

Cover crop in fallow lands

*Brining extra income and improving health of degraded fallow land*Category: Production

Promoted by: CWS and Avibyakti Foundation, Jharkhand, India, avfoundation@gmail.com/jrc@cwsy.org

The plateau region of Jharkhand has a huge tract of uncultivated degraded fallow land, degrading further due to scanty vegetative cover. In spite of having large land holding, the farmers are presently practicing farming only on a very small piece of their land, where water is available for irrigation, and are expanding the cultivation area in *kharif* to a small extent to uplands near their homestead land. Open grazing of animals is also a major constraint to take up crops in this area.



Implementation of the practice

Lift irrigation facilities from the nearby rivulets have been set up near these fallow lands to bring this vast tract under cultivation, initially by growing legumes to improve the health of the soil. Later on, farmers introduced wheat, maize, potatoes and other crops to make it a double cropped area. They also have set social regulations for controlled movement of livestock to address the crop loss caused by grazing. The farmers started with Horse Gram, which requires very little water and works as a very good cover crop. The crop is consumed as pulse and used also in traditional medical

Crops

After soil water conservation measure, one can try horse gram, sesame, sweet potato etc which require less frequent care, are resilient to dry conditions and offering good mulching for the soil.

As the fallows are mostly dry patches without tree cover, plantation activities, taken up in a grid, can help to control protecting soil health over longer time period.

practices. The husk and stems are used as fodder and green manure. All types of soils are suitable for its cultivation and require a proper arrangement for the drainage of water in the fields. Horse gram does fairly well on fallow lands with gentle or moderate slopes. In some of the plots, the farmers experimented with Roselle as a border plant. This plant belongs to the hibiscus family and its taste is not liked by animals, thus protecting the inside crop from grazing. The Roselle fibres are used for rope making and the flower and fruit used for consumption. However, in most of the plots the crop was secured through social regulations. The initial soil water conservation measures of land leveling and bunding were also linked to the Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA).

Results of the practice

With the initiation of fallow cultivation improvements through cover crops, the cultivable land has also been increased, thus having multidimensional effects on the life of the farmers. The soil health is slowly improving as it can be seen from the extended moisture retention in it for 2 to 3 months; the biomass generation has also increased organic contents in the soil that now looks darker. This has resulted in the possibility, for farmers, to cultivate other crops also in the same fallow land. Socially, fallow land cultivation has helped to decrease out-migration in terms of household numbers as well as migration days. With the presence of the father at home, children get more attention from both their parents and are somewhat relieved of cattle guard responsibilities. The process was initiated with 24 farmers in 58 ha of land. Within the first six months, 48 more farmers joined. 36 ha of this land has now been converted to double cropped land. Farmers have been linked with government schemes like the Mukhya Mantri Kisan Khushali Yojana (MMKKY) and MGNREGA to upscale it further.

Lessons learnt

Areas where fallow land cultivation was initiated in the patches where farm leveling and bunding were done, ended up producing better results. In some fallow land patches, Roselle was used as live fencing but since the variety used was not sour, in some patches cattle grazing destroyed the crops.



Single stick paddy cultivation

Bringing stability in rice production in the era of climate change

Category: Production

Promoted by: DRCS, West Bengal, India, drcscnew@gmail.com



Rice saplings are normally transplanted after 30 days. But farmers of rain fed area, often have to wait for rain and are thus compelled to transplant the saplings of 45 to 50 days. They also plant 7-8 stick/saplings together to reduce the risk caused by longer dry spells in between. Farmers assume that a higher number of saplings together will increase production and be safer, in case some saplings die. However, a single sapling sowing can improve the situation.

Implementation of the practice

The seed bed can be prepared with approximately 1.2 kgs of paddy seeds for one acre of land. The sapling can be kept up to 45-48 days on the seed bed. During the monsoon, the land preparation can be done with vermicompost, compost/FYM, bio fertilizer, mustard oil cake etc. Farmers have to transplant one sapling at 10" x 10" distance, instead of 8-10 saplings at 6" X 4" distance. Seven days after the transplantation, the first tiller will emerge; in the end, on average, more than 45 tillers can come up for each sapling.

Result of the practice

Average record	Single Stick	Normal Practice
No of tiller	55	20
Height of the plant	3 ft	2.5 ft
Number of paddy per panicle	250	190
Number of wasted paddy grain	35	55

The farmers found the System of Rice Intensification (SRI), the most popular practice for root intensification, complicated because of the water management. Even though the results of the single stick practice are not as good as SRI, they are anyway better than the normal practice. Apart from productivity reasons, as mentioned in the table above, this practice has two major positive aspects in tackling climate change related variations. First, farmers can wait up to 50 days before the transplantation, in case of late rainfall. Secondly, as the root grows, the stems are supported better and go stronger, so they can withstand storms and rainfall related problems and not fall off, thus minimizing the pre-harvest loss. In terms of economic benefits, the average yield will be increased by 30%, the paddy straw is of better quality and length, and works better as fodder. The seeds requirement is 60% less and weeding is easier at the initial stage.

In 2012, only 28 farmers had tried this practice in 8.3 acres of land, but in 2014, under the SIFS project, 171 SIFS farmers have applied it in 18.3 acres in 2 districts. . The technology spread beyond the SIFS project village to other districts in West Bengal.

Future scope

The trial was done mostly with HYV paddy variety with promising results. Additional trials need to be done with different varieties and different ecological setups. SRI has also been promoted in many areas under SIFS.



Biodung composting

A low cost method of converting waste to wealth

Category: Production

Promoted by: SPWD, Jharkhand, India, spwdranchi@gmail.com



Like other dry areas, the major problems in the soil in Ranchi, affecting its fertility, are low water retention capacity and low organic carbon content. While tackling this, traditionally households are normally apply limited quantity of farm yard manure, leading to an increase in the use of chemical fertilizers with resulting higher cultivation costs. Biodung has been tried as a solution to address this, which is a better quality of compost and uses agro-waste generated in the farm to increase the quantity of compost.

