education of the rural women. Proper guidance, improvement in role of banks toward women and upliftment through different NGOs will help women to become successful.

Title: Perception of Poverty and Inequality among the Rural People in Jharkhand

Scholar: Supriya Minz

Supervisor: Dr. Deep Narayan Mukherjee

The present was conducted at Jharkhand under the district Ranchi, Block Angara, Panchayat Bisa and the village Bisa. The objective of the study was to find out reasons for poverty problem occurs among the tribal Oraon, Bedia groups of people living in these study villages and for that present researcher adopted the participatory methods of research work like interview, observation, focus group discussion and schedule method for this present work. The study is based on the night frequency primary data collected from 10 rural households. The study undertaken to analysis the extent perceptions of poverty and inequality among the rural people in Jharkhand. People perception of (income and wealth) inequality has important on their decision as economic agents or voters, little is known about how perception relate formal framework that is based on the assumption that people typically do not observe the entire income (wealth) distribution and that their guesses about the extent of inequality are based on reference group. People perception of their own well -being is influenced by social capital endowment of household place of reside.

Title: Dimensions, Incidence and Perception of Poverty Faced by Oraon Community in Rural Latehar

Scholar: Rohit Oraon

Supervisor: Dr. Deep Narayan Mukherjee

Poverty is a state or condition in which a person or community lacks the financial resources and essentials for a minimum standard of living. This study examines the poverty in a village Matkoma of Bariyatu Block, Latehar District, Jharkhand on the basis of MPI (Multidimensional Poverty Index). Identify the multidimensional poverty and poor households, using three dimensions; health, education and living standard. Under these using Different indicators, these were relating to landholding size, type of house, sanitation, literacy status, labour status, means of livelihood, status of children, type of migration, reasons for migration etc. My study area was in Matkoma village of Bariyatu Block, Latehar District. The study was based on the survey; I selected 10 household of the village, based on the random selection. Along with information on household details, data on the dimensions of poverty and also collected household interview and case study. The data was based on the survey, personal observation, schedule filing and interview method of data collection. A majority of populations fall under BPL category due to less productivity and socio-economic factor. This study shows agriculture is the main occupation of this region and poverty leads to migration (generally seasonal migration) and both types of migration within the state and out-side the state is common. The main causes of rural poverty in the village can be summarized as; Lack of employment opportunities at local level, small and marginal land holdings, poor education facilities, poor health care facilities and poor infrastructure compounds the problem. So at the end of my study my suggestions are increasing the governmental intervention by providing employment opportunities to local areas will reduce the migration, thereby enhance the livelihood opportunities, Create awareness programmes for the villagers about different governments scheme of poverty alleviation and also aware them about importance of education. From the above study conclude that poverty has a big problem of rural area and makes a deep impact in their lives.

Title: Problems and Prospects of Farm Sector Entrepreneurship in Rural Jharkhand

Scholar: Ratan Priya

Supervisor: Dr. Deep Narayan Mukherjee

Entrepreneurship is a dynamic activity that helps the entrepreneur to bring changes in the process of production, innovation in production, the creativity of products, etc.(Kumar, et. al, 2016.). An entrepreneur is an economic representative who plays a major role in the economic development of a country. Entrepreneurship is a concept that gathered eminence in the economic

