Natural Farming Practice in Kandhamal

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The story of Kandhamal Natural Farming

Now it is a challenge for farmers to keep the agriculture under their own control and to keep chemical poison free to the agricultural food production system. The market system has totally captured the agriculture, the climate uncertainty; income insecurity and poor economic background of rural farmers have accepted the market supremacy unconditionally. As a result the farmer is not the master now, but just an agriculture labour in his own land.

Agriculture is the main source of our food and lack of purity and naturality in its production is mostly affecting to our food security and nutrition security. Mono-cropping has replaced the crop diversity in farmer's field. So to balance the diet and nutrition the farmer has to depend on market. The green revolution that was aimed to make food self sufficient the country has turned into health hazards mechanism.

To get out of this situation Natural and Organic Farming is the only alternative. Realizing its urgency, now the government is also focusing on it and advising the farmers to give importance on zero budget natural farming to save from high agricultural expenditure and to secure own food and nutrition security.

The trend of natural farming is still strong here in Kandhamal. The farmers have been practicing it traditionally. However, if it is not preserved and protected, it is likely to disappear under the influence of market.

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Natural Farming Practice in Kandhamal

Now Kandmal Agricultural products have a big demand in the state, national and international markets. Products like Kandhamal Turmeric and Ginger are now become popular in the organic food market of Europe and North America and Vegetables like Beans, Cabbage, Curly flower, green peas, brinjal, Chilly and Palua are very much popular in state and national vegetable markets. The main cause behind its demand is its low chemical content and its natural taste, quality, nutrition value and long lasting storage life. It indicates that till now the farmers have been practicing the natural way of faming and producing different food products according to the market demand.

Now it is increasingly felt that the modern system of farming is becoming unsustainable as evidenced by declining crop productivities, damage to environment, chemical contaminations etc and mostly controlling by market system. It has not only snatched away the farming resources from the farmers but also taken away the farmer's sovereignty on agriculture. So the necessity of having an alternative agriculture method which can stand beside farmers' independency and can function in a friendly eco-system while sustaining and increasing the crop productivity is realized now. The Natural and Organic farming practice by Kandhamal Farmers give some exemplary alternative to the conventional agriculture.

There are many factors that influence and enrich the natural farming practice by Kandhamal farmers traditionally.

Forest Resource

According to the Government data Kandhamal has the highest forest cover in the state. The district has 5,403.8 sq km forest area, 67.37 per cent of its total geographical area. Only 23% lands are cultivable and 16% land are using for agriculture. The forest is taken as the element to enrich the soil fertility and moisture of the land. Most of the lands are situated in the hill slopes adjoining to the forest and increases fertility of soil by adding essential nutrients to the soil. Similarly the topographical feature of the high land and forests facilitates quick surface runoff whereas the low lying areas under cultivation helps to observe the rain water as far as possible to increase the recharge potential. It stabilizes the soil, prevents erosion, enhances the land's capacity to store water, and moderates air and soil temperatures. It also helps by providing a habitat for pollinators and natural predators of agricultural pests. The farmers get fodders for their cattle, wood for making agricultural implements and collect twigs, branches and leaves from the forest to grow crops. So it is the vast forest coverage that has been provided organic matter to enhance the vitality of the soil and enrich its inherent power and given strength to the farmers to practice Natural farming in Kandhamal.

Livestock Resources

Animal husbandry plays an important role in Natural Farming practice by providing organic manure and power for traction in agriculture operations, load transportation and other rotary and sundry activities. In recent times the modern agricultural system has severely affected the of growth livestock population. The use of mechanical power and chemical fertilizer in agricultural operations has reduced the cattle rearing by the farmers. Except the tribal areas the farmers of coastal plains have given up cattle rearing, have not a bullock to plough the land or a cow to get cow dung for manure. The main cause behind it is the adoption of mechanical power and loss of grazing lands. But in Kandhamal still the farmers have a lot of animal resources. The vast forest coverage and plenty of grazing land have supported them to rear cattle like

cow, goat, buffalo, pig and poultry in large numbers. The livestock provides necessary organic manure to the farmers for their cultivation and it creates interest to practice organic farming. It also creates indifference among them to purchase chemical fertilizer or to use it in crops and protects them from expenditures.

Crop Diversity

Crop Diversity is one of the major factors in Natural Farming and is a strong example of farmer's sovereignty on agriculture. Over the past 50 years, there has been a major decline in two components of crop diversity; genetic diversity within each crop and the number of species commonly grown. It is found from a study carried out from 1993-94 to 2012-13 that Kandhamal stands first among the thirty districts of Odisha in crop diversification followed by Rayagada, Gajapati and Koraput.

The analysis indicates that the coastal districts lack diversification while several of the districts falling in the southern part of the state tend to be more diversified. The analysis reveals that greater use of high-yielding crop varieties and access to irrigation has influenced crop concentration, whereas rural roads and income have led to crop diversification. Two researchers Nayak & Kumar (2018) find a higher level of diversification associated with backwardness of agriculture in Odisha (higher in KBK1 region than in the relatively advanced coastal districts). The availability of infrastructure including irrigation and electricity, and the use of inputs such as HYV seeds and fertilizers are higher in coastal Odisha, but not the crop diversification. Nayak (2016) had also revealed that most of the districts in coastal Odisha are undergoing crop specialization, whereas the tribal dominated and technologically less-developed districts are experiencing crop diversification.

In Kandhamal the farmers cultivate different cereals, pulses, vegetables, oilseeds, fruits, root crops, spicy crops and many more in natural and organic way. This diversified farming practice in Kandhamal represents its natural and organic way of farming. The farmers here mostly do farming for their livelihood security and to meet the family food consumption as they don't like to buy food crops from the market. Traditionally they have been preserved different type of crops according to their consumption. To preserve the crop varieties they practice mixed cropping and intercropping in fields. In Podu cultivation area the Kutia Kandha farmers harvest 30 to 40 varieties of crops from a single patch. The farmers save own local variety seeds and use it in their traditional farming practice.

Human Resource

Human Resources are very important for agriculture. To protect the process of natural farming it needs traditional knowledge, skills, independent decision making ability of farmer and also skilled human resource. Though farming is considered as a traditional occupation, all the family members of farmer have acquired farming knowledge and skills from family, friends, neighbors, farmer to farmer interaction and local field exposure. Agricultural knowledge and information transfer through social interactions; therefore, ties to agricultural informants and network structures within farmers' local neighborhoods determine their information-gathering abilities. The Descendants have gathered knowledge on soil quality, land use, seed selection and use, water management on special lands, weed identification, pest and disease identification and method of control, making of different farming implements and manure and all the farming skills from their ancestors. This inheritance process has been made the descendants skilled and professional to bring transformation in agricultural profession. But in recent times the market oriented modern agriculture system is considering the farmers as unskilled and ignorant. The introduction of technologies, machinery, use of chemical and cultivation of genetic modified seeds in agriculture have proven it.

In Kandhamal, all the people are inherently skilled and knowledgeable in natural farming. On the other hand lack of other option for income in the district has tied up the new generation to concentrate on agriculture for survival. Though few young people show interest to move out area in searching of job, but most of the young people have engaged in agriculture. Generally natural farming needs more manpower and in Kandhamal they are widely available.

Importance of Protection and preservation

Natural farming is one of the best proven solutions to avoid the emerging crises like climate change effect, food and nutrition insecurity of poor, employment and income crises of youth and also cultural transformation. So to avoid all these threats it is necessary to protect and preserve the Natural Farming practice of Kandhamal.

Kadhamal agricultural products have been popularized because of its neutrality in taste and quality. It has brought credit and created a geographical identity for farmers in notational and international food market. The farmers and producers of Kandhaml should realize it and should come forward to protect and preserve it. It is also necessary to give importance on marketing of Kandhamal natural products. The Government and non-government organizations should take initiative to develop organized marketing strategy for proper market price and should provide support to the farmers for continuing the practice and for spreading the natural and farming techniques. Now some organizations like KASAM and OMFED are engaged in marketing of Kandhamal agri- products. But it is not sufficient and still the farmers are depending on local business men for selling their products and getting exploited in price determination. So many more business organizations should form to propaganda the utility of natural and organic food products among the consumers and its processing and value addition. If the farmers will get proper price of their products then they will get interested to continue the practice.

SWATI has taken few initiatives to popularize the process and to strengthen the marketing of the products. The Organisation has promoted many farmers groups and five Farmers producers Company to encourage the farmers in Natural and organic farming practices, Farmer to Farmer knowledge exchange, increase in farm productivity and organized marketing. Similarly the organization has opened some vegetable and agro-product outlets named Kandhamal Fresh at different market places to popularize and to make availability of the organic products among consumers. If this type of initiatives will be multiply then the products will be more popular in local markets and the farmers will get chance to market their products in own locality.

Story of Kandhamal Turmeric

Now Kandhamal Turmeric has a big demand in the state and national spice market and very much popular in the organic food market of Europe and North America. It has earned the Geographical indication (GI) tag in 2019 from Intellectual Property India, an organization functioning under the auspices of the Union ministry of commerce & industry. Its uniqueness in color, aroma high medicinal and organic value has created special identity in world market. India produces 80% turmeric of the whole world and the states like Andhra Pradesh, Tamilnadu, Odisha and West Bengle are among the top contributor states. Odisha contributes about 21 % of India's turmeric cultivation in terms of area and Kandhamal makes up for over 50 % of the state' s share. Odisha produced turmeric 59361 t from 24733 ha. Kandhamal district stands first in turmeric area as well as production (28,828 t from 11,088 ha).

The turmeric is the main cash crop of the Kandha Tribals of Kandhamal, which is being grown from time immemorial. The Kandha tribes have grown different food crops for consumption and cultivated Turmeric as cash crop. Most of lands in Kandhamal are high and middle lands and the bounties of nature have blessed this area with a congenial agro-climatic condition for cultivation of various spices mainly turmeric, ginger, mustard and tamarind etc. The Kandha farmers had been produced different type of cereals, millets, pulses, oil seeds according to their food necessity but did not sell it. Only they had cultivated spice varieties to earn money and to meet the family expenditure. Berhampur, the main business center of south Odisha is nearest to Kandhamal and it had business linkage to south and central india. So the business men of Ganjam and Berhampur had been collected turmeric and different forest products from Kandhamal. At that time Turmeric had a big demand for its use as spice, in ayurvedic medicine preparation, in preparation of cosmetic products etc. Because Kandhamal Turmeric was unique in color, aroma, natural quality and value, it had big market demand.