Implementation of the practice

Biodung is a method of composting in which the biomass is soaked with cattle dung slurry and allowed to decompose in anaerobic conditions. Monsoon weeds, hedge plants and leaves of fast growing trees that are not commonly consumed by the farm animals are used along with dry biomass; this is then covered by mud dung slurry/polythene to prepare the anaerobic condition needed for the decomposition of the biomass. This method accelerates the decomposition rate. The raw material is heaped on a raised platform; after every 1ft layer the leaf litter has to be covered with cattle-dung slurry (1 to 2% of the weight of the leaf). Five layers are thus made, each one 1ft thick, for a total height of 5 feet. The layers are well soaked in water and cattle dung slurry or biogas slurry and the heap is covered with a black polythene sheet. The heap must be turned over twice at an interval of 15 days, thus maintating50-60% moisture in the heap. The polythene coverage

helps in maintaining the anaerobic conditions, moisture and temperature (50-60°C) in the biodegradation of the heap during the initial period of 10-15 days. The fully decomposed dark colored compost is prepared in 50-60 days.



Results of the practice and lesson learnt

The practice is very easily replicable and builds on existing knowledge and improvement of a traditional practice. It reduces the use of chemical fertilizers, increases crop yield and improves the soil health by adding organic carbon and increasing the micro-organisms count. About 300 farmers in 25 villages are currently practicing it. It is calculated that by spending INR.200, one can prepare a compost worth INR 15000.

What did not work well in the practice was the need to turn the heap twice every fortnight; as this was not always done, the decomposition time increased.

Azolla as feed

A protein rich diet for animals

Category: Production

Promoted by: SPWD, Jharkhand, India, spwdranchi@gmail.com



Azolla is an aquatic weed that is very rich in proteins, essential amino acids, vitamins growth promoter intermediaries and minerals. *Azolla* is the most promising aquatic plant for livestock feed thanks to its ease of cultivation, productivity and nutritive value. Farmers in this region have always been facing lack of proper feed for hens and ducks. Azolla is being introduced as feed for these birds and also cows as well, as it has been noticed that farmers are not in the habit of supplying appropriate food to their birds and ruminants, but rather provide them with one type of food which has insufficient nutritive value.

Implementation of the practice

A pit of 10ft x 5ft x 1.5 ft is dug under the shade of a tree as a first step. The pit is covered with a polythene tarpaulin and then a water is poured to make a water body. All corners of the pit should be at the same level so that a uniform water level can be maintained. A slurry made of 3 kg of cow dung mixed in 10 litres of water is poured into the sheet. About 0.5–1 kg of fresh and pure culture of *Azolla* is placed in the water. This will grow rapidly and fill the pit within 10–15 days. From then on, 500–600g of *Azolla* can be harvested daily. A mixture of 20g of super shosphate and about 1 kg of cow dung should be added once every 5 days in order to maintain the rapid multiplication of the *Azolla* and to maintain the daily yield of 500g. The biomass (around 200g per square meter) should be removed every day or on

alternate days to avoid overcrowding. The *Azolla* should be washed in fresh water before using it to remove the smell of cow dung.

Results of the practice

Farmers are using it as feed for ducks and hens due to its nutritive value. The body weight of hens fed with *Azolla* increased of 200–250 g compared to the hens receiving normal feed. In case of duck it is about 150 – 200 g. The number of eggs laid per bird (7-8 in ducks/6-7 in hens) and the quality of the eggs (the yellow yolk portion of the egg being more prominent and yellowish) is better in the birds fed on *Azolla*. Feeding cows with *azolla* increases the milk production by 25%. At present 100 farmers in 35 villages are practicing *Azolla* culture and using it as feed for ducks and hens.

Lesson learnt

The composition of *Azolla* makes it one of the most economic and efficient feed substitutes for livestock, particularly as it can be easily digested due to its high protein and low lignin content. It is especially effective to strengthen birds' growth. As it is easy to cultivate and has a highly nutritive value, leading to higher production, many farmers are encouraged to practice *Azolla* cultivation. In the case of cows, at the initial stage they should be fed boiled *azolla* to avoid indigestion.



Multi-layered mulching

An effective moisture preserving practice

Category: Production

Promoted by: Anando, Chitagong Hill Tracts, Bangladesh,

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From April onwards, in Chitagong Hill Tracts, the soil loses its moisture due to evaporation and because the dry biomass is removed from the surface layer. Both the situation, the loss of moisture and surface nutrients, are problematic for standing crops. In addition, the closer dry sun burns the soil due to its direct heat application, causing the gradual death of microorganisms. Mulching has proven to be a very effective mechanism to tackle both these problems.

Implementation of the practice

For soil conservation in multi-tiered orchards, covering the soil could play a very vital role in conservation of surface nutrients and moisture. Usually fruit crops in the orchard take minimum 4-6 years' time for their initial bearing. The plants occupy a very small surface due to their short and un-bloomed canopy; both the sun burn and top dust removal are therefore acute at this stage. Cover crops like sweet potatoes, sweet gourd,

Three types of mulching has been practiced in the project area. Which are

Single mulching: The root zone is covered by leaves/ leaves mould/straw/saw dust, tea leaves residue etc at the beginning of winter i.e. dry season

Double mulching: The root zone is covered by leaves/ leaves mould/straw/saw dust, tea leaves etc followed by pressing the soil with a bifurcated banana pseudo base stem

Triple mulching: Both materials mentioned above are covered by sweet potatoes and sweet gourd when the rains end. Finally, after placing all above materials in the root zone, pigeon peas or similar plants are planted to cover up the sun burning.

groundnut, bitter gourd etc. could be planted and used as mulch. They can also produce biomass for food and fodder purpose.



Results and lessons learnt

So far, mulching by organic matter (dry leaves/ leaves mould/straw/rice debris/rice husk etc) did not find much resistance as it is derived and improved upon from traditional practices and thus easily accepted by farmers. Mulching by living plants such as sweet potatoes/sweet gourd/pulses etc is very effective but takes more time to be accepted by farmers. Practicing this method reduces the water requirements by 50%, increases the survival rate of the plant, allows the utilization of the fallow space and provides extra income/food.

Banana pseudo base decomposition

Waste to wealth

Category: Production

Promoted by: Anando, Chitagong Hill Tracts, Bangladesh,
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In Bangladesh, almost every homestead has a banana plant. After the harvest, sometimes the rhizomes are also utilized as food. However, the remaining pseudo base gradually dries up, whereas it could be utilized to prepare compost through a decomposing process for the young rising sucker.

Implementation of the practice

The mother plant should be cut at the pseudo base while harvesting the matured bunch of bananas. The exposed base should then be shattered and treated with 200 g of fresh cow dung (or 4-5 tea spoons full of urea). The ingredients should be covered with additional soil or manure. The base should then be left with a protective shade (from sunshine and rains) for 3 weeks. This will accelerate its decomposition immediately supplying feed to the young sucker.