literature that is the concept of some analytical treatment and assigned the entrepreneur as an economic role to take risk as an important entrepreneurial function (McElwee, 2006). It is the process of creating something innovative with value by devoting time and effort assuming financial, social, and economic risk, receiving the rewards of monetary with personal satisfaction and independence. (Mokaya & Namusonge et. al, 2012). Farm entrepreneurship is the vital activity of economic development which include agriculture, and allied activities to develop the country's economic growth and create a positive impact in the world scenario perspective that create wealth, job opportunities, firm, survival, and technological change as well as a catalyst for innovation and competitiveness. (McElwee, 2006). Farm entrepreneurship focuses on the optimization of entrepreneurial activities in developed and developing countries. (Mokaya & Namusonge, et. al, 2012). In developing countries, the people have fewer risk-taking abilities, motivation factors as compare to developed countries. But there are some similarities in both that there is a lack of capital and government and institutional support. (Bruno S. Sergi, Elena G, et. al, 2019). Jharkhand is one of the richest states because of its natural resources and geographical regions(Chakraborty, 2020). Jharkhand is the most suitable place in India to establish a farm-based venture due to the easy availability of natural resources, communication services, etc. (Chakraborty, 2020). There is a lack of farm-based entrepreneurship in Jharkhand. (Chakraborty, 2020). The objective of the study is to identify the present conditions of farm sector entrepreneurship in rural Jharkhand, to find out the problems and prospects of farm entrepreneurship in rural Jharkhand, and to identify the future opportunities of farm entrepreneurship in rural Jharkhand. The research paper is based on secondary based data where various information is collected from different repository sites. The economic development of our regions largely depends on the development of a country where farm entrepreneurship is one of the most important inputs. (McElwee, 2006). There are various farm entrepreneurial sectors such as dairy farming, mushroom cultivation, lac cultivation, beekeeping, sericulture, etc. All the farm entrepreneurial sectors are the emerging sector for entrepreneurial purpose in Jharkhand. It depends on individual to choose the right and sustainable entrepreneurial ventures. Dairy farming has provided a big opportunity for adding to the farmers along with the major goal for diversified production and sustainable livelihood generation among the farmers. (Sinha et al., 2012). Lac cultivation provides additional income and acts as a buffer in case of failure of other crops, and is a big opportunity for rural & tribal communities to improve their standard of living. (Pal, 2009). Beekeeping plays a great role in income generation in Jharkhand as it requires less time, money, and infrastructure investment, and gains additional income through this sector. (Popa et al., 2011). Mushroom cultivation is a minimum input and maximum output business venture providing additional income and is boon for both producers and consumers having high nutritional content and good source of income. (Dey et al., 2020).

Title: Dimensions and Determinants of Poverty and Inequality: A Case Study of Chhotki Gorang Village

Scholar: Manti Bediya

Supervisor: Dr. Deep Narayan Mukherjee

The present study was conducted at Chhotki Gorang village of Bisa Panchayat of Angara Block of Ranchi district of Jharkhand state. The objective of the study was to finding out the reasons for poverty problem occur among the tribal Oraon, Bedia groups of people living in these studied village. The present researcher adopted the participatory methods of research work like interview, observation, case study and schedule method for this present research work. The study is based on the frequency of primary data collected from 10 rural households. The study aimed to analyse the dimensions and determinants of poverty and inequality in Angara block of Jharkhand one of the most poverty stricken block of Ranchi district. Poverty has become a general phenomenon that is perceived to mean different things to different people at different times and place. Poverty, a situation where a household or an individual is unable to meet the basic necessities of life, which includes consumption and non-consumption items, considered as minimum requirement to sustain livelihood.

Title: Analysis of Potentiality and Prospects of Honey market in Ranchi district of Jharkhand: A way to Sweet revolution.

Scholar: Purnajyoti Khanra

Supervisor: Dr. Deep Narayan Mukherjee

Honey is the first sweetening agent ever tasted by the human civilisation. Today honey can be used as a good substitute of sugar and it has enormous medical uses and daily uses in most of the cultures around the world. During the year 2017 the Prime Minister of India Sri Narendra Modi asked the dairy board to take up the honey sector to bring 'Sweet Revolution' in the country. This will also help in the doubling farmer's income in 2020. The Chief Minister of Jharkhand has also focused in increasing the honey production, developing the beekeeping sector and honey market in the state with specific market opportunities and training programmes. Hence, this study was conducted to find out the requirements for economically viable market of honey, to establish criteria for honey marketing efficiency, to improve strategies in production of honey and to identify constraints and opportunities in the market in the Ranchi district. About 47 beekeepers from 10 different blocks of the district have been taken as the respondents to obtain the primary data of the study through schedules. Tabular analysis including frequency distribution table, cross table and rank based quotient methods have been used to analyse the collected data for the study. From the analysis it can be revealed that 64% beekeepers belonged