Turmeric cultivation requires temperatures between 20 and 30°C (68–86°F) and a considerable amount of annual rainfall to thrive and the environment, climate and soil of Kandhamal is very much suitable for it. In the past the Kandha tribal farmers used to cultivate turmeric on their high lands (padar land), on podu fields (Dangar) and back yard areas. Most of their Padar lands were covered with different trees like Mahua, jackfruit, mango and tamarind etc and it was very much suitable to grow turmeric on tree shades. It was considered as rain fed crop and did not require much water. So they had not to worry about water requirement. They were getting leaves and twigs easily from nearest forest for mulching in turmeric field. The Kandha farmers used to cultivate indigenous varieties like Godhi Singanga, Desi Haldi, Kanda Haldi and Krushna Haldi etc. Godhi singanga was popular for its unique color and Desi Haldi was oily. Kanda Haldi and Krushna Haldi have strong aroma and used in medicine preparation. The local varieties grown in the area are having 2-3 percent curcumin, 12-15 per cent of oleoresin and 5.3 per cent of volatile oil.

The Turmeric is generally planted in May-June and ready for harvesting in about 8 to 10 months after planting. The farmers used their owned seed material preserved from the previous crop or borrowing from the neighbors the mother rhizome as well as Fingers kept for next season as planting material. However Mother Rhizomes are treated as the best planting Material because they give 50% more yield then finger rhizome. For backyard cultivation mother rhizomes are used for planting but for medium and large size of cultivation both mother and finger rhizomes are used for planting. It has been observed that farmers are planting rhizomes on raised beds and also on ridges during April- May which is the most favorable planting time. Some of the farmers of Kandhamal districts are planting rhizomes in furrows for which they make furrows with the help of small spade and applied farm yard manure @ 10 t/ ha. After that rhizomes are planted in the furrows at the spacing of 30 cm and covered with soil. The mother rhizome are planted whole where as the finger rhizomes are cut into 4 - 5 cm long pieces. Well-developed healthy and disease free rhizomes are selected for planting.

The rhizomes are mulched immediately after planting with sal leaves. Mulching (green leaves) is also applied at 45 and 90 days after weeding. Farmers report that mulching in turmeric beds with green leaves is an essential to enhance germination of seed

rhizomes and to prevent washing off of soil in rainy season. It also helps to add organic content to the soil and conserve moisture during the later part of the cropping season. Farmers believed that mulching would increase germination; reduce weed growth and soft rot. It has been observed that organic content of the soil helps to check the multiplication of nematodes. It has been seen that small farmers poured cow dung slurry on the bed after mulching to enhance microbial activity and nutrient availability.

The cultivators of Kandhamal District are Organic by default. All of the Turmeric crops in Kandhamal District are grown organically without application of chemical fertilizers. Organic manure like farm made manure is used to meet the nutrient requirement of the plants. The leaf mulching applied to the crop also provides compost to the soil after decomposition in subsequent periods. The Turmeric crop is less prone to diseases and paste attack due to its characteristics. However Shoot borer is the most important pest of turmeric larvae bore into the pseudostem and feed on the growing shoot resulting in yellowing and drying of the infested shoots. The farmers in Kandhamal have been followed indigenous pest and disease management practices. Some farmers plant rhizomes just after burning the field to avoid soil borne disease and insect damage. The adult of shoot borer after emergence from the soil settle on the tree and farmers collected and destroyed them. Progressive farmers are also deep ploughed their field during summer to reduce the disease. Rotten plant roots scratched by farmers in Kandhamal applied wood ash in field to manage the incidence. The Farmers planted turmeric in red soil and under the shade of tree like sal, mango and jackfruit to reduce rhizomes diseases.

The field preparation and planting of the turmeric rhizome is done during pre-monsoon period i.e. during April and May by utilizing the sporadic rain falls receives during this period. The main vegetative growth phase of the plant is June to October during which it gets ample rain water due to monsoon and post monsoon rains. Due to this the plants attend vigorous vegetative growth and the rhizome expansion also starts. During the month of November and December the cool climate along with frost accumulation during night help the plant to meet the water

requirement and rhizome development occurs rapidly. During January the crop attends maturity stage and hence no irrigation is required.

The crop is harvested in about nine months from January-April. The main harvest season begins from first week of January and extends up to end of March. Turmeric is harvested when leaves turn yellow and start drying up. In harvesting, the whole clump is lifted out with the dry plant, then the leafy tops are cut off, the roots are removed, all the adhering mud particles are removed and the rhizomes are then washed well with water. Harvesting of turmeric is done after an unseasonal rain. After rains soil is become loose and digging of turmeric rhizomes is easy. It has been noticed that farmers are harvesting turmeric every year but some farmers do harvest in a delayed manner according to market demand and allow the rest of rhizomes remain in the field for maintain its curcumin content. Harvesting of turmeric is done by the farmers with the help of small spade. The average yield of fresh turmeric were recorded 10- 16 t/ha at farmers field. The finger rhizomes are separated from the mother rhizomes by men and women and kept in shade for 2-3 days. The mother rhizomes are kept for seed purpose and finger rhizomes are cured for selling.

In traditional method of curing, rhizomes of turmeric are boiled in aluminum pots along with water for 45- 60 minutes, depending on the quantity. The pots are covered with a lid. Boiling process is continued till white froth appears with a special quality flavor. Cooking process is completed when rhizomes become soft and inner colour turns yellow. Over cooking spoils the colour of the final product while under cooking renders the dried product brittle. Mother and finger rhizomes are cured separately. Boiled rhizomes are dried in the sun by spreading them in 5-7 cm thick layers on bamboo mats or ground floor for 10- 15 days. The rhizomes are stirred 2-3 times to ensure uniform drying. Improper drying results in the rhizomes become hard or brittle. A thinner layer is not desirable, as the colour of the rhizomes adversely affected. During night time, the rhizomes are heaped and covered with sal and turmeric leaves.

The cured rhizomes are stored by farmers in pits dug in elevated place and sun dried for one week; bottom and sides of the pits are thickly lined with grass. Subsequently cured produce is filled in pits and is covered with mats and finally with earth. The seed

rhizomes are stored for 3-4 months from harvesting to planting by spreading them thinly under a cover of turmeric leaves. For storage seed rhizomes are also stored by heaping them under the shade of trees. Heaps are covered with turmeric leaf and plastered with soil and cow dung mixture. The farmers stored turmeric in the field and also in backyard under the shade of mango and jackfruit trees. As tree protect rhizomes from heat and rains and also create micro environment to enhance the shelf life and reduce the losses.

To establish the worldwide marketing of this Kandhamal turmeric KASAM (Kandhamal Apex Spices Association for Marketing) came into being in the year 1998. Now its head office is located at Phulbani town and godowns at five blocks namely Daringbadi, K. Nuagaon, Phiringia, G. Udayagiri and Raikia. The Organisation is acting as the Manufacturer, Processor, Supplier and Exporter of a wide range of Organic Products of Kandhamal. The motto of KASAM is to generate employment, poverty alleviation, extension of spice area, production of quality and value added hygienic spices. In order to export the organic spices from the district KASAM has entered an agreement with the CUC (Control Union Certification) of Holland. KASAM is collecting and exporting Kandhamal turmeric above two crores annually to Europe and North-America countries. Now other agencies like OMFED and ODAF have entered in the marketing of Kandhamal turmeric.

Now Tumeric cultivation is a major source of income for Kandhamal farmers. But irregularities in collection and low market price are demoralizing the farmers for cultivation. Many turmeric farmers are not showing interest in increasing the farming area. To encourage and to support the farmers the government should increase the MSP of turmeric.

Turmeric has big demand in world market for industrial, domestic and medicinal use. It is used as the natural and inexpensive beauty aid like "kumkum" and "parani". Because of its high antimicrobial and anti-inflammatory activity it is also used in many cosmetic industries as a chief ingredient for making of beauty soap, beauty cream, medicinal soap etc. As the turmeric has proven to be having high anti carcinogenic activity many of the medicinal companies are engaged in extraction process of curcumin and oleoresin from turmeric to prepare medicine and

ointments. Apart from all above use turmeric is commonly used in various spices industries and readymade food industries as a measure food ingredient in curry powder, meat masala, chicken masala etc. In domestic use, turmeric gives a rich color and flavor to the food. It is mainly added to the most of Indian recipes like curry, dal, rice, pickle etc. the leaf of Kandhamal turmeric is mainly used in a Odia cuisine "EnduriPitha" which gives a pungent flavor and taste to the dish. Also turmeric is used worldwide as a seasoning. It is also known to discourage unwanted hairson feminine skin. Smearing of turmeric paste on face and limbs during a bath is found to clear the skin and beautify face.

Turmeric has a big medicinal value and it is widely used in medicinal industries. The main organs that turmeric treats are the skin, heart, liver and lungs. Turmeric is used for epilepsy and bleeding disorders, skin diseases, to purify the body mind, and to help the lungs expel Kapha. Activities of Turmeric include: Antiviral, analgesic, antibacterial, anti-inflammatory, antitumor, anti-allergic, antioxidant, antiseptic, antispasmodic, appetizer, astringent, cardiovascular, carminative, cholagogue, digestive, diuretic, stimulant, and vulnerary. Therapeutic uses of Turmeric: Anemia, cancer, diabetes, digestion, food poisoning, gallstones, indigestion, lbs., parasites, poor circulation, staph infections, and wounds. Turmeric helps to regulate the female reproductive system and purifies the uterus and breast milk, and in men it purifies and builds semen, which is counterintuitive for a pungent bitter. Turmeric reduces fevers, diarrhea, urinary disorders, insanity, poisoning, cough, and lactation problems in general. Turmeric is used to treat external ulcers that respond to nothing else. Turmeric decreases Kapha and so is used to remove mucus in the throat, watery discharges like leucorrhea, and any pus in the eyes, ears, or in wounds, etc.

Looking its demand in world market the business companies are generating more profit from turmeric and the producer farmers are bearing the loss in minimum support price. So government should take appropriate steps to protect the interest of the farmers and to increase the productivity. Similarly turmeric has provided a unique identity to the Kandhamal Farmers as Organic farmer in the world consumer market and it is the duty of farmers to protect that identity as the preserver of Natural and Organic farming.

Uniqueness of Raikia Beans

Raikia Beans has a big demand in Odisha vegetable market. The consumers of big cities like Brahmapur, Bhubaneswar and Cuttack search for Raikia beans in vegetable shops. This bean is long, fleshy and tasty in character. The specialty of this bean is that it is produced organically by the farmers of Kandhamal without any chemical application and maintains the natural taste and quality that gives more food pleasure to the person.

Farmers of Raikia, G,udayagiri and Tikabali in Kandhamal district have been cultivated beans since last 80 years using their own seed varieties. Perhaps the improvement of education and health consciousness and change in food practice due to the influence missionary activities and adoption of market based farming has motivated the farmers to cultivate the beans as vegetable cash crop. Raikia and G Udayagiri has direct market link with Berhampur, the main business center of south Odisha and it supported the farmers in marketing. Now Beans is cultivated above 2000 hectors land in the district all the year round and supplied to whole Odisha and neighboring states.