Results of the practice

This is originally an indigenous technology, which has been standardized through practice. It is important for bananas to get good sucker as they are one of the major cash crops. . It is usually harder to get a good sucker/crop without applying raw fertilizers, which is detrimental to the soil health. This practice raises the bunch weight by using almost no fertilizer, thus reducing the quantity used as well as raw input cost.

Lessons learnt

The technology is simple, easily applicable and highly economic for homestead marginal farmers. It helps to combat land degradation and prevents the application of the fertilizer for the second time. Through this project, about 1200 farmers - some of whom are commercial banana farmers are practicing it.



Liquid foliar manure

A home-made fertiliser and pest controller

Category: Production

Promoted by: Forward, Chitwan, Nepal, forward.sifs@ntc.net.np



High prices, distant supply chain, lack of technical know-how, insufficient quantity supply and detrimental effects to soil and environment are the major barriers of using chemical inputs. On the other hand, many farmers in Nepal are rich on plant resources with botanical pesticide value, which works as repellent keeping insects away from crops; in addition it controls vectors and improves the plant health. A standardized liquid manure uses these resources to achieve the dual result of pest control and improved soil health.

Implementation of the practice

The plants having the characteristic taste or odor of bitter, hot, sour are collected. Firm and tender leaves and plants decompose faster than the matured twigs, branches etc. The materials are chopped and chaffed into small pieces, then put into a black polythene drum or other airtight container while continuously ramming with a wooden bar and filling up the vessel to 3/4. Around 40

In Nepal, Bakaino (*Melia azedarach*), Neem (*Azadirachta indica*), Sayapatri (*Tagetes erecta*), tobacco (*Nicotiana tabacum*), Simali (*Vitex neundo*), Tulsi (*Ocimum sanctum*), chilly (*Capsicum frutescens*), turmeric (*Curcuma longa*), Sisno (*Urtica dioica*), Asuro (*Justicia adhatoda*), Khirro (*Holarrhena pubescens*), Bojho (*Acorus calamus*), kalo-banmara (*Mikania micrantha*), Titepati (*Artemisia vulgaris*), ginger (*Zingiber officinale*), etc. are commonly available plant materials to make liquid fertilizer. In addition, chilly, garlic (*Allium cepa*), lime (*Citrus* spp.), black pepper (*Aconitum ferox*) are also used.

liters of cow urine are placed in the airtight vessel to soaking the plant materials. The drum is placed in a sunny area to increase the temperature inside so that the degradation process is accelerated. The process is completed in around one month during summer but takes relatively longer during winter. Application of EM and Jaggary accelerates the decomposition process. The completely decomposed foliar fertilizer produces quite a pungent smell at the end.

Generally, 20 liters of liquid fertilizer are sufficient to drench one Kattha of land. In practice, 1:10 ratio of foliar fertilizer and water is used for nurseries, whereas the concentration increases up to 1:5 for bigger plants in the kitchen garden. It is applied in 10-15 days interval over the cropping period.

Results of the practice

This is a broad range pest repellent that has long term impacts rather than immediate relief. Foliar application of this pungent material has a repellent effect for insects and vectors of disease, preventing them from attacking the crops. Wetting plants and soil application of foliar fertilizer helps to reduce the costs of chemical fertilizer, improves soil fertility, and gives healthy foods to consumers. More than 550 beneficiaries are adopting the foliar fertilizer practice in the SIFS project area in Nepal.

Future possibilities

Village development committees of the project area have highly appreciated this technology innovation. Local leaders look very positive from the impact of foliar fertilizer to crops. The technology is replicated by many farmers' in their farm. But, it needs scientific study on its composition/concentration, ingredients used, method of action, recommended doses of foliar fertilizer etc.



Cattle shed improvement

A healthy solution for improving animal health and productivity

Category: Production

Promoted by: Forward, Chitwan, Nepal, forward.sifs@ntc.net.np



Traditional unhygienic cattle sheds increase health problems and ultimately hamper the production and productivity of the cattle. An improved cattle shed is a combined solution to improve the health and hygiene of cattle and buffaloes, while collecting urine - a viable alternative to mineral fertilizer - to be used in the farm. Cattle urine is. Of the nitrogen excreted by cattle, 60% is found in urine and only 40% in dung. In traditional sheds, urine is left to be absorbed in the bedding material, while excess urine is channeled out of the shed and disposed of. Simple intervention of improving the floor addresses this problem.

Implementation of the practice

Two types of floor improvement materials were used in the SIFS project by FORWARD Nepal; cemented floors and with wooden planks. In the case of a cemented floor, the project provided four bags of cement and 16 bags of sand to the model farmers; the farmers additionally contributed with materials and labour to make a concrete cattle floor and a gutter linking with the urine collection pit. In the case of wooden planks, the farmers managed wooden planks of Sal tree (*Sorea robusta*) for the mutually agreed cost of NRs 4000.00; the urine passes through the gutter and is then collected from the urine collection pot.



Results of the practice

This practice enables farmers to raise healthy and comparatively more productive animals. It also helps to improve soil fertility and to manage diseases and parasites of plants in an eco-friendly way by using cow urine. This technology is practiced by 85 beneficiary households and is being increasingly used. A similar practice has been tested in India and Bangladesh with various models like sloppy floors, floors with stone chips and even mud. Overall, this has been tried with approximately a thousand farmer – and always yielded positive results.

Lessons learnt and future possibility

Cattle shed improvement helps farmers to collect urine separately, used then for soil application thus increasing the availability of nitrogen, phosphorus and potash (major plant nutrients) and other micro nutrients in the soil. This fertilizer management reduces the costs of plants production and of chemical fertilizers, and helps to manage shortage of chemical fertilizer or to use it in a more balanced dose. It is also noticed that cleaning of cowshed is easier and cattle remain healthy. However, for small and marginal farmers the investment for floor improvement cost is often relatively high, but can always be linked with government schemes and programmes.

Kitchen fishery

Raining fish in small pond in the backyard garden

Category: Production

Promoted by: Forward, Chitwan, Nepal, forward.sifs@ntc.net.np



Fish is well known for its lean and white meat with low fat and cholesterol levels. Fish and fisheries are important for the livelihoods, food, nutrition and income of rural people. Kitchen fishery was conceived to produce fish around kitchen garden or homestead areas in a small scale. In Nepal, this new concept was tried out with pond of sizes varying between 40-200 m². Chinese and Indian carp species are grown with intensive stocking density. This type of fishery is practiced by utilizing locally available farm or kitchen wastes as feed and is targeted more prominently for home consumption.