to 36-50 years age group and 36% beekeepers were 26-35 years age group. 57% beekeepers completed Graduation, 32% completed secondary education and 11% completed primary education and also secondary education. 51% beekeepers had about 5-8 household members and 49% beekeepers had more than 8 household members. About 89% of the respondents were married and left 11% beekeepers were unmarried. About 74% of the beekeepers had 11-20 years' experience in beekeeping, 13% beekeepers had more than 20 years' experience, 11% respondent had 5-10 years of experience and the left 2% had less than 5 years' experience. The total cost of rearing and producing honey from 100 bee hives was Rs 178000 (approx.) at an average for all 47 beekeepers. The average cost of producing 100 bee colonies for selling was Rs 93105.43 for 28 beekeepers. The average total income from wholesale and retail sale of honey from 100 hives per year was Rs 362841 and the average net income was Rs 184841. The average total income from selling 100 bee colonies by 28 beekeepers was Rs 163214 and the average net income was Rs 70,108.57. The average total yield of honey per year for all the beekeeper respondents was 111.58 quintal. The average selling quantity of wholesale amount honey per year was 105.05 quintal and average selling quantity of retail amount of honey for 40 beekeepers was 7.67 quintal. The average selling amount of bee colonies for 28 beekeepers was 59 colonies. The average price received by the beekeepers in wholesale honey was Rs 114.15/kg, in retail honey was Rs 280/kg and colony selling was Rs 1632.14/colony. The average price preferred by the beekeepers in wholesale honey was Rs 250/kg and in colony selling was Rs 1818/colony. The inputs for beekeeping were provided by KVIC, Divyayan KVK, and Cooperatives and from different states like West Bengal, Chattisgarh, Uttar Pradesh. The products were sold to different brands in wholesale and retail honey was sold in retail stores. Five major constraints faced by the beekeepers were analysed with RBQ method which includes Marketing (69.79), Diseases of honey bees (68.09), land availability for forage (61.70), chemicals and pesticides used in foraging plants (53.19) and transportation for the business and marketing (48.09). Again, RBQ has been used to identify the quality parameters preferred by the customers which includes Colour (77.02), Taste (72.34), Density (65.53), Organic (55.32) and Price of honey (29.79). According to the findings several conclusions have been ruled out and some recommendations for the beekeepers and policy implication by the government has also been suggested.

Title: The Role of Institutional Supports in Entrepreneurship Development

Scholar: Sangita Maity

Supervisor: Dr. Deep Narayan Mukherjee

The report indicates about the role of the institutional supports in entrepreneurship development. It shows that how different institutions help to the entrepreneurs for their new venture growth in our country, needs increases of new, innovative, skilled, passionate and creative entrepreneurs and different institutions plays a vital role in development of entrepreneurship. Institutions have a definitive impact on the economic development through uplifting the entrepreneurship development. The objective of the study is to identify the role of institutional supports on entrepreneurship development, to identify problems being faced by entrepreneurs in creating new venture and discuss the assistance provided by the various institutions to develop entrepreneurship in India. Also, this study indicates how different institutions support in country's poverty reduction, employment generation and skill development through entrepreneurship development. This report is fully based on secondary data sources. Only for the case study survey, I was going to a village named Barakamarda, Purba Medinipure West Bengal. The method of analysis of the study was qualitative. All the informations have been discussed with the help of literature review. The analysis of information has been qualitatively interpreted to arrive the conclusion. In this study, found the number of institutions are always move forward at Central, State Government as well as Non- Government Organisations to provide different modes of support like financial support, technical support, educational support as well as marketing support to the entrepreneurs for the new venture creation. I have learned from secondary data sources that entrepreneurs face a lot of problems such as financial problems, marketing problems, human resource problems, external and internal relations problems, strategic problems, lack of knowledge etc faced by entrepreneurs while creating their new ventures.