The climate and soil quality is very much suitable for bean cultivation. The farmers grow beans two times in a year, in rainy and in winter by using their own seed variety. They first plough the land thoroughly and apply cattle manure and compost to maintain the fertility. They also apply another dose of manure at the time of seed sowing. After three weeks they do hoeing and weeding and also apply last dose of manure. Then they install trellis to support the plant for climbing the vines. It starts produce in two months and takes another two weeks to mature.

The farmers harvest once a week and it continues for 4 to 5 week. They invest above 60 thousand in cultivation and get nearly 50 quintal beans from an acre. The bean plants are affected by bean stem maggots, bruchids, pod borers and pod bugs etc and the farmers apply neem oil, cow urine and other traditional pest control method to prevent the pest and disease.

Now Beans farming is a major source of income for the farmers of the area. Each farmer earns above 30 to 50 thousand rupees annually from this cultivation. The environment supports the farmer to continue this farming and does not allow him to depend on others. The farmers keep their own seeds and don't depend on market. They use their own organic manure for cultivation and don't buy chemical fertilizer from market. Similarly they collect leaves and twigs for trellis from the forest to grow the beans. The cold climate, land and soil type are also very much suitable for beans cultivation. It also protects their sovereignty on agriculture.

But now the farmer are targeted by the seed companies and started to motivating them. The attracting pictures on seed packets have also started to motivate the farmers for use of market seeds. All the market seeds are mostly need chemical application to cultivate and the farmers will have to apply chemical fertilizer and pesticide to increase the production. This practice will affect the natural and organic farming practice of the area. It will also affect the quality of beans by changing its taste and size etc. It may not be store for long days like the local beans. So the credibility and identity created through Raikia beans will hamper because of this. The farmers should analysis this market policy that affects the farmer's independency and prepare themselves to be free from the influence.

Kandhamal Cabbage and Cauliflower

In the past Cabbage and Cauliflower was recognized as the vegetable of rich because the rich persons were only able to purchase these vegetables from market. But now these vegetables have entered in the food plates of general people of Odisha. The general families have adopted these as regular vegetables in their kitchen because of increase in cultivation and production. Cabbage and Cauliflowers are available in the market round the year as farmers cultivate twice a year. Many general families also cultivate it as winter vegetable in their kitchen gardens. Cabbage and Cauliflowers are cultivated widely in Odisha not only for personal use but also for market supply. Kandhamal is the second largest producer of Cauliflower in Odisha after Keonjhar and also second in Cabbage production after Jagatsingpur. But it has a big market demand because of its organic value, natural taste and durability. The Kandhamal Farmers mostly use organic manure and compost in vegetable cultivation and occasionally use very less chemical fertilizer and pesticide. So the quality and taste of these vegetables remain better than others.

Farmers of Raikia, Tikabali, G.Udayagiri, Phulbani, Phiringia, K.Nuagaon and Baliguda area widely cultivate Cabbage and Cauliflower as one of their major farm based income. Initially it was restricted in some pockets of Raikia and Tikabali and in between twenty years it has spread to most of the areas of the district. The geographical situation, soil quality and climate is very much suitable for vegetable cultivation and the farmers have adopted it as a major source of income. Due to lack of irrigation facility and lack of fencing facility to avoid the stray animals in summer, the farmers give importance on rainy crops only. Generally the high and high medium plain lands are used for Cabbage and Cauliflower cultivation. All these lands are

situated in the foot hills near the forest and the forest compost water make the soil fertile. The farmers rear large number of cattle like cow, buffalo, goat and poultry etc and use the manure in Cabbage and Cauliflower cultivation. They apply more organic manure and compost at the time of field preparation and tillage.

They also apply cattle manure at the time of seedling and planting. It helps them to avoid the use of chemical fertilizer and monetary burden of purchasing the fertilizer. In this district the farmers are supported for organic turmeric production. Many organizations like KASAM, OMFED, SWATI and Madhyam Foundation have been motivating and supporting the farmers to practice organic farming and also providing them trainings on organic manure and pesticide preparation. It is also helping the farmers to grow Cabbage, cauliflower and other vegetable in organic way. In some areas farmers apply only 10% chemical fertilizer and use more organic manure in Cabbage and cauliflower cultivation. Because of this these vegetables last long without refrigeration and natural taste and quality is protected.

Looking at the market demand of Cabbage and Cauliflower, the unemployed youth have engaged in vegetable cultivation and it is providing them income opportunity in own locality. They are cultivating Cabbage and cauliflower in vast patches by taking lands in lease. The businessmen from cities like Berhampur, Bhabaneswar and Cuttack are reaching the villages and procuring their products. It has increased the market efficiency and bargaining capability of the farmers. Farmers are getting above 50 thousand rupees individually in 4 months from one crop.

But the coming time will be more challenging as the seed and fertilizer companies will make strategies to intervene in the area to spread their business. So the farmers should prepare themselves to protect its natural and organic way of production that has given a special identity to their products. Its quality and uniqueness will create its own market demand in state and national level like Kandhamal turmeric. The Organic vegetables production will give a vast income opportunity both to the local farmers and the farmers of new generation. It will provide a sustainable income to the unemployed youth and will check the distress migration.

Bandhagada Potato

Now potato has acquired a prominent place in our food menu and so also in our vegetable basket. But fifty years ago the uses of potato was very much limited and only some service holder families and rich families were prefer to consume it. But now it is one of the major constituents of daily diet and an essential vegetable for everyone, both rich and poor. The annual requirement of Odisha is 10.21 lakh MTs at present as per latest NSSO survey and it produces only 20% of its own requirement of potato annually. The state depends upon West Bengal and other states to fulfil its potato requirement. Potato is being cultivated over about 15000 hactor In Puri, Cuttack, Kandhamal, Sambalpur, Baleswar and Mayurbhanj district of Odisha with production of about 2.5 lakh MTs per annum. The productivity of potato in Odisha is 16.48 MT/ha which is below the all India average of 22.76 MT/ha. On the other hand while potato is used as a daily food commodity, use of heavy chemical fertilizers and pesticides for its production is creating harmful effect on public health.

Potato is not an indigenous vegetable of India and local people were generally used Yam, sweet potato and cassava etc. The potato was indigenous to Peru till the 16th century and unknown elsewhere. The voyages of Christopher Columbus opened up different parts of the world and its produce creating what was known as the Columbian Exchange. This allowed the potato to travel from its place of origin, across the seas to nearly every

continent in the world. Easy to grow, resilient to vagaries of weather and abundant in their fruition, potatoes quickly became an answer to food shortages and a staple across Europe. In India, the story of the potato is one that begins with the early Portuguese and Dutch traders. However, their influence or reach did not extend across the subcontinent and the potato remained restricted to small patches along the Malabar coastline. It was in the 18th Century, under the British East India Company that the potato got new impetus. Since theirs was a long term mission in India, growing potatoes made far more sense than importing them. So, the plants were given out to farmers at a pittance and the overall agenda was one of indulgence as well as commerce for the potato business was picking up across the world. By the 19th Century, potatoes were being grown all across Bengal and the hills of north India. So Potato is generally known as Bilati Aloo in Odisha.

In Odisha there were many substitutes to potato and they used cassava, different type of yam, arum and sweet potato as vegetables. But the service holder people and rich people preferred Potato and purchased from market. Looking its demand the farmers cultivated it widely and gradually it conquered our dietary system.

Fifty years ago there was not much demand for potato in Kandhamal villages and villagers mainly used forest tubers as food. But at the same time kandha farmers of Bandhagada and some neighboring villagers in Phiringia area of Kandhamal produced Potato. The farmers of the area can't say clearly about how the tribal farmers started potato cultivation in the area.

Now potato is widely cultivated in the district and in many villages the farmers are still cultivating this local variety Bandhagada potato for own consumption. This Potato is small in size and very tasty. People called it Bandhagada Aloo or Thuri Aloo. The farmers

of Bandhagada, Tejamaha and Chadheyapalli have been cultivating this local variety potato since fifty years. According to the old farmers of the area, they have been known it since their childhood days. At that time there was not practice of potato cultivation in villages and only Bandhagada and its neighboring villagers were cultivated. They used to carry on shoulder to distant market places and

weekly markets like Baliguda, Phiringia and Raikia to sell their products.

The farmers cultivate this variety in natural and organic process and it doesn't require any chemical fertilizer or pesticide. Generally farmers grow it as winter crop after the harvest of paddy. They cultivate it near the springs of water bodies. They have stored their own potato seeds. They have separated the healthy tubers for seed at the time of harvest and stored it under the bed in cold place. Some of them have stored the seed potatoes in bamboo baskets to protect from rats, ants and other insects. They open the seal of baskets before the planting time. During this period the seed tubers are turned dry and sprout on body. The farmers prepare the land by tilling 2/3 times and apply organic manure and compost. They make rows and plat seed potatoes one foot apart in a 4 inch deep trench, eye side up. It is cultivated like other potato in October - November and harvested in February and March. The farmers apply ash, cow urine and cow dong to avoid the pest and disease. The plants can produce 200 to 300 gram potato each and the average yield of potato is 25 to 30 quintal per acre. But the size of this variety is very small and rarely a big one.

This variety of Potato is very tasty and remains crispy after boiling. It doesn't need much spice to prepare dishes. The local people use it as boiled, fry and curry. In the past the villagers were eaten the boiled potatoes in lean periods. They were also given it to the infant children as baby food. This Potato was very much popular among the local people of Kandhamal and during 1980-90 it was widely cultivated in many areas of the district. But after 2000, when the improved variety potatoes were introduced it lost its credibility and the cultivated area gradually decreased. The consumers did not attract to it because its small size and farmers felt reluctant to cultivate because of marketing problem and low yield rate.

Now some of the farmers in Bandhagada, Raikia and Tikabali area are still cultivating this potato for own consumption. According to those farmers, It is very tasty and nutrious for consumption and the person those have tested it will not be ignore it. The families those use it neither regularly will nor prefer market potatoes. It has unique taste and quality. It is true that nowadays more chemical use in potato production has created many health issues among the people. When the people will aware about their health consciousness, they will surely search for organic products and will definitely search for this Bandhagada Variety potato.

