

Climate Emergency Climate resilient natural farming

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Finance Minister Nirmala Sitaram had announced in this budget session that the government will promote zero budget natural farming to reduce farmers' production cost and hence, boost their income. Subhash Palekar, an Indian agriculturist who coined and practiced zero budget natural farming was asked by 6 states to train farmers on this technique. In Andhra Pradesh, Rythu Sadhikara Samstha (RYSS), an organization set up by the AP government helps farmers in ZBNF's implementation. This project started with a 100 crore budget grant by Azim Premji Philanthropic Initiative. Natural Subsistence Farming Methods are said to be more resilient to climate changes. They also have more nutritional yields. Zero budget natural farming enables farmers to shift out of chemical-based agriculture to low-cost non chemical farming. In this method of farming, many crops will be grown instead of just one in one harvesting period with no chemical inputs. I am Vaishali, a reporter at Suno India. I recently participated in a travel workshop organized by the Center for Sustainable Agriculture. In this episode of Climate Emergency, I reached out to Ramprasad Sana, an agricultural scientist who works as a project coordinator for the Center for Sustainable Agriculture to know more about zero budget farming. He has worked with private institutions and NGOs, and was also an agricultural officer in Andhra Pradesh State Department of Agriculture.

"Climate Resilience is core to natural farming because in India, 60 % of the farmers are in rain-fed regions and are most affected due to climate change. Climate change should not have an effect on the economy of farmers. So, support is needed for the farmers on several fronts like access to water, access to the seed system, access to other supports like market evaluation and crop management."

Vaishali (Host) : According to experts, this program develops models to aid farmers in rainfed regions with soil and water conservation. For a farmer, irrigation is a key component that ensures a good crop. Where he relies on rain, uneven and unpredicted rain can lead to leaving his land fallow or changing the crops. How will this kind of farming support farmers? How do you make sure that farmers are safe against any of the external factors, and that the farming will be climate resilient?

Ramprasad Sana (Guest): Previously, the watersheds were macro-watersheds. They were dependent on the bigger zones or larger areas where the water is collected into a river. For instance, in Rayalaseema region, which is mostly watershed region, several programs implemented by the water conservation department include big check dams built in upland regions and soil conservation. In the valley parts, farm ponds and percolation tanks were

built, where different kinds of agriculture or tree-based farming systems were built. Most of them are either not adapted by farmers or not useful in terms of functionality due to technical reasons. Nowadays, focus is on micro-watersheds and systems that are practically adaptable to farmers. Contour bunding and contour ploughing are done and developed by the watershed system. Most of them aren't practiced by farmers regularly. Though water was harvested in initial years, later, farmers did not care about it and it was not very effective. They were back to square one. Now, with the emphasis being given to watershed development, the focus shifted to micro-watershed level development and are working from bottom-up, like, based on the farmer's understanding and his flexibility of doing the operations on a yearly basis. The rate of success is much better now because when it rains, the farmer collects water and stores it to be used later to extend their crop or have a second crop. In that way, farmers will be resilient on the waterfront.

Host: Drought tolerant varieties like red gram and many types of millets are also being pushed to deal with delayed monsoons and dry spells. They can be harvested in a shorter time and won't need a lot of water. What other differences will these types of croppings have?

Guest: The red gram is widely spaced. If in an acre there are few rows of red gram and multiple rows of millets between the red gram rows, that is called Navdanya system. It is traditionally practised in rayalaseema. Groundnut is found to be much tolerant to drought situations. When these crops are sown in the field and there is a delayed monsoon, one supplemental irrigation for germination and another for supporting the young crop will be in place. When it rains, farmers can catch up with the monsoon and don't lose the crop season. There is a model developed and tried in the last couple of years in Rayalaseema region, called row water sowing method. Though monsoon is delayed, the sowing is done without any rain. We sow a row crop with wider space, apply mulch material over the row and give one good irrigation along the row. That it takes 1/10th of the water required for flood irrigation. Here we are also covering the row with mulch material which also helps in stopping the evaporation. This will help in the successful germination of crops.

Host: Mulch can be a living layer of crops grown throughout the year or other materials which cover the soil without any exposure to harsh sun or rain. It helps build a soil profile. Mulch is covered between widely spaced rows. Other drought resistant seeds like millets and pulses are broadcasted here. So when it rains, a crop is there already. The seeds which were earlier sown will germinate then.

Guest: Farmers have an insurance of a main crop which is irrigated properly. Even if it rains late in the season, the farmer can get something. This is one way of doing it. There is another way which can be done without the support of water. It is called pre-monsoon dry sowing. Drought resistant variety seeds like millets, pulses and some oils seeds are mixed and broadcasted in the field and are covered with mulch. No irrigation is given. This is usually done in the last week of may. We expect rains in the first week of June. Even if it

rains late, the seeds remain in the soil and there is no harm in that. Another method is seed pelletization. We soil coat the seeds into pellets to help in better germination, combined with simple broadcasting. When it rains, the seed will germinate and the soil moisture will be maintained by mulch material and the dhana jeevamrutham.