Implementation of the practice

Farmers were first trained on basic fishery. The topics included general introduction and nutritive value of fish, cost benefit analysis of fish farming, pond digging, stocking density, pond management, feeding management, water management, fish harvesting, disease/pests and marketing of fish. The farmers then dug out the ponds varying the size between 40-200 m² in their homestead and let the sun dry the pits for 15 days. The ponds which had greater possibility of leaking or percolating water, were lined with polythene plastic sheets and fertilized with farm yard manure to enhance the natural food. The ponds were then filled up with clean water and stocked with Chinese and Indian carps. Fingerlings of Common Carp, Silver Carp, Big Head Carp, Grass Carp, Naini and Bhakur were purchased from the government and put in the pond to maintain intensive stocking density. Farm yard

manure enhances the natural microbial organism for fish; in addition, the fish in the pond is fed with kitchen waste, farm byproducts and mustard meals. Fodder and forage grass was supplied to feed the grass carps too. Kitchen fishery is then integrated with the vegetable production around the pond by using fertile pond water.

Results of the practice

Kitchen fish culture supplies meat all around the year to the household. In addition, farmers get additional income from the sale of surplus fish. The water stocked in the pond helps to recharge water in the adjoining farm land. The technology is currently adopted by 50 farmers in Chitwan.

Lessons Learnt and future possibilities

Integrated kitchen fishery and vegetables increases farm productivity and reduces malnutrition problem of children and women. A technical orientation on fish culture could be very effective in motivating smallholder farmers to innovate their practices. Some farmers have expanded their fishing area and increased the scale of farming. Linkage with a technical center and hatchery is very important for kitchen fishery too. In few cases, farmers planted light trap over the pond to attract pest, which eventually became food for the fishes.



Kharif Paddy Stabilization (KPS)

A comprehensive package for improving paddy production

Category: Production

Promoted by: Pravah, Deoghar, Jharkhand, sifs.fhfi@pravahjharkhand.org



Rain fed paddy is used as staple crop in the eastern part of India. However, the productivity in these states is low due to traditional cultivation practices and erratic rainfall, thus leading to food insecurity, distress migration and low income. Generally, the entire landmass of this area is composed of an undulating topography where low land is mostly dominated by rice cultivation. In Deoghar, people have been facing draughts since 2010. Stabilizing the productivity of paddy, which requires a considerable amount of water, is thus crucial. KPS is a method which needs less seeds, is easy to weed and consumes less fertilizer and water (25%).

Implementation of the practice

The method has been tried out with rice varieties such as IR- 64, Sarna, Rajendra Monsuri and local seeds. Seeds are generally sown during the 1st week of July by soaking them for one day and treated with 1:6 cow urine. A raised bed measuring 10-12ft x 3 ft is prepared with 15-20 kg of farmyard manure (FYM) for 1 kg seeds. The main land is prepared by ploughing 2-3 times and adding 25 kg of FYM and bone meal during the second ploughing (2nd week of July). 20-25 days old seedlings are transplanted, putting 2-3 seedlings in a spacing of 10- 12 inch by maintaining a line. Weeding is done after 25 days and 40 days. Watering is dependent on the rain, but the seedlings in the middle land might need watering 2 times. The application of compost and cow urine is recommended during the second weeding and

before flowering. Neem or Brahmastra (a homemade organic pest repellent) are applied two times at interval of three days interval for Stem Borer. Brahmastra is also recommended for Blast. The flowers come after in 60-64 days for IR 64 and after 85-90 days for the others. The seed maturing time is 10 days.

Results of the practice and lessons Learnt

The average number of tillers in normal KPS methods is around 40-45. The harvesting time is between the last week of November and the first week of December. In the case of Sarna, the number of seeds per tiller is around 215, and good quality grain is around 188. The total production of straw in this method is 12 quintal/acre and the total production of rice is 30-32 quintal/acre.

It is observed that it takes at least two to three years for a farmer to enjoy the yield benefits of cultivating a particular crop after adopting a specific practice. In 2014, farmers increased their land under KPS method. Despite the long dry spell, an increase of 10% in the production of paddy was observed in the 2014 rainy season.



Reinventing Madua

Revival of a traditional crop

Category: Production

Promoted by: Pravah, Jharkhand, India, sifs.fhfi@pravahjharkhand.org



Two decades ago, Madua was produced in almost every households of the Sonaraythadi Block of Deoghar. Paddy has now turned into a major staple food here. As irrigation facilities started improving, new tube wells and bore well were constructed. Due to the green revolution, people started to show more interest in cultivating HYV varieties of paddy and maize rather than traditional crop like Madua, Gundli, Kodo etc, to get more return from agriculture. On the other hand, because of the recurring droughts since 2010, farmers in Deoghar have started looking again at the traditional crops. Madua requires only one or two rainfalls during its crop cycle and it can grow well even on waste land. It does not need chemical fertilizer and pesticide, thus reducing cultivation costs.

Implementation of the practice

In 2011, Madua was re-introduced in very few plots through a farmers' club in three villages. It scaled up largely in 2012 and 2013. To transplant Madua, healthy seedlings have to be raised in seed beds. The seeds are sown on a raised bed nursery in the middle of June. After 3-4 weeks, the seedlings are transplanted in the main field. 8-10kg of seeds are required for one hectare land. Before transplanting, the main field is ploughed 3-4 time. At the time of the last ploughing, 100kg FYM per hectare is mixed with the soil. The plant-to-plant distance is 20cm. During the sowing, 30 kg of compost can be applied. During the transplantation, 250 kg of compost, 70 kg of vermicompost and 500 kg of FYM per hectare have to be added. After 25-30 days, a further application of 250 kg/ha of compost is needed. The first weeding is after 15-20 days and the second after 35-40 days; Madua can then be harvested in October with 5-6 Q per acre.

Results of the practice

In 2011, the SIFS team worked with 45 farmers in 3 villages on 1.78 acre land and produced 9 quintals of Madua. Now, about 550 farmers in 32 villages are practicing this. Leveraging this acceptance by the community, the team is now involved with the government to upscale this in the whole Block through Government initiatives. Value addition of Madua (like sweets, grinded powder) was also taken up with support from Birsa Agriculture University (Department for Food and Nutrition) who will help the SIFS team and some selected farmers.