Kandmal loses its local Paddy varieties

Indigenous seed traits have important role in natural farming. All these seeds are hardy, pest-resistant, withstand unfavorable conditions in the area of their origin, require less water and nutritional inputs, fit in better in the organic method of farming and may even have special characteristics such as nutrition, fragrance or color. These native breeds have a direct impact on Soil health as they do not deplete the soil of its nutrients. They are innately well accustomed to local climate change, they have an inherent adapting power to climatic stress and can sustain drought conditions, require very little or no forced management and are naturally resistant to diseases and pests. Indigenous seeds provide full sovereignty to farmer on agriculture. Firstly the farmers gets full independency to use own seed. Secondly the climate smart characteristics of these seeds don't break the farmer's hope in production. Thirdly the knowledge of the seeds is traditionally acquired by the farmers. In fourth the local farmers are well experienced and expertise in its farming process. The market seeds always keep farmers in dark. Those seeds are developed in laboratory by biotech companies for getting profit from agriculture. Now Companies are trying to reap more benefits of farming by introducing Genetically Modified Seeds. GMO agriculture has led to super weeds and super pests that are extraordinarily difficult for farmers to manage. Farmers affected by resistant pests must revert to older and more toxic chemicals, more labor or more intensive tillage, which overshadow the promised benefits of GMO technology. It will create Potential impact on human health including allergens and transfer of antibiotic resistance markers. According to researchers due to implementation of genetically modified crops the Farmers' production efficiency would also be affected, as well as the frequency of pesticide poisoning incidents and health impacts. Cultural aspects may be impacted as well; for example, GM seeds need to be purchased, causing a disturbance in the traditional exchange of seeds among indigenous farmers (along with potential changes in identity and trust among involved farmers).

Since rice is our main food, we give priority to rice cultivation. In Odisha, many indigenous rice varieties were cultivated in the past. According to a survey, in 1950's there were 1700 varieties of indigenous paddy were cultivated in Koraput region that is adjacent to Kandhamal. But due to its geographical deference Kandhamal had only few numbers of indigenous paddy varieties. The district has 5,403.8 sq km forest area, 67.37 per cent of its total geographical area. Only 23% lands are cultivable and 16% land are using for agriculture. Most of the lands are high and high-medium non irrigated land, not much suitable for paddy cultivation. The farmers use only low and low medium lands for paddy farming. According to the old farmers of Raikia area, they cultivated 13 to 15 varieties of paddy in the past. The farmers of Kambaguda in Raikia block say that they cultivated paddies like Matasaka, Nadiasatanga, Kalitolashaka, Bukurnaga, Ajalanga, Brihadalanga, Kundadhan, Tureka, Nagardhan, Daspalianga, Budadhan, Jhalaka and Putkudianga. Kundadan was cultivated in high lands and harvested within 3 months. The villagers celebrated Nuakhia festival with that paddy. Similarly Kalitolashaka and Ejalanga were highland varieties, Putkudianga, Nadiasatanga, Daspalianga, Brihadalanga and Matasaka were lowland varieties. Nagardhan was planted in water logged lands. Matasaka is dwarf in size but fat, white in color, and produces better gruel. Therefore, this variety is used daily. Nadiasatanga is thin and in medium size, white colour, with a normal scent, medium yield and grown in plain land. Kalitolasaka is medium in size, thin, black colour, scented, low yield and is of early variety. This is used occasionally, but mostly in festivals and rituals. Bukuranga is very thin, smaller size, white colour, pleasant odour and grown in low land, and can be grown in upland also. It has medium yield and is primarily of early variety. This variety is used occasionally in rituals as well as in festivals. Ajalanga is large sized, white in colour, of medium yield and is an upland variety. This is used daily or occasionally based on its availability. Brihadalanga is large sized, both elongated and fat, red colour, low land is preferred, resistant to pest and insect infection, and this variety is used daily. Kundadhan is large sized, brown or redish coloured pod, good for husk for fodder, and this variety is grown in upland. It is known for early production and used for daily consumption. Tureka is another early variety, occasionally and mainly used for puffed rice and pressed rice. It is used daily. Daspalianga is large sized, with red coloured pod and for production low land is preferred. This variety is used in social occasion, also used for puffed rice. Putkudianga is small sized, scented and a low land variety. It is used occasionally, particularly during rituals and other special purposes.

But due to adoption of high yeilding varieties like Jajati, Swarna, Lalata etc those indigenous rice varieties are on the verge of extinction. This process may create a big problem for the farmers in future. The farmers will lose their seed independency and seed right. Adoption of market seeds will encourage the chemical application and will affect the environment and health of the community. Cultivation of one or two varieties will create more crop disease. The farm cost will increase and the poor farmers will affect. So to protect the naturality of farming and to avoid the climate threat, the Kandhamal farmers should came forward to preserve and multiply indigenous seed treats.

Krisastama Pradhan
The Experienced Farmer of Natural Farming

According to Masanobu Fukuoka, The renowned Japanese Farmers and proponent of Natural Farming, "Many people think that when we practice agriculture, nature is helping us in our efforts to grow food. This is an exclusively human-centered viewpoint... we should instead, realize that we are receiving that which nature decides to give us. A farmer does not grow something in the sense that he or she creates it. That human is only a small part of the whole process by which nature expresses its being. The farmer has very little influence over that process... other than being there and doing his or her small part. If nature is left to itself, fertility increases. Organic remains of plants and animals accumulate and are decomposed on the surface by bacteria and fungi. With the movement of rainwater, the nutrients are taken deep into the soil to become food for microorganisms, earthworms, and other small animals. Plant roots reach to the lower soil strata and draw the nutrients back up to the surface." There is a quite resemblance between Fukuoka's quote and Krisastama's farming practice. Krisastam has been maintaining his family of eight members from agriculture in 5 acres land and cultivating in natural way without application of any chemical fertilizer and pesticides.

Krisastama belongs to Kandha community, lives in Panganaju Village near Raikia with wife, son, daughter-in-law and grand children. Agriculture is their main source of livelihood and income. They have only five acres land and out of those two acres are paddy land and other three acres are high land. Krisastam is acquainted with agriculture since his childhood. After his matriculation from Raikia High school he had many chances to join in government services like forester,

Police and Military. But his parent did not allow him to go out village for job and suggested him to concentrate on agriculture. As an educated person, he decided to do the agriculture in a planned way.

Forty years back when he had started agriculture, it was a transition period in the agricultural practice of the area. The people were just sifted their view from traditional pattern to market orientated pattern of agriculture. They were started to give importance on vegetable farming rather than cultivating millet, pulses and cereals. Krisastam produced vegetables like beans, brinjal and potato with traditional crops turmeric and paddy. Gradually he added Cabbage, cauliflower, green pea and other to it. When the farmers started Cabbage and cauliflower cultivation in the area some of them applied chemical fertilizer. But Krisastam tried to cultivate in organic way. He had many cattle and started to prepare organic manure from that. He also prepared compost from his agricultural waste and applied in lands. He observed that the soil quality of the area is fertile itself with forest waste and doesn't need any chemical application. He also acquired knowledge and skills on soil fertility, seed selection, seed storage, crop management, mixed farming, pest and disease management and water management. He kept relationship with village agricultural worker and block agricultural officers to get government facilities, scientific knowledge and information.

In the meantime Kandhamal turmeric earned its reputation in the national and international organic markets and many government and non-government organizations like KASAM and OMFED etc supported the farmers to spread the turmeric cultivation in the district and initiatives were taken to develop the district into an organic area. The farmers were given training on organic manure preparation, compost preparation; vermin compost preparation, natural pest and disease management techniques in scientific way. Krisastam utilized the opportunities, took the trainings and learn the techniques. He made a vermin compost tank and started to produce vermin compost. Similarly he produced different organic manures like pot manure, Magic

Manure, Panchamrut, Nimark etc and applied in his crops. He observed that application of these organic manures is showing effective result and reducing disease and pest attack on crops.

His three acres farming plot near the house is full of crop diversity and plant diversity. He has planted 200 Lichee plants with other fruit bearing plants like Mango, Guava, Orange, Lemon, Papaya, Banana etc. He grows different seasonal vegetables like Beans, Brinjal, Cabbage, Cauliflower, Tomato, Potato, Ladies finger, Chilly, Pumpkin, green peas and many others. He cultivates different tuber crops like yam and arum, spices like turmeric, ginger, pulses like arhar and blackgram, millets like ragi, purl millets and maize etc. Since last two years he has been trying to grow different market based vegetables like Bit, Carrot and Bracoli etc. He produces 12 quintals Turmeric, 5 quintals beans, 60 shoulder banana and vegetables worth fifty thousand. He has never bought any vegetable from market for own consumption but supplied to the market. He has been maintaining his family, managing the expenses of study of the children, expenses on health, festivals and ceremonies from this agricultural income.

He suggests some successful techniques from his long experience that:

The lands should cultivated thoroughly before sowing or planting because it will help in controlling weeds, will improve the water observing capacity and air circulation, so that the roots can go deeper in the soil.

Farmers should apply organic manure and compost to increase the soil fertility. It is low cost and effective than chemical fertilizer and improver the micro organisms in the soil.

The Farmers should adopt crop rotation practice to increase the production. Every year he rotates his turmeric, ginger, arhar and cabbage plots and get more production.

Mixed farming is a better traditional farming practice to reduce pest and disease attack on crops. Planting turmeric, gingers, marigold flower plants near the crop field also reduce pest attack.

There is no difference between the care of a human child and plant. If we will not take care of diet and hygiene of the child then child will be seek and similarly if we will not take care of the plants the they will be prone to disease. He who always keeps the plants under observation is the real farmer.

Dilip adopts Natural Farming to avoid Irrigation Problem

Dilip Pradhan, the young vegetable farmer of Banda Village of Gumagada GP in Raiki block is well known in the area as a progressive farmer. He sells vegetable worth 1 lakh rupees annually and maintains his big family of nine members from this vegetable farming. Dilip has attraction towards agriculture since his childhood. He was the agriculture minister in the school at the time of study at Boud and had grown different kinds of vegetables and flowers in the school garden. The teachers praise him for his agricultural ability and it creates lots of encouragement in him. When he dropped out of school and returned home engaged in agriculture. He had five acres of ancestral land property from which two acres low land and three acres high land. They cultivate paddy in low lands to meet their food needs and rarely grow pulses in other 3 acres high lands. Due to lack of irrigation these high lands are cultivated in rainy season only. Dilip planned for vegetable cultivation there. To solve the irrigation crises he appealed the local block officials for support through lift irrigation scheme but failed. First he started rainy season vegetable crops like Brinjal, Chilly, ladies finger and beans etc. It did not require any irrigated water and gave a good result. So he thought about how to cultivate the land all the year round.

To harvest the rain water he made pits and trenches in land. The rain water was collected in pits, soaked in soil and maintained the groundwater level. He did not remove the grasses and the grass cover protected the soil from direct sunlight. It maintained the soil moisture for long days.

He made an orchard in a part of the land and planted Banana and Papaya plants. Dilip observed that if he will apply chemical fertilizer in the land then it will require more water. So he decided to apply more organic manure and compost in the field. He collected dry grasses and dry leaves from the

nearby forest and prepared manure using cow dung and goat manure. He also adopted different traditional techniques mulching and basin preparation method to conserve the water. He learned different scientific techniques of organic manure preparation and prepared pot manure, Jivamrit, Magic Compost etc using cow dung, cow urine and different leaves.