Title: Integrated Village Development Planning of a Tribal Village of Jharkhand

Scholar: Sarthi Kumari

Supervisor: Dr. Deep Narayan Mukherjee

The present study entitled "Integrated Village Development planning of a tribal village of Jharkhand" was carried out at Angara block of Ranchi district of Jharkhand in 2016. The study is based on the data collected from randomly selected 80 through well -structured questionnaire and personal interview method. 80% households head were male and 20% were female. Education level of households' head was very low as 43.75% households head came under illiterate and class 5th passed and 13% were up to class 10th. No any head of the households completed higher education. Total population of sample household was 402 where 51% and 49%

were male and female respectively. Of which highest about 57% were over 18 years age group. 52% and 48% of households were STs and SCs respectively. About 37% sampled households had life insurance policy, 41.25% sampled households had life insurance policy, 96.25% had KCC and 95.00% households had MGNAREGA Job Card. 59% and 39% of households had red card and yellow card respectively whereas only 2% had not had any ration card. Total adult population was 231 of which 44% were married and 13% unmarried and illiterate were highest with 21% and lowest were post-graduation with 0.50%. 6 to 18 years' age group population were 140 of which 2% were married and 33% were unmarried. School going were highest with about 30%. Below 6 years' age group were 33 of which 61% were going to AWC and 55% of children were fully immunized. In case hygienic practices after toilet and before eating, none of sampled households uses always soap but 62.50% and 38.75% of sampled households use soap sometime respectively. Sampled households belonged to small category farmers with average land holding of 2.09 acre. In case occupational activities, 98.75% depended on agriculture, 17.50% had animal husbandry, 6.25% had fishery, 7.50% were salaried employees in Govt. sector and private sector, and 6.25% had business. 36.25% members of sampled households were migrated outside. About 55% of households were using chemicals in their crops. 54% of sampled households depend on pond and river for irrigation. While 28% and 6% depend on bore well and canal respectively. 5% had not had any sources of water. In case of irrigation system followed by sampled households, 37% and 33% of households installed drip irrigation and sprinkler irrigation while 38% not had any irrigation system.

Title: A Study on Role of Training in the Promotion of Organic Farming in Jharkhand

Scholar: Kailash Kumar

Supervisor: Dr Sudarsan Biswas

Training is the most important factor to enable a farmer skilled in a specialized field and also to build a favourable attitude to adopt any specialized agricultural practice. Several empirical studies have shown that training has a significant impact on the farmers to adopt and promote new agricultural technologies. Therefore, extension agencies take it as a fundamental mechanism to disseminate any innovation among the farming communities. Food materials that are grown under organic cultivation have got enormous popularity in very recent years not only in India but also across the globe. Having realized the immense importance of training, all concerned Government and non-government organizations have been organizing several training programmes to increase the rate of adoption of organic farming practices among the primary growers of the country. But still, the sloth rate of adoption among the primary growers has now become a matter of concern before the extension functionaries. The present study has tried to

reveal the actual importance of training in the adoption and promotion of organic farming in the present context in the state of Jharkhand. The study also has tried to excavate the fact through a Systematic Literature Review (SLR). The present study has found that there is a significant association between the training and adoption of organic farming in the study area and more than 70% of people are continuing their organic farming practice after receiving training while the rate of adoption (4.80% only) among the untrained population are not satisfactory. Thus, the study concluded that training still should be a vibrant alternative before extension functionaries to promote organic farming in our country.

Title: The Present Status of Organic Farming and its Adoption in India- A Review

Scholar: Souvik Gayen

Supervisor: Dr. Sudarsan Biswas

This review paper attempts to bring together different aspects in light of recent developments in organic farming. Organic farming is considered ecological farming, a way for sustainability. The co-existence of harmful after-effects of the green revolution and the relative benefits of organic farming have encouraged the farmers to take up organic farming. Organic agriculture is achieving rapid popularity in India for its attractive economic, social, and health benefits. This paper has reviewed the global and Indian scenarios with reference to the growth and development of organic farming adoption. In India, the cultivated land under certification is 1.78 million hectares only. The key issues emerging in organic farming include yield reduction in conversion to organic farms, soil fertility enhancement, integration of livestock, certification constraints, crop ecology, marketing and policy support. The potential for organic farming, especially in the small and marginal landholdings as well as in the resource-poor areas (like dryland and arid areas) has been discussed. It has been argued that organic farming is productive and sustainable, but there is a need for strong policy support for it in the form of subsidies, agricultural extension services, and research.