Host: So, this also covers the seed aspect?

Guest: Most of the seed systems in the country are developed and polarised towards irrigated situations and chemically supported situations. The seed system in dry land parts are mostly falling apart because there are no support systems for them. In this natural farming system, the aim is at making the seed resilient to climate change scenarios. Locally adapted seeds are preferred over the improved or hybrid seeds released from a research station. Improved varieties and hybrids respond more to chemical inputs and irrigation but these drought tolerant seeds can perform above average in low nutrient soil conditions which are very common across these dry regions. Climate change is mostly characterized by unpredictable rainfall or temperature situations. Requirements vary in each region. First, we collect different types of seeds available in that area and their passport data. We will now understand the diversity of the seeds and their adaptability to particular regions. Most farmers don't have knowledge about these seeds. We need to put these seeds through smaller trials. These trials are monitored or evaluated by the farmers themselves. At the end of the season, we'll conclude along with the farmers, which seeds are suitable for which village and their requirements. We call this participatory seed varietal trial. This is done for most important crops in the village. These seeds will be kept at a seed bank-level. Seed banks are mostly aimed at the conservation of seeds. If the same seed is required by a large number of farmers, the seed must be multiplied and made available. For that, we are graduating the seed banks basis system into biodiversity block and seed multiplication system. At a cluster level, we are maintaining a 5 acre biodiversity block which covers more than 100 varieties of seeds that are available and brought in for evaluation of farmers. These seeds grow in a season, and farmers come and evaluate them. At the end of the season, these seeds are purchased by the local community organization. These organisations will multiply in next season and make it available to farmers based on demand. There is a model particularly used groundnut, which is called Man Vitra Kendra. A local organisation will collect subsidies from the government and distribute it to farmers through their people's organisation. Department will purchase seed from farmers and again sell it to the group with subsidy. The subsidy amount will be going to the cooperative. The community is benefitted in 2 ways. They get the good seed from the farmers and also the subsidy. Climate resilience is brought in through seed banks, biodiversity blocks and Man Vitra Kendras.

Host: When talking about the soil, you said that you will be making the soil quality and health better and that even if the land is fallow, you will still be able to deal with it. How are you achieving that?

Guest: Soil fertility management is core to natural farming. If the soil is full of life, then it can give a good crop. When soil is barren or kept fallow or exposed to the vagaries of the climate, there is a little chance of organic matter and microbial activity in the soil. That kind of soil takes a little time to come to a level where it can support a healthy crop. Soil fertility improvement requires 2-3 levels of treatments. It takes little also. In this the first step is soil conservation. Top soil is the richest soil in terms of organic matter, microbial activities and nutrients. When it is exposed to vagaries, it is lost to some extent. So, the first step is to control loss of topsoil.

Host: Building farm bunds or creating trenches will also stop the fast flow of rainwater when it rains and will stop the fierce of strong winds during hot periods to save the soil from drying up. Apart from these soil management activities, how do you ensure that the soil is enriched with good nutrient content or absorption?

Guest: Through proper crop management and agronomy, the soil should be amended and enriched with proper organic matter to increase the microbial activity. The microbial preparations like dhan jeevamrutham and dhava jeevamrutham are full of microbes that help in increasing microbial activities. This will require little moisture in the soil. Mulch is needed to retain the moisture. All the physical, chemical and biological characteristics of the soil like depth of soil, the texture of the soil, pH, etc. can handle a few crop varieties. For example, clayey soil is most suitable for cotton, vegetables require soils with more organic matter and loose structure. Crops like red grams, millets, and pulses can grow in soil which is low in nutrition and highly mineral structure with low organic material content. Crop choice should be based on your soil, not based on your market.

Host: Most of your focus and work is on the drier land, right?

Guest: There is an emphasis, time spent, people are employed and practices are made better even in irrigated parts of the state because Andhra Pradesh is a long coastal belt. Godavari and Krishna rivers irrigate some districts which have very rich soil. Main problem there for farmers is salinization. There's every chance that the yield will come down in the future. The water bodies are contaminated by high levels of nitrogen fertilizers. Highly chemical laden foods are not good for health. The emphasis there is on reducing chemicals or stopping chemicals (if possible) and increasing organic matter in the soil so that the salinization is stopped. In paddy cultivation, SRI method is low water and input intensive. This system of rice intensification has been advocated for over a decade now. It requires 1/10th of seeds, 20% of water and new techniques like weed removal and organic manner of cultivation. Otherwise, it is a little difficult for the farmer to come to terms with this system culturally. The yield levels are higher than the conventional systems. Paddy is cultivated as a monocrop. Several types of vegetables are advised to be cultivated in the field bunds. This is possible when the bunds are bigger than conventional. This gives the scope for plant diversity and is helpful in controlling the pests.