School Gardens

Improving nutrition in schools

Category: Production

Promoted by: Pravah, Deoghar, Jharkhand

The majority of children in India go through underprivileged childhoods starting from birth – with a considerable impact on their later life too. The proportion of underweight children (under 3 years) in India dropped by less than 1% per annum between 1992-93 and 1998-99 (from 52 to 47% according to NFHS I and II); in the following seven years (from 1998-99 and 2005-06) the total reduction has been only of 1% (from 47 to 46%). This is in clear contrast to the target set by the tenth five-year plan (2002-07), which had envisaged a reduction of under nutrition from 47% to 40%. In spite of the enhancement of the supplementary feeding allocation, the numbers presented above clearly show that it is still hard to provide the required 300 kcal nutrition to the children in Integrated Child Development Services (ICDS), as well as Mid Day Meal Scheme (MDMS). Looking at the quality aspect, it is quite evident from many reports that most schools, provide *khichuri* (rice cooked with pulses, and seldom some vegetables) as the cooked meal. Pravah has tried to address this issue by introducing gardens in schools, thus creating opportunities of improved vegetable supplements in the midday meal and creating the scope for an increased importance given to nutrition.



The crops in school garden can be following
Summer and Rainy Season

Long bean, Ridged gourd, Cucumber, Pumpkin, Snake gourd, Indian Spinach, Jungle potato, Sweet potato, Chilli, Okhra, Taro, Turmeric, Ginger, Pigeon Pea, Amaranths, Wild spinach, Yam, Taro, Ash Gourd

Winter Season

Broad bean, Long bean, French Beans, Bottle gourd, Bitter gourd, Beans, Amaranths, Radish, Spinach, Chilli, Coriander, Carrot, Ipomia

Implementation of the practice

Schools, where a garden is planned, do not necessarily need a big open space or a lawn. A garden can also be considered a platform to learn recycling of waste materials (like paper, tiffin waste and waste from the garden itself) through composting and vermicomposting. Gardens can also be a very useful physical activity. In a rural setup, in ICDS centres, primary or high schools, there is usually ample scope to cultivate gardens and supplement midday meals with vegetables, thus bringing a considerable change in the nutrition status of the children. Plants should be selected that:

- give large amount of fruit vegetables (like various types of bean) or leaves (like Ipomia, bitter gourd leaf, pumpkin leaves)
- need less care and water
- are suitable for the local ecology.

Lessons learnt

The implementation of the practice was initially very difficult because of the resistance from the authority, but the mothers of the children studying in the school eventually managed it. Which was also supported strongly by School Management Committee. The gardens now help supplying vegetables for 12-15 days towards MDMS. Children were also enthusiast to initiate their own small garden back home. It also created scope of discussing nutrition related issues in the school, which was only a part of a chapter somewhere left to rote learning.



Using space around households

Looking out for resources

Category: Production

Promoted by: Anando, Chitagong Hill Tracts, Banglades,
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The bottom of most of the tube-wells and taps normally remains dirty as waste water spreads around from it. Similarly, in rural areas the roof and cliff of a house often remain empty and unused in Rural. Space, for a marginal farmer, is often a scarce thing. Anando tries to look in to the planning of a farm and make the most of empty spaces. The bottom of the tube-well can be utilized by transplanting arum sucker and other water tolerant crops. Roofs can be used by creepers; the cliff, with water coming from the roof, can be planted with papaya.



Implementation of the practice

Arum is a popular crop that grows in semi-aquatic environment in most of Bangladesh, except in the saline south-west area. The corms of arum can be used as planting material after removing the mother plant. Leaves should be cut from the sets or suckers at a downward angle, leaving about 40–50 cm of petiole, with up to 5 cm of the corm, and then placed in a dry shady place for 3–5 days for the wounds to cure before the planting. The dried land arum as Dud Kachu (*Xanthosoma violaceurn*), Mann Kachu (*Alocasia macrorrhiza*) etc. can be transplanted little far from the tube well



depositing the hearth-ash for maximum growth. Some farmers also planned a small garden with other various plants, mainly leafy vegetables, near the tube-well. Similarly, pumpkin and bottle gourd are two popular vegetables that can climb up the roof without taking much space in the garden; papaya, can grow on the cliff.

Results and lessons learnt

This practice utilizes empty spaces and unused resources (like waste water) thus promoting a healthier and cleaner environment. The arum and the plants recommended do not need any extra nourishment as they will get it from the natural environment. These technologies are easily replicable and can also be considered as a direct source of nutrition for mothers and children. Around 500 household are currently using these practices.

System of Rice Intensification

Lookout for resources

Category: Production

Promoted by: SPWD, Jharkhand, India, spwdranchi@gmail.com



The productivity of the land is extremely poor and crops are grown mostly under rain fed conditions in dry areas. Low nutrient consumption per hectare is the main cause for low production. The system of rice intensification is a technology where one various principles of best practice of cultivation are incorporated, increasing the yield of nearly 40%.

Implementation of the practice

Generally this method is practiced in all types of land with different slopes. The main requirement is to have a proper drainage system so that the water can be controlled as and when required. 2-3 kg of seeds are used per acre. After the seed treatment, raised beds above five to eight inches are developed. The seed beds are covered with straw after sowing till germination, to avoid losses. 10-13 days old seedlings are uprooted with soil and transplanted in the main field. Bio dung, cow dung, mustard/neem oil cake and liquid manure (used 5 times at 10 days interval from the first application) are used to prepare the main field. The seedlings removed from the nursery bed are planted in the main field, one seedling in one hill at a spacing of 25 x 25 cms. Special attention is given to ensure that the root zone does not get disturbed much. The first weeding should be done with Cono-weeder 15 days after transplanting and after having applied liquid manure. Weeding two more times is required.

Results of the practice

SRI method helped farmers in reducing cultivation costs in terms of input cost reduction. It also increased the yield from 12.5-13 quintal to 25.5 -27 quintal per acre. It gradually gives farmers the strength of switching over to organic farming from inorganic. Reduction in the use of pesticide also observed as using this method, crops are more resilient to the effect of insects and pests. Currently 1000 households in 25 villages are practicing the SRI technique of cultivation in paddy, upland crops and in vegetables, resulting in an increase in the overall production.

Lessons learnt

This method has the capability of withstanding severe droughts and rainfall breaks. During 2013, even after the rain break with late transplantation, there has been an increase in the yield compared to the crops transplanted with the traditional method.