Title: “Farmers’ Attitude towards Adoption of Organic Farming in India: A Review”

Scholar: Vidyadhar Mahto

Supervisor: Dr. Sudarsan Biswas

In recent years the demand for organic food materials has increased manifold. On the flip side, the land under organic farming has not expanded proportionately. It indicates the less acceptance of organic farming technologies among the primary growers. Several recent studies have experienced that the farmers using modern science and technologies are reluctant to adopt

organic farming practices. Several factors are starting from the low productivity in the initial days of adoption, low market potential, unavailability of fair prices, huge input requirements and many more are the factor for not spreading the organic farming technologies which have been observed by the present study. The present study has tried to understand the farmers' viewpoint and attitude towards the adoption or not adoption of organic farming technologies through the review of the literature.

Title: "A Study on The Barriers of Organic Farming in India"

Scholar: Anirban Ranjit

Supervisor: Dr. Sudarsan Biswas

India has 30 percent of the world's total natural makers, but it only has 2.59 percent (1.5 million hectares) of the total natural development area of 57.8 million hectares (World of Organic Agriculture 2018 report). Organic farming is a good alternative to traditional agricultural practices. Going organic is a terrific method to avoid chemicals while also safeguarding our health and the environment. Organic farming is a type of agriculture that depends on techniques such as crop rotation, green fertilizer, manure, and natural pest control to maintain soil efficiency and pest management on a ranch. A farmer needs to work harder if he takes the way of organic farming because this farming style requires more interaction between the farmer and his crop. Organic farming allows the crop to grow naturally without the use of artificial chemicals. We can attempt to focus on the issues of organic farming - the reason behind not accepting organic farming. This paper is based on the problems of Organic farming - why organic farming is not acceptable to farmers easily. Different researchers find out the barriers to organic farming in the current situation of India which are going to be described. Also, some suitable solutions are mentioned.

Title: A Study on The Impact of Training on Organic Farming Among the Farmers of Bero Gram Panchayat of Ranchi District, Jharkhand

Scholar: Anasua Tewari

Supervisor: Dr. Sudarsan Biswas

Organic farming is all about quality and sustainability, and it is considered ecological farming. Although organic farming takes some time to produce considerable yield, there are lots of benefits that have encouraged farmers to practice this form of farming, over the decade. Organic farming has its own set of benefits, ranging from the good health of soil and plants to the good health of consumers. This paper focuses on the impact of training that farmers have received,

for organic training, and how their farming methods have changed since then. Farmers with training encourage and motivate other farmers to practice organic farming for a sustainable and better life. Organic farming methods take 2-3 years to bear results, but it is worth the wait. Traditional farming methods, over the years, have caused problems for both the soil and the crops. The use of chemicals has proved to be harmful to both of them, and, the health of consumers has been challenged. Organic farming is a step towards a better and sustainable future. With further research and extension education, we might be able to take this somewhere shortly.

Title: “A Study on The Impact of Training on Organic Farming Among the Farmers of Nawagarh Gram Panchayat of Ranchi District, Jharkhand”

Scholar: Anik Kumar Guha

Supervisor: Dr. Sudarsan Biswas

The Study of “Impact of Organic training on Farmers of Jharkhand “was conducted from February 2021 to June 2021. For collecting the data different methods were adopted like quantitative (survey- personal interview) and qualitative (observation, case –study) and PRA also. By the survey, it was known that Irrigation is done by only a comparatively less number of farmers due to scarcity of water. The type of irrigation done is mainly by flood and drip. While flood irrigation is in majority the setup of drip irrigation has been adopted and is comparatively adopted by farmers after receiving training. Although the number is less as the initial cost of the setup is much high. The use of plastic mulching is much more efficient in reducing water loss compared to paddy straws. However, the ratio of plastic to paddy straw mulching varies as the plastic used is expensive and less available to the farmers. JSTDS has supplied materials for mulching to demonstrate the advantage of this technique to some farmers. Organic farming is a sophisticated alternative agricultural system. Ample data exist to conclude that it can compete economically with inorganic farming. Further research is needed on the economics of organic farming with horticultural crops and in other geographic regions. Particular attention should be given to optimum approaches for conversion to organic farming. Information needs of organic farmers should be surveyed and information delivery systems should be tailored to meet those needs.