Host: The zero budget natural farming promotes multilayered poly cropping method instead of one crop which is of same height and layer chosen by the farmer. Natural farming requires a diversity of living beings, both on and below the ground like microbes, that are said to be made possible by having different layers of plants. Can you tell us what else the polycropping method is good for and how it is done?

Guest: If a farmer wants to take a grain crop like finger millet or foxtail millet, he should choose a couple of crops with dichotomies like pulse crops or oilseed crops. These two are different types of crops, in terms of below the soil structure like the root system. One is having a fibrous root system, the other is having a tap root system. Both will take nutrients from different levels and different depths. Above the soil, they will grow at different heights and different crop canopy. This will help utilize the rhizosphere and atmosphere effectively. Multilayer cropping system is for long term sustainable farming. When you go for a tree-based farming system, the initial investment should be supported by the government. Once trees are supported for an initial couple of years, the need to be taken care of comes down. The space between these trees should be utilized for annual cropping, which will be the regular income generators for the farmers. In utilising different depths of the soil and bringing up minerals for the crops, a whole ecosystem of insects, birds and other animals is supported. They bring about the environmental balance and prevent big pest outbreaks. In the conventional farming systems, most expenses are incurred for crop, pest, disease and weed management. These can be covered in multiple cropping systems, along with higher productivity. If you look at the type of crops chosen, the lumen requirement varies for each crop. The lumen is light intensity. When you layer the crops, the top layer crop is a high light intensity requirement crop. The next layer requires little shade and light. Bottom layer will be having better relative humidity because of trees around.

Host: When we change the kind of crops that are being produced, it also changes the way we consume, right? That will also impact the export and the way we eat, right?

Guest: If you go for monocropping, tomatoes and onion will give good income for farmers, depending on the market. If the market is flooded with produce, the farmer is at a loss. With multiple cropping systems, prices of the crops are averaged across. Farmers will be more economically sustainable than while practicing monocropping.

Host: We have a chemical intensive farming system as the normal. What are the major environmental impacts that need to be remedied because of this?

Guest: Agrochemicals are the most damaging inputs to the ecosystem. High fertilizer use has made soil saline, making them harder. The soil structure, microbial activity and diversity have come down. If you look at nutrient utilization from the soil, most nutrients held within soil can't be taken up by plants directly. Carbon, hydrogen, nitrogen and oxygen are obtained by plants from the atmosphere. They are not all available in the soil. Carbon, nitrogen and oxygen are there in the air. Nitrogen is in the atmosphere but it is deposited in the soil through rain and then taken up by plants. Majority of the elements should be cooked by soil microbes and then they will make it available for plants. When the microbes

are less, readymade solutions are supplied to plants, part of which are consumed by plants. When you apply urea, 90% of chemicals applied in the soil is lost through flowing water, evaporation and leeching, and only 10 % of chemicals are utilized. These chemicals end up making the greenhouse gas or pollute the air, or polluting water bodies by making it more poisonous to plants in water bodies and killing the fishes.

Host: Speaking of agro-chemicals, insecticides and fungicides play a major part. They are said to be highly toxic and more often, they affect our nervous system, especially of those who are directly exposed to its spraying.

Guest: When they are sprayed, less than 10% lodges on the plant and is absorbed. 90% of it is going into the air or soil or water body or on the person who is spraying. When these products are used in vegetables harvested in a short cycle, there are a lot of deposits of these chemicals on the surface and are absorbed into vegetables. Let's look at the period it takes for a chemical to not be effective when human beings consume the vegetable. For example, the life of monocrotophos is 30 days. Once you spray the chemical, you should harvest the vegetable after 30 days. Vegetables like bhindi, brinjal, or tomato will be harvested on alternate days or alternate 3 days cycle. When you spray chemicals like monocrotophos or cypermethrin or permethrin, the deposits of chemicals will be lying for many days. These vegetables are consumed on a fresh vegetable basis and the chemicals will end up in our bodies. These are very harmful to humans and animals.

Host: I also heard that in climate resilient natural farming, when a farmer goes for multiple cropping systems, the need for pest control mechanisms is reduced a lot because there is a diversity of plants and insects. How is that so?