Mixed cultivation on fallow lands

Fallow lands become productive

Category: Production

Promoted by: DRCS, West Bengal, India, drscsnew@gmail.com



Dry land areas often have more fallow land than cultivable. Fallow lands are mostly used for grazing. Shortage of biomass for food and for fodder and fuel is an issue for most of the farmers. Fallow lands are thus used to address that. Fallow lands are often undulated, so it is important to use suitable soil-water conservation methods like bunding, semicircular bund, channels, small ditches etc. Cultivation of the fallow land by a group of farmers is often practiced by DRCS in the project villages, providing extra biomass for the regular need and being very well integrated with the production system.

Implementation of the practice

1/3 acre of land needs about 4 bullock carts of farm yard manure after an initial ploughing. A fence is made with roselle; pigeon peas and maize are planted inside the fence in rows. Yard long bean, cluster beans etc can be cultivated between rows of these two. The distance between two roselle plants should be 8 inches, between two pigeon pea plants 1 ft and between maize plants 6 inches. Where beans are cultivated, the distance between two lines of planting should be 3 ft. Many other drought tolerant vegetables can also be planted with beans.

Results of the practice and lessons learnt

Fallow land cultivation is a very low cost intervention as compared to the land being more degraded. After few years, the land can be completely regained as a cultivable land; legumes are the main pillars of such intervention. The calculation for a season in one of such plots shows that cost for a 1/3rd acre is roughly 1500 INR (including labour); this can generate crops of about 8000 INR with pigeon peas for the next 2-3 years. It also produces fuel and fodder, adds nitrogen and carbon to the soil and controls soil erosion.



Micro-enterprises

Adding value to the primary produce

Category: Post Harvest

Promoted by: DRCSC, West Bengal, India, drcschew@gmail.com



Undulating terrains and shallow topsoil, high temperatures and consequent evaporation losses along with long dry seasons and periodic dry spells within rainy seasons are part of the problem dry areas face. Natural forests and water bodies, which play an important role as a source of fodder-firewood and uncultivated food, have decreased due to many reasons. There are gaps in the livelihood cycle of the community, which used to be filled up by Non-Timber Forest Products (NTFP) based livelihood. Some of these, such as rope making, basket weaving, palm sugar making, mat making etc, have gradually disappeared as sources of livelihood, because of either negligence, insufficient support, lack of appropriate technology or a combination of all these. DRCSC tried to revive some of these practices.

Implementation of the practice

The member of the women farmers group, who were also involved in farming, had planned to initiate a group business of puffed rice making from the rice they grew in the field. However, they initially failed, as the traditional method of puffed rice making consumes considerable time and fuel. They later they applied for a puffed rice maker machine to DRCSC in 2012. The machine, developed by IIT, is low cost and energy efficient. Until now, from the income of the group by selling puffed rice, 4600 INR have been distributed to each of the 12 members of the women farmers group. They never struggled to find a suitable market as they could sell their products

within the village, in every household and in the market nearby. Now they have diversified their production to include popcorn and roasted chickpea.

Date palm is a wild tree in Bankura, which does not produce good quality palm but provides high valued ate palm juice and jaggery. As Bankura relies mostly on rain fed agriculture and has a considerable gap in the livelihood calendar, 12 members were introduced to jiggery making during the lean season. In 2013, they had 150 trees and produced 35Q of jiggery. About 8750 INR have been distributed to each of the members from the net income. In 2014, they have planned to use 300 trees and expand their work to three villages.

Lesson Learnt

In addition to these, other examples of activities that can produce extra income without migrating from the village leaving one's family are oil extraction from Neem, rope making from grass, basket



weaving, palmyra palm jaggery etc. These can integrate very well into the gap of their livelihood cycle, which is mostly rain fed with little work in winter and a fallow in summer.

Rice parboiler

A simple technology that makes rice parboiling easy and less labour intensive

Category: Post Harvest

*Promoted by: CWS and Avibyakti Foundation, Jharkhand, India,
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Rice parboiling is a common practice in Eastern India to make the rice edible for regular consumption. The process involves steaming the paddy in an iron tray/pan for one and half hour with an average batch size of 1800 kg. The steamed paddy is further dried in the shade and sent to the rice hulling machine to get the final produce. The steaming process is labour intensive as it requires constant handling to avoid the burning of the paddy and every time the hot and heavy pan has to be put down, thus requiring at least two persons; the entire process is normally done by the women of the family. 'Rice parboiler' is an innovation by the Abhivyakti Foundation, which ensures safe and drudgery-free handling of the paddy steaming process and minimizes production losses as well.

Implementation of the practice

The design was developed on the basis of the convection heating process. A 200 litre drum is used for this purpose; The drum is divided into two vertical chambers through a sieve net of 1 foot height from the bottom. The lower portion is used to store water as a boiler to steam the paddy; the steam rises

and cooks the paddy uniformly. Just above the sieve, there is a door to collect the paddy after steaming. The first pilot unit was built and a trial run was conducted in Madanpur village with two farmers. After their feedback, design modifications were made in the paddy drum, adding one additional sheet layer at bottom for extra life.

Results of the practice

The paddy steaming unit 'Devipur Usra' rice parboiler has various benefits. Similarly to other methods, a farmer can steam 1800 kg paddy in a single batch but in this case only one person is required to handle the process. In addition, there is no hassle of turning the paddy again and again, thus largely reducing the hardest part of the work, as it can also be safely poured out from the exit door. As in the conventional method, the process is completed in one and half hour; however, the subsequent batch of steaming takes 15 to 20 minutes less. The fuel consumption is comparatively reduced, as this method requires 50% of what is needed in the traditional system; twigs, straw and leaves can be used as fuel too. The farmers are happy with this unit since the loss of rice grain, very high in the conventional method due to uneven heating, is reduced of 50%. During the milling period, previously women had to chaff the rice from the husk twice; the drum made this meticulous process unnecessary.

So far the piloting was done with 26 farmers; 40 famers have replicated it on their own.



Zero energy cool chamber

A simple technology that lowers the temperature of a chamber to store surplus vegetables

Category: Post Harvest

*Promoted by: CWS and Avibyakti Foundation, Jharkhand, India,
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Small and marginal farmers who come to sell their surplus products at the local *hatia* (market), often fail to sell their entire produce at a good price as they do not have any access to cool storing facilities to preserve their vegetables for the next market; this forces them to give away all their products at the end of the day, at a lower price. The Zero Energy Cool Chamber, an already prototyped technology was identified to address this situation. It is a simple design of double lined brick tank with moist sand filled in the gap that helps to store about 60 to 80 Kg vegetables, fruit etc without weight loss for 2 to 3 days. The Zero Energy Cool Chamber was conceived to solve this problem and, with the simple design of a double lined brick tank with moist sand filled in the gap, it helps to store about 60 to 80 Kg of vegetables, fruit etc without any weight loss for 2 to 3 days.