Recommendations

Division of Agriculture

Horticulture

- *Growing onion through organic culture after harvesting upland paddy* : Planting of onion cv. Arka Niketan at any time in between 1st and 3rd week of December is equally effective for good quality and more bulb yield through organic culture when 50% of RDN is met through FYM and remaining 50% through vermicompost.
- *Growing onion during late kharif (early rabi) season through organic culture* : FYM @ 10 t ha⁻¹ and wood ash @ 5 t ha⁻¹ as basal application followed by split application of Sasyagavya @ 10% concentration four times at 15 days interval initiated at 21 DAT is found to be beneficial for more yield of late kharif/early rabi grown onion varieties like Bhima Sweta, Bhima Dark Red, Bhima Subhra, Sukhsagar, Bhima Super and Agrifound Dark Red in the south Chhotanagpur region of the eastern Indian plateau. In addition to Sasyagavya (10%), application of BD-501 (10%) as foliar spray ensured both high yield and better-quality bulb production.
- Poultry manure @ 2.5 t ha⁻¹ and wood ash @ 2.5 t ha⁻¹ as basal application atleast 15 days before sowing followed by the split application of Sasyagavya (10%) seven times at 15 days interval started at 15 days after sowing may be a potential low-cost organic source of plant nutrients for alternative approach of non-chemical farming practice in French bean cv. Swarna Priya in the south Chhotanagpur plateau of Jharkhand. It is also found that the application of *Enriched Sanjeevani and Amrut Mitti* is another alternative approach of farming practice to grow comparatively safer produce of French bean in Chhotanagpur plateau. Under organic culture, besides Swarna Priya other varieties like Arka Komal are found to be suitable.
- Garden peas varieties like Swarna Amar and Azad Pea-3 are highly responsive to organic farming practices under the condition of the South Chhotanagpur plateau of Jharkhand particularly during *rabi* season. Organic liquid formulations namely Sasyagavya (10%) as an alternative source of plant nutrients through organic culture is found to be significant in terms of growth, yield and quality traits expressions in garden peas. In addition to the incorporation of FYM @ 10t ha⁻¹ and vermicompost @b 5 t ha⁻¹ as basal manure, application of *Panchagavya* (3%) and BD-501 (2%) in garden pea cv. Arkel ensured more and quality pod yield.

- Soil application of Sasyagavya (10%) along with BD-501 (1%) four times at fortnightly interval commencing from 15 days after transplanting significantly influence the yield and quality of cabbage cv. Golden Acre. However, Sasyagavya (20%) as soil application 4 times at 15 days interval starting from 7 days after transplanting along with paddy straw mulching is found to be significant for growth, yield and quality traits expressions in cabbage cv. Rare Ball. In another study, it was found that enriched *Sanjeevani* (15-20%) as top-dressed soil drenching six times at 15 days interval initiated after 21 days of transplanting for higher yield with good quality crop in cabbage cv. Golden Acre under the south Chhotanagpur plateau regions of Jharkhand.
- FYM @ 10 t ha⁻¹ and Wood Ash @ 10 t ha⁻¹ as basal application followed by *Sasyagavya* (15%) and fermented mustard oil cake solution (10%) as split application thrice alternately at weekly interval initiated at 21 days ensure better yield in paddy straw mulched tomato cv. Swarna Lalima. Amritjal (1%) as soil drenching and vermiwash (10%) solution as foliar application greatly influences the yield and quality of organically grown tomato varieties under Chhotanagpur plateau of Jharkhand.
- Swarna Shyamli variety of brinjal is highly suitable for organic farming in Jharkhand with five times application of enriched *Sanjeevani* (5%) at 15 days interval commenced from 21 days after planting in combination with Homa/Agnihotra Farming for expression of better yield and proximate quality traits. Basal dose of manures like vermicompost @ 1 kg and wood ash 500 g per square meter area followed by three times application of *Sanjeevani* (10%) ensured better yield of brinjal cv. Swarna Abhilamb.
- Application of cow urine (15%) and Sasyagavya (20%) independently may become an alternative source for organic cultivation of potato. Application of those liquid organic formulations four times at 15 days interval starting after 30 days of sowing is found to be effective for better quality tuber yield in potato cv. Kufri Pukhraj and Kufri Kanchan. In another study, FYM @ 10 t ha⁻¹ as basal dose + 3 times application of enriched *Sanjeevani* (10%) at 30, 45 and 60 days after sowing recorded more quality tuber yield of potato cv. 2236 under the south Chhotanagpur plateau of Jharkhand. Kufri Pukhraj variety of potato also respond well even during kharif season cultivation in the south Chhotanagpur plateau of Jharkhand with four times application of Sasyagavya (15%) at 15 days interval commencing after 30 days of sowing.