To avoid water crises he gave importance to cultivat different high land crops, those require less water. He grew turmeric and ginger in some patches and pulses varieties in upper lands. He planted yam and different tuber crops in tree shadow spaces and cultivated drought resistant crops like millets and maize in the land.

Now Dilip is not considering Irrigation as a major requirement for his farming and He is cultivating both rainy and winter crops in his land. To conserve the rain water he has dug a water pit on the river side near his land and lifting water through a diesel pump set. The pit is supplying water upto December. He has made water pits in the land and storing water by using polythyne sheets. Now he is cultivating different winter vegetables like Potato, Tomato and Beans by using that water.

According to Dilip, it not easy for a poor farmer to collect all the requirements of agriculture at a time and he has to start his farm in available resources and facilities. If you have high lands and no irrigation facility then you can grow high land crops and drought resistant crops in it. This method was adopted by the ancestors. One can get better market price from turmeric, ginger, yam and millets than cabbage, beans and tomato cultivation. This year he has produced 5 quintals Turmeric, 2 quintals Ginger, 3 quintals Elephant Foot Yam and 2 Quintals ragi from his land. These crops have not required much expenditure or water to grow.

Pot Manure cures Disease in Green pea

Adibasi Pradhan, the 40 years old farmer of Kambaguda Village in Prtapanka GP of Raikia Block manages his family of seven members from agriculture in five acres land. He has to manage all expenditures of food, clothing, medicine, ceremony and study expenditure of children from the income of agriculture and most of the time faces monetary problems. He cultivates paddy in two acres low land and vegetable in another two acres high land. He cultivates three times vegetable, in rainy, summer and winter and earns near about 1 lakh rupees annually from this. He grows different vegetable like brinjal, Beans, Green pea, tomato, chilli, Cabbage, cauliflower and also turmeric and ginger to sell in market and mustard, spinach, tubers and pulses for own use. He don't use chemical fertilizer or pesticides in his crop, applies cattle manure and compost mostly.Some twenty years ago he was not interested in farming because of low production and migrated to Keral state for better income. He was worked there as a laborer in saw mills, but always suffered from illness due to climatic change and after some year returned back to village. He got married and decided to stay at home and support the family through farming. At that time Raikia area was developed as a vegetable corridor and Adibasi took interest to produce vegetables according to market demand. He developed the two acres high lands near the village, bought a diesel pump set to lift water from near stream and started vegetable cultivation. As an educated and experienced person Adibasi caught the pulse of market very quickly and studied the demand of consumers and businessmen. He started to produce vegetables accordingly and supplied to market. He observed that Raikia Beans and Cabbage has a big demand among the consumers and its market price is always staying high. So he concentrated on Cabbage, Cauliflower and Beans production. Initially he was applied Chemical fertilizer and pesticides, but gradually realized that it is not necessary because he has lot of cattle manure and compost to apply in the crops. Use of chemical is only giving extra monetary burden on him. So he started his farming in organic way.

This year in rainy season he had cultivated green peas in his 1/4 acre plot. The plants were grown healthy. But when the plants were started fruiting attacked by disease and leafs turned yellow and pods were dried. Adibasi consulted to the local agriculture worker and he prescribed some pesticides. But Adibasi was not interested to apply the chemical pesticide and discussed about the problem with Nikunta, the young secretary of Raikia Farmers producers Organisation of his village. Nikunta suggested him to produce pot manure. Nikunta had taken training on organic manure preparation and guided Adibasi in Pot Manure preparation. Adibasi collected a 20 liter clay pot, 5 kgs cow dung, 10 liters cow urine, 1 kilogram Neem, Karanja and Arakha leaves and half kilogram jaggery. First he cut the leaves into pieces, mixed the cow dung with urine thoroughly in earthen pot and then added jaggery in it. Then he added the leave pieces in it and mixed it thoroughly with a stick. After that he covered the pot mouth with a clean cloth and put the pot inside the farm hot in shade. Every day he was shaken it with the stick and after eight days the manure was ready to use. He filtered the mixture with a cloth and collected it in plastic bottles. Then He added 30 liter water in one liter mixture and applied it in green pea plant.

After a week he observed some positive changes in plants. The dried plants were came out with new leafs and plants were no longer dry and yellow. After one week he applied the second dose and within fifteen days the field was returned to its former state. He marked that the organic mixture has not only cured the disease of the plant but also enhanced the soil fertility and helped to retain the nutrient. The plants grown healthy and produced more. He felt relax and happy that this small initiative protected him from a big crop loss.

Other green pea farmers of the village were also faced same problem and this technique of organic application helped them to recover their crops. They learn the preparation technique from Adibasi and applied on their crops. Adibasi says from his own experience that most of the crop diseases are caused by the use of market seeds and chemical fertilizer. So he decided not to use chemical fertilizer and pesticides in his farm.

Dinabandhu adopts Mixed Farming for Pest and Disease management in crops

The forty years old Dinabandhu Pradhan of Kambaguda village in Raikia block is an experienced farmer in the area having vast knowledge on traditional farming practices. He earns his livelihood from his four acres land, cultivates rice in two acres low land, vegetable in one acre high land and oil seeds, pulses in another one acre land. He produces seasonal vegetables to market round the year and earns above one lakh rupees annually from it. When many farmers in the area take interest on modern farming he loves to follow the traditional practices on cultivation. According to Dinabandhu all the villagers are rich in traditional farming knowledge and they have acquired it from their ancestors. It has been passed down from generation to generation through practices and cultures. He has learned many agricultural techniques and skills from his father, grandfather and relatives. The people in the past were self sustained and independent in agriculture. They had kept all the agricultural resources with them and did not rely on others. They had their implements, seeds, manures and they had vast knowledge on land and water management, crop diversification, crop rotation, natural pest and disease management skills. But the modern agriculture makes the farmers ignorant and unskilled laborer only.

When he first started vegetable cultivation he faced many problems of low production, pest and disease attack on his crops. The co-farmers and agricultural workers suggested him for chemical use. But due to lack of money he could not able to purchase the high

rated chemical pesticides from market. So he started to think the alternative and analyzed the farming practices. He found out from his own analysis that the farmers in the past were faced low pest attack because of traditional techniques. When they were cultivated different varieties of paddy, the pest and disease attack was very low, but when they adopted single variety paddy the attack increased. In the forest trees don't get sick because of the diversified environment, where as in the orchards the fruit trees are affected by disease due to mono culture. So he came to know that the monoculture practice in recent times is one of the major causes of Pest and Disease attack.

In the past the farmers of Kandhamal were widely practicing mixed cropping and crop diversification. It was protected them from crop loss due to natural disasters and balanced the production. In sifting cultivation they were grown 20 to 30 varieties crops in a single plot. Similarly in high lands they were cultivated 2 to 4 type crops in a single patch to avoid the crop loss due to drought and rain. The farmers were tried to produce all

types of crops according to their food needs from their field. They were produced grains, cereals, pulses, oil seeds, spices, tubers and vegetable in their limited patches. So they were adopted integrated farming and mixed farming practice. They were grown millets with pulses or vegetables, oil seeds with vegetables etc. This practice was protected the crops from pest and disease attack also.

So Dinabandhu started mixed farming to check the pest and disease attack in vegetable cultivation, He cultivated mustard with cabbage and radish, maize with cauliflower, Brinjal with spinach, green pea with mustard. He also cultivated turmeric and ginger around the vegetable plots, planted marigold flowers and coriander in between rows. It helped him to reduce the pest attack. To avoid the disease in crops he also adopted techniques like deep tillage, water management and weed management. He also prepared neem pesticides, organic pesticides using cow dung, cow urine and different leafs and applied in crops. He also use ash, cow urine, goat poop in the crop field and got good result. Dinabandhu says – He never uses any chemical pesticide and only follows traditional techniques and applies organic solutions to check the pest and disease.

According to Dinabandhu, farming is not a technical process rather it is a natural process and there are many factors like role of soil, temperature, water, wind, seed, insects and many other natural factors are there in producing the crop. So the farmer should learn this natural theory first. He should have the knowledge about which plants are useful and which are not useful, which insects are useful to crops, which soil quality is suitable to which crops, water observing capacity of the soil, how the soil organism increase the fertility and supports the plants, how the living world like birds, animals, insects influence the crop production etc. In the past the farmers were acquired all these knowledge from their experience and used in farming.

But now the farmers have less knowledge about farming and they deal it technically due to the influence of market. They think that if they will use hybrid seeds, chemical fertilizers and pesticides then they will produce more. They don't calculate the role of nature in production and most of the time face crop loss like situations. If a farmer has studied thoroughly the process of farming then he will not fail at all. If the farmer concentrates on farming, he can identify all the problems of crops including the nature of plants and the activities of insects on plants. When the farmer will take farming as a means of food production rather than a profitable business, he will be able to get all the possible solutions of his farming problems.

Millet cultivation enriches the Natural Farming in Raikia Area

Raikia is a major agricultural production centre in Kandhamal and well known in the state for its vegetable production. The main characteristics of Raikia vegetables are its natural taste and quality, which are produced organically by the tribal farmers. They rarely apply chemical fertilizer and mostly use organic manure in crops, so the products maintain its own natural qualities and stay fresh for many days. But some forty years ago this area was rich in millet farming and farmers were cultivated different varieties of millets like little millet, pearl millet, finger millet, foxtail millet and sorghum etc in high lands and hills. However over emphasis on rice cultivation gradually eroded millet farming in the area.

The tribal farmers had been adopted Millets according to the climatic condition, soil type and also according to their food needs. Millets are climate-resilient crops adaptable to wide variety of ecological conditions requiring less water for irrigation with better growth and productivity in low nutrient soils and potential to address the livelihood security of small-scale farmers, in addition to hunger and nutrition.. They require low artificial fertilizers application and show minimal vulnerability to environmental stresses. Finger millet (Eleusine coracana) was among the major crops cultivated in the undulating terrains of Kandhamal district. It was consumed as a staple food and drink by the local tribal communities. However, over the years there has been rapid decline both in area and in production of the crop leading to reduced grain availability for household consumption.

According to the researchers, In India, 60 years ago millet was grown in 40% of all

cereal cultivated area. Dropping over the last 50 years, millet occupies only 11% of India's cropped area. The major wave of undervaluation came from the 1960s

onwards with the Green Revolution. Within government policy there has emerged a food grain caste system. White rice, bringing profit to fertilizer industrialists, large farmers, and export revenue to government, is considered the food for superior classes. India remains the second-largest exporter of rice after China. Millet came to be known as a coarse grain eaten by the poor and used as fodder. It has largely remained excluded from government's food grains research, policy, minimum support price buyback, irrigation facilities and marketing campaigns. Agricultural scientist M.S. Swaminathan has called millet one of the orphan crops. Before the green revolution in the 1960s, millets were a major portion of cultivated grains. During 1952-54, millets constituted 20 per cent of national food grain production. But gradually the demand has shifted to paddy and wheat as high-yielding and high-input utilisation crops to meet the demand of national food security. As the population grew, total consumption of millets remained unchanged, which explains the big drop in per capita numbers. By 2018, millets accounted for only 6 per cent of the grains grown in the country.