Implementation of the practice

A zero energy cool chamber is an on-farm storage chamber working on the principle of evaporation reducing the temperature inside it. Cool chambers can be constructed easily anywhere with locally available materials like bricks, sand, bamboo, khaskhas/straw and, gunny bags with a source of water. It is a double walled chamber, filled with sand in between the walls. The sand are always kept moist to reduce the temperature inside the chamber. This chamber can keep the temperature 10-15°C cooler than the outside temperature and maintain about 90% Relative Humidity. Farmers

can easily construct these chambers nearer to their houses to store their produce for a few days after the harvest, before sending it to the market. The unit cost of this is around 6000 INR (in 2013).

Results of the practice

Now the farmers are able to store their unsold vegetables. This has increased their enthusiasm as they earlier were often worried about not getting enough return on their agricultural produces. On an average, this model is helping farmers to save about Rs. 800 extra for a 5 to 8 months vegetable production period, increasing the shelf life and retaining weight and freshness of the produce. The benefits would further enhance as the farmers have a regular surplus production period.

Comparative storage life of fruits and vegetables

Crop	Period	At Room temperature		Zero energy cool chamber	
		Fresh days	Weight loss%	Fresh days	Weight loss%
Potato	Jan - Mar	48	15	90	5
Tomato	Dec - Apr	4	19	15	5
Spinach	Nov - Apr	1	45	2	12
Amaranth	Oct - May	1	42	3	14
Methi	Jan - Mar	2	18	7	10
Okra	June - Sept	1	15	5	5
Papaya	Nov - Mar	3	18	8	5
Brinjal	Oct - Feb	2	18	4	5
Cauliflower	Dec - Feb	1	16	4	5
Cabbage	Dec - Feb	1	25	4	8
Beans	Nov - Mar	2	20	5	5

Future possibilities

Though the model has been appreciated by many farmers, the practice is yet to be replicated on its own by individual farmers as the cost implications are relatively high. The cement binding of the tank is costly and it requires skilled mechanics too. We are currently trying to develop a model using clay mortar that can reduce cement and labour expenditures and further reduce the cost by Rs. 800 to 1000.



Farm Planning













Planning of the farm using all resources around

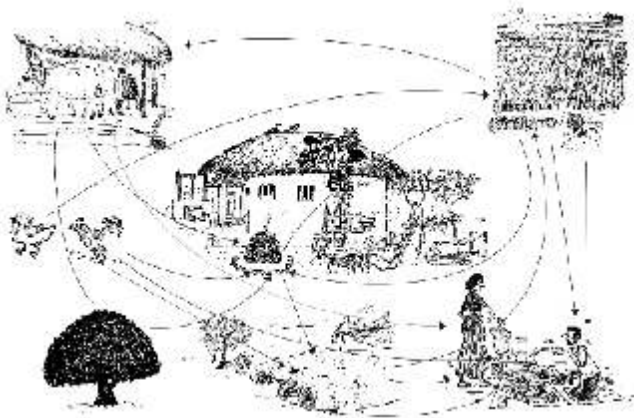
Category: Process of Integrated Farming

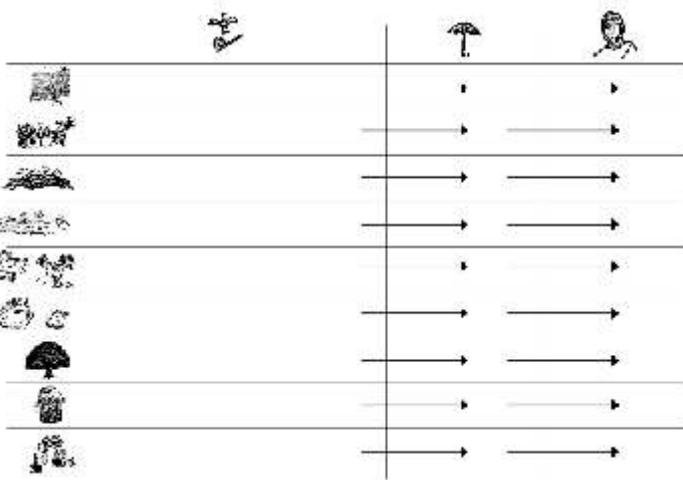
Promoted by: Welthungerhilfe with all its partner organization,
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Small and marginal farmers, the majority of the third world's population, normally own less than an acre of land, inclusive of a field and homestead, few livestock and a pond; they rarely have or can borrow more than 250 dollars per acre to invest, nor do they earn a significant profit. The Sustainable Integrated Farming Systems approach is meant for them, as it looks into crop, poultry, livestock, fishery and orchards in a holistic manner and capitalizes on the complementarity between them, to increase the overall biomass production of a farm. Integrated farming is an improved version of mixed cropping, where not only crops but various types of plants, animals, birds, fish and other aquatic flora and fauna are utilized for production. These are combined in such a way and proportion that each element helps the other; the waste of one is recycled as resource for the other. It is thus very crucial to look into each and every resource farmers have and accordingly plan, as they can't afford any wastage in the production cycle.

Methodology





The steps are as follows:

1. Develop a transect map together with the entire farmers' group, to understand the resources, scope and possibilities of IFS including NRM in the village. .
2. Highlight, with the entire farmers' group, the various sources of income/production/biomass, to get an idea of the sources of income and production in a generic way. This step should be linked with step 1.
3. Develop a seasonal calendar, together with the whole group, to show the of scarcity of food, fodder, firewood, drinking and irrigation water, cash and work. The seasonality of temperature, rainfall and disasters should be included too. This will help the farmers gain an understanding of the overall situation.
4. Develop a seasonal calendar, with individual farmers, showing crop in lowland/ upland/garden, marketable products, wild food items and value addition. This will help the understand the individual production system.
5. List out all the available resources of a farmer. This step should be linked to step 2.
6. Prepare a resource flow diagram, to understand the biomass flow of various subsystems that a farmer pointed out as resources. This is done with a farmer to draw a production system he would dream of in the future and should be linked with step 5.
7. Develop a planning matrix that shows the plan for each subsystem, keeping the resource flow diagram as ultimate target. This should be linked with steps 3, 4, 5 and 6.