Entomology

- Alternate spray of organic formulations, fermented Dashparni (10% solution) and Neem oil (0.5%) are effective in controlling shoot and fruit borer of brinjal.
- Spraying of organic formulations either fermented Dashparni (10% solution) or instant

Dashparni (10% solution) are equally effective to control the infestation of mustard aphid.

- Spray application of microbial pesticide, *Verticillium lecanii* @4 g/L water is effective against sucking pest like aphid infesting mustard and cowpea.

Plant Pathology

- *Trichoderma viride* used as biocontrol agent against several soil borne plant diseases such as fungal wilt, damping off, collar rot, dry root rot, charcoal rot etc. Farmers can mass multiply *Trichoderma viride* on boiled sorghum grains, wheat grains and vermicompost using pure culture of *Trichoderma viride* for seed treatment (10 g/kg seeds) and soil application (25 kg/ ha).

Division of Rural and Tribal Development

- There is a need to create a Village Resource Register of NTFPs for Jharkhand's forest fringe villages, which can be used to develop local resource-based cottage industries to supplement villagers' income.
- Created a template for generating a village profile that can be replicated to prepare profiles for various villages in Jharkhand while keeping their traditional customs in mind.
- Several studies have identified the potential of rural tourism in Jharkhand, which can be used for both local enterprise generation and the preservation of Jharkhand's eco-cultural heritage.
- The study of various artisan communities such as *Malhar*, *Patua*, *Mahli*, and others provides insight into their plight, which requires immediate intervention for the conservation of intangible heritage.
- Ethnographic documentation of various tribal communities in Jharkhand can be used as a reference guide for developing a tribal livelihood intervention plan.
- Through an exploratory study, the incidence, pattern, and factors of school dropout in rural and tribal areas are documented, necessitating immediate intervention.
- The majority of maternal injuries that result in death in rural areas are caused by blood loss, infection, obstructed labour, anaemia, malaria, and other factors. Such an incident could be avoided with increased awareness and prompt management by ensuring access to skilled health professionals.
- Rice mills in rural areas cause severe pollution, resulting in crop failure and loss of natural resources on a regular basis. Before establishing rice mills, strict policies regarding proper

waste disposal and waste recycling facilities must be developed so that villagers and natural resources in surrounding areas are not harmed.

- Community-based resource conservation programmes necessitate the participation of villagers as partners, provided that the villagers' social dynamics are fully understood and that both policy makers and resource-dependent peoples mutually benefit from conservation.
- In the context of tribal villages, a framework for livelihood asset analysis has been developed for a sustainable village development plan.

*"Let New India arise. Let her arise-out of the peasant's cottage,
grasping the plough; out of the huts of the fisherman, the
cobbler and the sweeper. Let her emanate from the factory, from
marts and from the markets and from groves and forests from
hill and mountains."*

- Swami Vivekananda

Editorial Team :

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