The challenge to food production posed by climate aberrations has been seeing increased attention to reviving millet-based farming systems. Millets are climate-resilient and nutritionally equivalent or superior to most other cereals, making them a favourable crop to address the prevalence of malnutrition. The state government of Odisha was one of the first movers in reviving the farming and consumption of millets by launching the "Special Programme for Promotion of Millets in Tribal Areas", popularly known as the Odisha Millet Mission (OMM). The Odisha Millets Mission envisages to address both supply side and demand side aspects of millet use. The scheme focuses on improving millet farming practices, reviving household consumption of millets for improving food and nutritional security, setting up millet enterprise and farmer producer organization, and ensure the integration of millets into exiting food and nutrtion programs such as Integrated Child Development Services (ICDS) and Public Distribution System(PDS) .

In the year 2017 SWATI initiated the process to revive the millet farming in Raikia area with the support from Odisha Millet mission in 12 grampanchayats -Petapanga, Raikia, Mandakia, Beredakia, Dadingia, Sugadabadi, Gumamaha, Manikeswara, Karada, Badabaraba, Indragada and Ranaba of Raikia block in Kandhamal district. 8 of these Panchayats are situated in remote hill tracks. The Organisation provided support for revival of millet farming, improvement in productivity, improved agronomic practice, appropriate farm mechanization, promotion of household level consumption, setting of decentralized processing facilities, promotion of millet based foods in towns and promotion of Millet farmers' producers Organisation in the area.

During this five years intervention, above 1500 tribal farmers of 12 GPs have revived Millet cultivation on their land in both Ravi and Kharif season and producing above 500 tons millet annually. The Farmers are oriented on Systematic Millet Intensification method, Bio-fertiliser preparation and application, pest and disease management, seed selection and storage etc. The Farmers are also provided high yielding seeds with other agricultural inputs. They have adopted Systematic Millet Intensification method line transplantation method line sowing method and other scientific methods of cultivation to increase their millet production. The farmers are linked with different departments and institutions for agricultural, climatic and marketing information. They are selling their products through government procurement mechanism and getting government MSP rates. They are participating in Food festivals at village, block and district level to create interest on different millet recipes among the villagers and to promote and disseminate the food and nutritional value of millet based foods.

This process has revived the traditional mixed cropping practice among the farmers. They have cultivated it with other traditional crops and got crop protection through this practice. The revival of millet crops has brought back the nutritional supplements in their food recipes. The fallow lands are converted to millet farm lands and it generated more income and production. Farmers have realized that millet farming is more profitable with less input and more reliable in crises period. But in a major achievement this Millet farming is reviving the age old natural farming practice among the farmers and encouraging the organic practice. The Farmers those were given importance on rice and vegetable cultivation and chemical application are now taking interest on organic millet production. This program has capacitated the farmers to prepare organic manure and pesticide preparation and application. The millet faring plots are remaining chemical free. The farmers are cultivating it integrating with vegetables and getting additional income.

Take the example of Siabana Pradhan, the 45 years old leading vegetable farmer of Dadingia village under Raikia Block. He cultivates different seasonal vegetables in five acres of his land and earns above three lakh rupees annually. He also grows different

improved varieties rice like Jajati, Puja and pratikhya etc but never cultivate millets. When the workers of SWATI suggested him for Millet he did not shown any interest because he had a calculation that Millet will not profitable like rice or vegetable. But

SWATI workers motivated him to try once as the intercrop in his vegetable field.

He was cultivated cauliflower in one acre of his land and decided to grow ragi in that patch as intercrop. SWATI worker guided him in the process. He raised Ragi saplings in a plot. After 45 days of planting cauliflower and complete of hoeing and second dose manure he transplanted the ragi saplings in between the lines in entire one acre cauliflower plot. It did not require any extra labour, manure or expenditure for him. The ragi plants grew with cauliflower by receiving nutrition and water from cauliflower plot. After one and half month the cauliflowers were matured and Siabana picked them out. Ragi plants got more space and after some days he observed that each plant has produced 50 to 70 tillers. The plants grew healthy and he produced above 4 quintal Ragi from that plot, which is a cost above 14 thousand rupees. It was an additional income for him from low input cost. He felt very much happy as the production was higher than his expectation. It also earned a good recognisation for him as many neighboring farmers came to his field to see the ragi field and praised him for farming skill. Many farmers expressed their willingness and interest to cultivate like him and requested for seeds and technical support.

He observed and learned many things from this process. During this cultivation period the SWATI workers visited him regularly and discussed about benefit of organic farming. They explained him how he could prepare organic solutions in low cost by using his own resources and could avoid the expenditure in purchase of chemical fertilizer and pesticides from market. He had also many bad experiences on chemical use but no other options. He had ten cows and bullocks but he did not give much importance to use their manure perfectly. He was used their dry dung but never their urine. SWATI workers explained him that the manure produced by his cattle is sufficient for his ten acres farming and only he needs to prepare it in right process. They oriented him on compost preparation using farmyard wastes, dry forest leafs and crop residues and organic manure and pesticides like pot manure, Neem solutions, Panchamrit, Magic Compost etc using Caow dung, Cow Urine and different forest leafs. Now Siabana is preparing different organic solutions and compost to avoid the chemical use in the farming.

Birendra profits from Millet intercropping

Birendra, the 30 years old young and educated farmer of Dibari village in sugadabadi Panchayat of Raikia block is now well known in the area for as a progressive vegetable farmer. He earns above three lakh rupees annually from his three acres vegetable cultivation. But two years ago before the outbreak of Corona he was worked as a driver. In April 2020 when the whole country faced month long lockdown and all the movements, transportation, business centers, markets, offices and institutions were closed indefinitely and the people were directed to stay at home, like many other he also lost his livelihood and returned to home. Due to lack of any income he faced problems to maintain his family of seven in corona phase and decided to give more importance on farming to feed the family. He had five acres of land from which 2 acres were low paddy land and remaining 3 acres were unproductive high land. He decided to establish a vegetable farm in that high land. That land was situated in two different areas, one was near the village and other was in the foot hill. Those lands were occasionally used for cultivation of high land paddy, pulses and oil seeds due to water crises and the always affected by stray animals. To avoid the water crises and stray animal problem Birendra started Rainy vegetable cultivation in those two patches. He grew cabbage and beans in two acres and other rainy vegetables in remaining one acre. Due to lack of money to purchase fertilizer and pesticides he applied cow dung and compost in crops. In the first year he got a big profit from vegetable and it boosted his confidence level. He decided to continue the winter vegetable in his patch near the village and made a green fence from that income. He also purchased a water motor pump and arranged to bring water from a distant stream to irrigate the field. He grew Beans, Potato, Green pea, and cauliflower, radish and other winter vegetable there.

Looking his encouragement in agriculture SWATI workers suggested him to adopt millet farming. At first he did not show any interest because he had a thought that it will not profitable like vegetables and he may face marketing problem to sell it. But SWATI

workers explained him about the marketing facility of millets by government through Millet Mission. They also advised him that he could do it as intercropping in the vegetable plot. At last he agreed and planned for ragi cultivation. He had no idea about ragi cultivation the local farmers had stopped millet farming many years ago. SWATI workers introduced him with the agricultural officer and he explained him how to grow ragi with vegetables.

Birendra was cultivated cabbage in two acres of his land and planned to grow Ragi in that plot. SWATI workers provided him Ragi seeds and guided him in nursery raising. They also guided him in preparing organic manure and solutions. After one and half month of planting the cabbage saplings Birendra hoed the land and applied second dose manure in cabbage. After that he planted the ragi saplings in between the cabbage lines. It did not give any extra burden of expenditure on him. After another 45 days the cabbage were got matured and ready to harvest. He cut the cabbages and ragi plants found wide space to grow. The manure that was applied in cabbage helped the Ragi plants to grow healthy and the plants produced above 50 tillers each. Two months later Dinabandhu harvested above 6 quintal Ragi, which was additional income for him. He expected to get above twenty thousand rupees from this Ragi.

It was a strange experience for him and other farmers of the village as they never seen like this earlier. The intercropping field was grown healthy better than the general ragi fields. The production was also very good and the neighboring farmers were influenced by this technique. The expressed their interest to replicate this practice in their fields.

Kandhamal Mustard Leaves Recipe

In the beginning of winter one can find the beautiful sceneries of mustard fields full with yellowish flowers everywhere in Kandhamal. Mustard is a major oil seed crop in Kandhamal and every farmer cultivates mustard to fulfill the household needs. Mustard is cultivated in high lands after the harvesting of paddy and many others also cultivate it in the low lands near the village and back yard lands also. Another main reason of mustard cultivation is its green leaves, which provide leaves curry to the families for two months. Mustard leaves curry is very much testy and full of nutrition also. In mustard season each and every family in Kandhamal must prepare a mustard leaves

recipe in their food items and the non-farmer people buy mustard leaves from farmers to make curry.

The Kandhamal families prepare different recipes of mustard leaves like mustard leaves fry, Mustard leaves and Dal fry, mustard leaves and brinjal fry, mustard leaves with radish leaves and other spinach mixed fry, mustard leaves and puffed rice powder fry etc. The mustard leaves are peppery, pungent, and a little bitter in taste and Kandhamal people like it very much. The farmers also preserve the curry leaves in traditional methods for further use. They pluck the big and healthy leaves and wash it thoroughly. Then they dry it in sunlight until complete dry , grind it and keep the leaf powder in a plastic jar. They use it latter as curry powder and make delicious chatnee by mixing chilly and garlic.

The Mustard cultivation of Kandhamal is a fine example of natural farming. Farmers don't invest much for this cultivation. They use their own seeds and manures for this. In the month of September and October, after the harvest of paddy they just plough the lands and sow the mustard seeds. After that the farmers don't invest anything. The mustard plants grow by receiving moisture and nutrition from paddy land. Sometimes the farmer applies cow dung or cattle manure to fertilize the field. Once or twice winter rain is enough for this mustard crop. It does not need any chemical application also. Within 30 days of germination, mustard plant develops a mature canopy and within 35 to 40 days of germination, it begins to bud. The flowering period lasts around seven to 15 days, sometimes more. Pods develop from the flowers over the course of the next 35 to 45 days. Farmers harvest mustard after three to four months of sowing in January and February. Many farmers cultivate it as intercrop with vegetables, millets and cereals.