Lesson Learnt

In the process, farmers become analytic in identifying their resources, strengths and stresses and learn to plan accordingly. Up to now, this methodology has been tried out, with slight variations, in all the project locations in more than 3000 farms. It was observed that farmers tend to talk more about technical solutions and problems rather than going deeply into the planning process. However, those who did realized and acknowledged that planning helps in identifying unused resources and in looking at the farm from a holistic perspective. The first times it requires a considerable amount of time that however reduces gradually when farmers help others in planning their farm.

Community monitoring

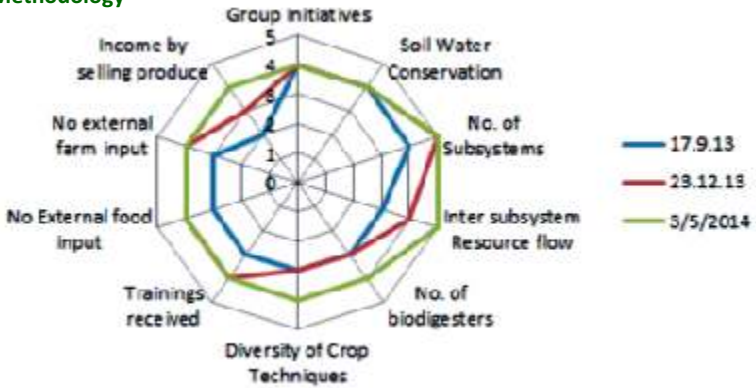
A self-evaluation method based on wheel/web diagram

Category: Process of Integrated Farming

Promoted by: Welthungerhilfe with all its partner organization,
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Community monitoring is an already established way of tracking progress of an action and do mid-term corrections. In addition, setting a target is always helpful to ensure one keeps going in the right direction. Keeping this in mind, a tool based on the wheel diagram was developed to help farmers to set their own target and monitor it. *The Wheel* helps in visualizing and comparing multiple ratings/scoring. The technique is useful when one needs to organize information, compare the views of different parties, assess the same element or situation at different points in time, identify priorities or expectations, and evaluate the process of learning over time.

Methodology



Ten criteria were initially developed for a successful farmer's group and then tested with few others. Taking into account their feedback, the following criteria were then finalized.

1. **Group/cooperative activities:** it describes the extent to which farmers are active in groups, cluster groups, common activities and joint actions like farming in common land etc. In case of a group, the criteria refers to the health of the whole group.
2. **Soil Water conservation methods adopted:** it illustrates how SW conservation methods are integrated in the farm, from field bunds, to rainwater harvesting, mulching, using compost, semi-circular bund, zero tillage farming, diamond bed, double digging bed, pitcher irrigation, circle bed etc..
3. **Number of subsystems:** it indicates the number of subsystems (Biogas, Poultry, Livestock, Tree, Crop, Aquaculture) possessed by the farm.
4. **The inter sub systems resource flow:** it shows the number of linkages (indicating integration) between the various subsystems
5. **Number of biogas plant:** from Biogas Plant, to Vermicompost Pit, Compost Pit, Liquid Manure, Farm Yard Manure, green manure etc..
6. **Diversity of crop and cropping techniques:** it grades the farm should in terms of the diversified crop elements present. Crops may include fruit type, leguminous, leafy vegetables, cereals, medicinal herb, tuber crop, spices etc. Cropping techniques include mixed cropping, intercropping, crop rotation, relay cropping etc.
7. **Training received:** it lists the different types of training a farmer undertook. SIFS is about multiple skills - a yearlong training approach was adopted with FFS. The skills broadly are: 1) Analysing Stress, Livelihood cycle, Resources, Capacities and correspondingly planning an own farm model; 2) Various soil nutrient management methods; 3) Water management methods 4) Horticultural component in the homestead and field; 5) Backyard poultry management including feed; 6) Small livestock management including fodder; 7) Pest/disease management of crops/livestock throughout the growth stages; 8) Soft skills on group development and value chain
8. **No of external food input:** it quantifies the external food input (vegetables, proteins – everything that needs for a balanced diet) bought from the market.
9. **No of external farm input:** it quantifies external farm inputs (including seed) bought from the market.
10. **Income by selling product:** it measures 'how far cash need is met from market linkage income' – distress selling is not taken into consideration.

For each criteria, farmers are supposed to give a score from 0 to 5 (low to very high) and add it to the web in the diagram. The same will be repeated in 6 months.

Lesson learnt

It was observed that there was a lot of discussion and debate during the scoring part, which is the most important part of the exercise. Many shortcomings and successes were pinpointed as reasons behind that scoring, thus helping in planning for the future course of action. This activity also give a direction to a regular monthly meeting. Keeping the same method, the criteria may be changed by the community for other projects.



Farmer to farmer Learning

A learner centric environment for farmers

Category: Process of Integrated Farming

*Promoted by: Welthungerhilfe with all its partner organization,
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It was often noticed that training sessions by an external trainer do not produce the expected level of learning. The main reasons observed were the lack of same energy level of the trainee and the trainer, less practical hands on work and the lack of recognition of the trainees' potential. As IFS talks about local knowledge and the farm design is very local specific, it is important to bring in collective knowledge. The role of the trainer is thus considered more as a facilitator. Experience has shown that when a farmer trains other farmers, all the pre-conditions of a participatory training are met – both the trainer and the trainee are at the same level, trainings are more practical and the environment of collective knowledge building is created. Farmer to farmer learning is a system that values the ecological and financial needs of the farmer first and foremost, and where the farmer plays a central role in the entire process.



Methodology

In the SIFS project, a curriculum for SIFS farmers was developed with i) farm planning methodology; ii) technical skill building on crop management, soil management, water management, farm design, pest management, livestock management and energy; and iii) community monitoring; all this was put on a Flip Chart, which is then used by a farmer trainer. A farmer trainer is selected from a farmers' group, who is willing to do trials of new technologies in his own field, has good communication leadership skills. The farmer is trained by the facilitator on the same curriculum and then imparts the

same training to the other members of the farmers' group, using his own field as demonstration field. Though there are specific sessions to be followed, it is the farmers' group that decides on the date, timing, venue, specific topic of discussion and sequence of topics.

Lesson Learnt

The success of this approach is based on the integration of the principles of learning by doing, farmer-led learning activities, problem-posing and problem-solving and working together. Farmers find the training relevant because the farmer's field is the learning ground. It also creates an ownership on the entire idea and ensures sustainability. All the farmers of SIFS project are now trained, as the project managed to create around about 150 farmer trainers.