Mustard farming is not only the source of food or income of the farmer but also act as a biological element of natural pest and disease management. Mustard is basically an insect-pollinated type of crop, with ample pollen and nectar to attract pollinating insects. It attracts and feeds many insects like honey bees, butterflies and other pollinators, those play vital role in pest management of crops. So farmers cultivated it with other crops. Similarly the honey farmers produce more honey in mustard season and get more income.

Organic Farming Practice by Tikideo Pradhan

Tikideo Pradhan, the 50 years old farmer of Sandakupa Village in Gumamaha panchayat of Raikia block lives with wife Janani, two sons and a daughter. The daughter has completed her graduation and the two sons are continuing their study in +2 and metric. Tikideo is well known in the area as a progressive vegetable farmer who sells vegetables above two lakhs rupees annually. He manages all the household expenditure including the education expenses of the children from this vegetable cultivation. But his journey to acquire a sustainable livelihood source and to reach this point was full of hurdles and challenges. He had tasted many unsuccessful experiences and lost many resources in the journey and at last chosen farming as final alternative.

After completing his matriculation From Daringbadi High School he had migrated to Bhubaneswar for searching of a job. He worked there in and electric shop and learned the electric work. After five years he returned back to home and open a electric shop at Raikia market but could not sustain. Then he changed his profession to cycle repairer and opened a cycle repairing shop at roadside of Raikia. The shop was running well and he was earning a comfortable income from that. But a few years later his shop was displaced because of road expansion work. He could not find another suitable place to open the shop and returned to village with regret. He promised that he would never go out again to earn his livelihood and will concentrate on farming only.

He had about seven acres of ancestral land property from which three acres low paddy land and other four acres high land. He decided to grow vegetables in that high land. Because he had spent above 20 years in cities he had a good exposure about the marketing and he thought that only vegetable production could meet his income level. There was not any irrigation facility to the land. So he started rainy season vegetable in the first year. Wife Janani also helped him in farming. They get very good income from vegetable and decided to convert their land in to a vegetable farm. They established a bore well point in the land and started seasonal vegetable farming three times a year.

He produced different vegetable with turmeric, ginger, tubers and oil seeds. He planted different fruit bearing trees like mango, Papaya, Guava etc. In the initial years he had been applied chemical fertilizers to improve the production but when he started

to produced turmeric, he had to give importance on organic because the turmeric marketing agencies were collected only organic turmeric. He also observed that it was easy and low expensive for him to produce organic manures. Looking his interest in agriculture Madhyam Foundation, a local NGO working in that area assisted him to practice organic agriculture. They also supported him to develop a banana plantation and Papaya plantation in organic way. They give him orientation on preparation of different organic solutions like pot manure, Jivamrit, Neem solutions, Magic manure etc. He also reared some cows and bullocks and used their dung and urine in preparation of organic manure. He contacted the block agriculture officer and got assistance to develop a vermin compost unit.

Now Tikideo produces quintals of cabbage, cauliflower, beans, potato, tubers, green pea, brinjal, chilly and many other vegetables. He has also developed a banana orchard and a papaya orchard. He does not apply any chemical fertilizer and cultivated in organic way only. He makes liquid manure, pot manure, Jivamrit to apply in vegetable crops and Neemark to check the pest attack. He also produces above 50 quintals cattle manure and compost and above 5 quintals vermin compost. According to him, he has a got very positive result from organic farming. He doesn't not experience deficit of fertilizers in his crop. Rather he is observing that the organic process has enriched his soil fertility and produced quality vegetables. The fruits and vegetables are keeping their natural taste and stored for long time.

Tikideo say that, the farmers of Kandhamal don't need any chemical fertilizer as there are lots of resources and opportunities for them to produce organic manure. There are vast forest in villages and farmers can collect dry leafs for compost preparation. They have numbers of cattle and they may use their dung and urine in crops. Goat manure and poultry manure is best for crops. The farmers are taking interest because of their ignorance and by the influence of marketing adds. They have a mindset that the vegetables will not grow without chemical fertilizer and pesticides. But he proves it wrong in his field.

Backyard vegetable garden of Naimini

Naimini, the fifty years old farmer of Lamungia village, lives with husband Mohan, son, daughter-in-law, daughter and two grand children. The whole family depends on agriculture for livelihood. They have only two acres of agricultural land from which one acre is paddy land other one acre is high land. They grow pulses and oil seeds on that high land. They have a patch of back yard land which is used for vegetable cultivation. Due to weak financial condition they can't afford market vegetables and grow varieties of vegetables on that backyard garden according to home need.

Naimini is very much experienced in vegetable cultivation. She knows that the market vegetable has not the natural taste or quality because of market seeds and chemical application. That can't be stored for long also. So she cultivates vegetables using local seeds, cattle manure and compost. She has 4 cows and she uses their dung and urine in vegetable crops. She also keeps different vegetable seeds and collects some from neighbors and relatives for own use. To meet the vegetable need especially she grows local vegetable. In Rainy season she grows ridged gourd, Ash guard, Pumpkin, snake guard, beans, radish, brinjal and varieties of spinach. Similarly in winter she grows chilly, potato, tomato, radish, cabbage, cauliflower, long beans and in summer bitter gourd, cucumber, ladies finger and leaf vegetables. To provide vegetable round the year she has planted banana, drumstick, papaya and Barada Sago plant in her garden. In tree sheds she has planted different tubers, turmeric, ginger, pineapple and custard apples. She knows above thirty varieties of non cultivated green leafs that use as food. She says that one can get it any time of the year from fields, forest and wetlands. According to her thirty years ago the forest was dense and they were getting plenty of forest foods like tubers, leafs, nuts, bamboo suits, wild mushrooms and many more. Those are no longer available.

Naimini spends most of her time at vegetable garden to take care of the plants, to watering the saplings, weeding, hoeing and manuring works. She has a compost pit and a manure pit in his garden. She gathers dry forest leafs, farm yard waste, crop residuals and grasses in the compost pit and makes compost by using cow dung and urine. To make fertile the garden she regularly applies compost and cattle manure. To check the disease and pest attack she applies wood ash, neem and kanaj oil etc. Sometimes she use smoke to drive away the pest.

Naimini says that each vegetable has its own taste and scent and we can get this naturality only through natural farming. But today's farmers are applying more chemical fertilizer and pesticide to get more production and it is destroying the natural quality of the crops. it is neither delicious nor nutrious to eat, but causes various disease in the body. So each and every farmer should give importance for own food and produce accordingly.

The Agricultural Farm of Misananda & Jivanilata has become a farmer's field school

The Agricultural Farm of Misananda & Jivanilata covers an area of ten acres and full with 50 varieties of vegetables and 20 varieties of fruit plants, represents the diversified farm of agriculture. They earn above five lakh rupees from that farm. Mostly they use cattle manure and compost in their crops and practice organic farming and use own seed varieties. So many farmers from nearby villages and local agricultural workers come to his farm to observe his practices. The local farmers share their farming knowledge and skills and learned different techniques from him. They collect seeds, saplings and plants from them and take suggestions about soil and water management, pest and disease management, crop rotation and many other farming ideas. Now they are well known as progressive farmer in the area for their vegetable production and farming practice.

Their farm is situated in the middle of the forest near a foot hill, five kilomiter distance from Dadingia village of Raikia. Misananda & Jivanilata have spent almost fifteen years to develop the farm. Their native village is Dadingia and now they saying near their farm. Fifteen years ago Misananda had married to Jivanilata. At that time Misananda was unemployed and assisted the family members in agriculture. Jivanilata was matriculate and had an ambition of improved life and better living. So to earn a better livelihood Misananda decided to go out state to search a good income but Jivanilata gave him a new idea. They had ten acres ancestral land property in the middle of Sunapanga forest and it was remained fallow throughout the year because of the distance from the village. Whenever they cultivated any crops there, were destroyed by the wild animals and stray cattle. Jivanilata suggested

Misananda to start vegetable cultivation in that land and not to go outstate for job. She also explained that if they could develop that land they would not have to worry about income after ten years and it could be a sustainable income source for them in future. Misananda agreed in the proposal and they started to develop that land.

In the first year they cultivated some rainy season vegetables with arhar, black gram, mustard and turmeric in high lands and paddy in stream side lands. They also planted some mango, guava and banana plants. They had many goats and two cows. They applied the cattle manure in the field and grown crops. They got a good profit from vegetables and it increased their confidence. But there was a problem for them that they had to walk daily 10 kilometers up and down from village to reach the farm. So they decided to stay there permanently with their cattle. They built a farm house there and started to stay. It was convenient for them to take care of the farm. They buy a diesel motor pump to irrigate the land and made a live fence around the land. They started to cultivate different seasonal vegetables three times a year.

They produced vegetables according to market demand. They cultivated more Cabbage, cauliflower and beans to get more income. With different seasonal vegetables they also grew turmeric, ginger, pulses, tuber crops, oil seeds and spices. Within a few years his farm had become a vegetable production center. Initially they used to go to weekly markets to sell their vegetables and later the businessmen came to their farm. They produced loads of vegetables and got good

income. Looking his success in farming the agricultural officers also visited their farm and suggested them different scientific agricultural techniques and provided government supports. They got assistance to promote vermin compost, irrigation and implements from block. Similarly the agro business organizations like KASAM and OMFED supported them for organic farming. They developed a vermin compost pit and a compost pit in their field and prepared different organic solutions.

The Farm also gave opportunities to Jivanilata for experimenting different farming ideas. She grew different market vegetables like sweet corn, Bracoli, Bit, carrot etc and got success. She experienced that purchasing seeds from market is not only expensive but also a process of cheating. Most of the time the market seeds germinate and produce less. So she tried to keep seeds from own crops and collected radish, ladies finger, bitter gourd, ash gourd, papaya and many spinach seeds and used those in her own farming. Many farmers also collected seeds from her.

Now both Misananda and Jivanilata are well-known ideal farmer in the area. The dream they had fifteen years ago has come true today. They have got a sustainable way of income from their farm and earn above five lakh rupees yearly. They have built a pucca house, got electric connection, purchased a tractor and many agricultural implements, established a lift point to irrigate the farm from their earning. Their children are studying in hostel schools. According to Jivanilata now they are providing work to 3.4 persons daily in their farm. In the future, children will also able to develop it as their livelihood and income source.

Droupadee found a new way to avoid the loss in vegetable cultivation

Thirty five years old Droupadee lives with husband Prakash, two sons and a daughter in Lamungia village of Raikia block. The main source of their livelihood is agriculture, but they face lot of problems to manage the family from their two acres land. They have to depend on labour work and NTFP collection to get some additional income. Initially they

were cultivated paddy in the low lands and pulses, oil seeds, some rainy vegetables in high lands to meet the food need of the family. But when the farmers in the area started vegetable cultivation widely they also decided to grow vegetable on their land. They developed their high land, made a fence around it, purchased a diesel water pump and started vegetable cultivation. The vegetables like cabbage, cauliflower, green pea and beans had more market demand, so they cultivated these types of vegetables to sell in market. They had not seed of these market vegetables, so they purchased seeds from market. To get more production they also applied chemical fertilizer and pesticides. They get good production in first two year and after that it decreased gradually. They applied more doses of fertilizer but could not revive the production. They also faced mare pest and disease attack and the pesticides could not create any effect. They suffered a lot in farming. Apart from their own labour cost they had to purchase seeds, fertilizer, hormone, and pesticides etc which were very expensive. They were borrowing money from local money lenders in high interest rate to meet the farming expenditure and due to loss of crops they were in debt. Family's financial condition was getting worse and they decided to quit the farming and lease the land.

In the meantime SWATI started millet mission program in the area and organized the farmers to adopt millet cultivation. They also oriented the farmers to follow organic farming practices and trained them on preparation of different organic manure and pesticides. Droupadi participated in trainings and learned to make organic manures like pot manure, compost preparation, jivamrit, Nimarka etc. She decided to revive her vegetable cultivation through organic application. She had two cows and she collected their dung and urine. SWATI workers assisted her in preparation of pot manure and Jivamrit using Cow dung, cow urine, leafs of different wild plants, jaggery and garlic etc. They also explained her about its techniques of use and doses etc. Droupadi collected dry leafs and crop residues and made compost.

Before vegetable cultivation she cultivated the land thoroughly and applied compost and cattle manure in it. She also prepared sapling beds using cattle manure and compost. She observed that the saplings are growing as healthy as before and there were no damage. She applied pot manure and Jivamrit time to time and noted that plats don't require chemical application any more. The vegetable plants grew healthy with flowers and fruits. It gave her more confidence and she was convinced that she could produce vegetables without chemical application. After the harvest she calculated her income and expenditure in farming. She noted that she has produces little less in quantity but she is able to save the fertilizer and pesticide cost in it. Now she realized that organic application is low expensive and sustainable method for farming and it protects farmer's independency in agriculture.

Nikunta aims to be a marketing manager of Kandhamal products

Nikunta is a tribal graduate of Kambaguda village in Petapanka panchayat of Raikia block. After completing his study from Raikia collage now he is engaging in marketing linkage of Kandhamal products in the area. According to him Kandhamal products have unique identity and demand among the costumers around the world and He want to establish a marketing brand and marketing enterprise in that name. Now Nikunta is acting as the secretary of Raikia Farmer Producer Company, a farmer's producer and marketing cooperative promoted by SWATI in Raikia area.

In the year 2011 Nikunta passed out from collage and tried to find a job to secure his livelihood but despite many efforts he failed. So to support the family he engaged in farming and started to grow food grains and vegetables in their little amount of land to feed the family. In 2018 SWATI organization promoted a Farmer Producers Organisation in the locality and Nikunta took its membership. Looking his education qualification and interest to work for the development of farmers the Farmer Producers Organisation selected him as the secretary. He got exposure opportunities to different areas, built relationship with farmers and acquired knowledge about their farming and marketing. He also got opportunities to join different meetings of farmer's forums and marketing forums and came to know about the market demand of Kandhamal Farm products. He realized that despite the heavy market demand the producer farmers are not getting minimum price due to lack of marketing facilities. He also marked that due to lack of income opportunity from farming many village youth are migrating to out areas for search of job. He had an idea in his mind. He observed that many local youth are working in different cities like Brahmapur, Bhubaneswar and Cuttack and staying in slums. There are also many vegetable vending shops in these cities and large numbers of costumers. Vegetable business is very much profitable in these cities also. Now the city

based consumers are more health conscious and searching for fresh vegetables without chemical application. The Kandhamal farm products like Kandhamal turmeric, Ginger, Ragi, Palua, mustard and pulses have big demand in these cities. So if the migrant kandhamal youth could have got good income if they had engaged themselves in vegetable business, opened vegetable vending shops or vegetable business in weekly markets. If Kandhamal people will do business their own then costumers will believe that those are pure kandhamal product. There is also good transport service to these cities and the products will reach in short times.

Nikunta has planned to start his export business using the youth groups of own locality. After joining in the Farmer Producers Organization he has built relationship with local farmers and gained the knowledge about their production. He has also planned to market the products collected by the organization. Now he has started the business by collecting products from own village and plans to expand his business to neighboring villages in the coming days. According to Nikunta, Kandhamal is rich in farm products. The outsider business men are getting more profit from it, where as the local youth are working as labourer in out areas. They will no longer have to worry about the earning when they take over the business. The Farmers will also get the proper market price of their products and the village economy will also be strong.

Purnima Prepares Organic Compost using Jackfruit waste

Purnima's family is one of the poorest families in the village, without any land property they depend on daily wages to maintain the family. But they don't get sufficient wage opportunity in the locality after the agricultural season and it is not possible for them to go out area for searching of job by leaving the family and children. So to earn some money and to feed the family in lean periods they grow vegetables by taking land lease from others. For cultivation they have to bring all things as rent. They take

plough on rent, purchase seeds from market

or local farmers and collect forest leafs, crop residues to use as manure.

Purnima has three jackfruit trees in her home yard and these trees support her family in many occasions. The family maintains its vegetable need for two months from baby jackfruits. The ripe Jackfruit provides food security to the family for one month in lean periods. Few years ago Jackfruit was one of the prominent fruit for food security in Kandhamal. The people of Kandhamal used the fruit in different food items from its baby stage to ripe stage. The baby jackfruits were used as curry, fry, cheeps and many other recipes. In last summer and first monsoon days the ripe jackfruits were used as raw food. The family members were used it as breakfast, the farmer were used it as launch in agricultural works, people carry the ripe jackfruit in visiting the relatives. The jackfruit seeds were used as curry, fry and children were eating those as dry foods. No one in the family was hungry in jackfruit season and it was acquired a major portion in food plates of Kandhamal people between April to August.

Purnima get lot of jackfruit from these trees but due to lack of marketing facilities she can't sell. The district produces a lot of jackfruit and the outsider businessmen purchase those in low price. So people prefer to use it rather than sell it. In early monsoon days the village roads are full with jackfruit waste. The people have thrown away the waste parts everywhere after eating the pulps, the cattle and dogs have pulled those out and scattered all around. Purnima observed that the jackfruit wastes are getting worse without any use and polluting the surrounding. She thought it would be very useful if it could be used in manure preparation. She dug a compost pit in her backyard and collected forest leafs and crop residues. She got over 10 quintal jackfruit wastes from her own and collected another 5 quintals from village. She kept all the collected materials in compost pit, mixed some cow dung in it and covered the pit with soil. After 2 months she got above 10 quintal pure quality compost from it. She applied it in her vegetable crops and got very good result. She has been preparing this type of compost since past 4 years and getting manure according to her need. If villagers follow her technique then they too can get sufficient manure for their farming.

Millet Sakti Tiffin Center to popularize Millet foods

In the past the farmers used to cultivate different crops according to their food habits. As rice is our main food we focus on paddy cultivation. Similarly wheat cultivation is a priority in states that accept bread as their main food. There was a time when people ate what they were collected. They had not any particular choice or hesitancy in food selection. Different non-cultivated forest based foods and water based foods were their staple foods. But when people started to settle permanently they used to eat what they produced through agriculture and what they got from nearby areas. The people of hilly tracks and forest areas were used millet crops as their staple food. Different recopies of millets like ragi paes, rice of little millet and sorghum millet, halwa of foxtail millet and pearl millet were widely used among tribal of hilly areas. But now the time is changed and our food hobbit and food production are controlled by the market. The food companies are creating market demand of foods through attractive advertisements and packaging. The farmers are forced to cultivate according to market demand and the market is deciding the price of crops. It is sure that now-a-days our agriculture and food habits are totally controlled by the market. We are so influenced by the advertisements that we don't give importance on nutritional value or quality of any food products. So this process is not only affecting our food practice, it is also affecting our nutritional need, food diversity, food recopies and our crop diversity, crop selection and production systems.

Now many nutritional food crops like millets, tuber crops, different spinach, and local varieties of vegetables are vanishing gradually from our farming and so also from our food plate. The farmers are rather taking interest to produce crops to supply the market than own food need. As a result the farmer is supplying 2/3 items to market and purchasing 10 to 15 items from market. When he supplies cabbage and brinjal to market, he purchases all other food

items including spices, oil and vegetables. In many occasions the farmer is purchasing own products differently, like sells maize and purchases pup-corn packet, sells raw pulses and purchases cakes and chips made from pulses. So how can we call ourselves a farmer if we buy our food from the market?

Due to change in our agricultural crop production we have lost many nutritional, tasty and healthy food recopies of our food tradition. The new generation is not aware about the millet based food items due to extinction of millet farming and now they don't realize its necessity. But we can prepare many tasty and nutritional modern food items from millets.

To popularize the millet based foods in Kandhamal, SWATI organisation has been arranging community level and district level food festivals in the district through Millet mission program. It is also opening Millet Sakti Tiffin centers in road sides and market places to popularize the millet snacks and Tiffin among costumers. There are two tiffen centers in Raikia area, one is at Dibari square and other is at Kilakia, on the way to Mandasuru natural tourist spot. The village women groups are preparing and selling different millet foods in these centers. They are making delicious sweets in ragi, millet snaks, chips, Vada, gulugula, Suan ladu, Halwa, ragi soup, Millet paes and many Tiffin items. The taste and quality of food items is attracting the consumers largely. The tourists are also appreciating the food items. With Tiffin and snacks the centers are also selling

ragi powder, small millet powder, Foxtail millet grains and millet flour mixter (Chhatua) in their stalls. SWATI has planned to open another 10 centers in the area in coming days.

Due to revival of Millet cultivation now the villagers have added millet in their daily food recipe. They are preparing family breakfast in millets and giving millet foods to children, pregnant and delivery women to improve their nutrition. This community acceptance has created a new hope in revival of Millet farming.

Natural Farming Practice in Kandhamal

At present, the agricultural system is completely under market control and the farmers are losing their agricultural resources and knowledge. Control of seeds, manure, pesticides and implements has transferred from farmers to businessmen. It is not only a question mark for farmer's sovereignty but also danger to farmer's existence. Not only farmers but also our food system is particularly affected by this business conspiracy. Pure and fresh foods are rare to eat, and chemicals continue to cause disease in the body. In this situation Natural and Organic Farming is the only alternative.

The farmers of Kandhamal are still practicing their natural way of farming. The natural forest cover, cattle resources, crop diversity, local seed and traditional agricultural knowledge are enriching the farming practice here. Now it is very important and urgent to give it protection and to adopt policy for its sustainability and replication. This book briefly discusses about the natural and organic farming practices of Kandhamal farmers.

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