Guest: Some insects will feed upon the plants. Many are harmful, some are beneficial and some are neutral. When multiple cropping systems are practiced, there is always a pull and push mechanism. Some insects cannot proliferate so much and they cannot reach an outbreak kind of situation in multiple cropping systems. For example, if marigold is grown in between roses, it emits a strong smell. This is attractive for many beneficial insects and this will also repel many insects. This will act as a pull mechanism for beneficial insects and push for harmful insects. This kind of balance exists in nature and you can bring that balance to your crop system if you go for multi-cropping. Even in an organic method of pest control, you need not apply neemastram or agnastram or brahmastram because insects are much dependent on climate systems. The climate is also a factor for their growth and Some climatic factors will be favorable for insects. A long cloudy period will favour larval insect infestations. Continuous rains will favour acid infestations.

Host: That is like a pest predator mechanism. But what when then things get out of hand for some reason?

Guest: In any case, if one pest or a couple of pests are dominating, and the situation gets out of control, farmers can always go for neem-based sprayable preparation, or chili garlic preparations or strong organic preparations like brahmastram and agnastram.

Host: All these are the kinds of proposals that you made and also help with implementing. From the center of the organisation point of view, what are the policy level pushes that you get for natural farming. Where does the policy implementation stand?

Guest: A social organisation or farmer level organization can support in developing a model and taking it to a couple of ecological systems, to try whether the model is suitable there. When we try 10 models, 6-8 models might be suitable for a particular place. These models are tried in farmers fields. These models are kept as demonstration sites. Farmers from neighbouring villages are brought into these spots to understand and adapt in their fields. This is being implemented across Vijayanagaram, Kadapa, Kurnool and Anantapur. In these places, we have requested the agencies, which are supporting natural farming to support developing resource villages there. These resource/ model villages will have demonstrations of suitable models and will serve as knowledge centers. They can interact with the farmers who have practised the model. This project believes farmer to farmer communication. This structure is supported by the funding agencies. Azim Premji philanthropic initiative is the core funding agency.

Host: Where do we find a link between the government supporting this program and you implementing this program on the ground?

Guest: This program started with non-pesticidal management to stop the chemicals applied on the crops. After 20 years, a second step is taken in the form of natural farming to bring a totally organic way of cultivation. A step ahead to that is natural farming to reduce external input utilization and for minimal tillage, making long term sustainability by incorporating tree species, animal husbandry and other livelihood operations integrated into the system. For such a robust system, which thinks about bringing in all the agricultural, livelihood and animal husbandry part into the community, there is a requirement of support from various departments and bigger funding support to make it holistic and successful. Currently, for natural farming, support is drawn from central government funds of RKVY and PMKVY programs and the state government is supporting this program through the deployment of agricultural departmental personnel in each district, asst. director and mandal agricultural officers in designated clusters. RYSS (Rythu Sadhikara Samstha), the organisation which is spearheading this program is trying to utilize RKVY and PMKVY funds, to bring field level staff to support farmers in training and in building models that are locally specific for farmers, are locally successful and building the seed systems. Currently, there is much more need for funding support to scale this up to saturation. Funding support is required at each and every aspect because this is only possible when there are support systems for each of these areas like soil and water conservation, seed systems, infrastructure for grading, sorting, value addition, and in form of other inputs like labour, infrastructure to store and transport.

Host: Since we talk about being natural or climate-resilient, all this comes in terms of agriculture and farming practices. Is there anything being done on the side of energy

consumed on operations that are required of these people on the farms? There are renewable sources of energy like solar energy. Are they being picked up as well? That makes it even less polluting and more sustainable. Is there anything being done on the energy side of it?

Guest: There are small initiatives. In essence, the natural farming system is a low energy requiring system because all the materials are recycled within the system. By-product or waste product of one system is the input for another system. For example, the plant material of the crop residues at the end of the cropping season after taking out the grain can be used as mulch material, fodder or firewood for the farms. When it comes to water pumps to supply water, to drip basis systems or lifting water from nearby canal, or from farm ponds, there is always a need for energy. We are taking solar based pump or solar based lighting systems for completely isolated villages, in resource villages. Tata trust in collaboration with Celko India has come up to work with CSA in our resource villages in helping us support the farmers and setting up their solar water pumps. In a mango growing area, extracting pulp of mango and making mango jelly is one value addition. We are setting up renewable energy supported systems in our resource villages. One is being set up in mango processing or vegetable drying. In another, we are thinking about setting up a solar supported cotton value chain. When it comes to the valuation part, there is a need for energy. It can be renewable energy. Linking this with the central government Kusum guideline, we might even go to the extent of building solar farms.

Host: We have spoken about energy and the solar aspect. Are there any other similar aspects?

Guest: Conventional agriculture brought in a certain level of comfort to farmers. In practice, farmers bring in several off-the shelf products to be used. Drudgery has come down with the conventional method. When we go for natural farming, there is a little drudgery. We want to introduce some innovations that can reduce drudgery and save time for women, so that they can have more time for family and nutrition. We are trying to bring innovations like bio preparations like jeevamrutham or panchagavya in big volumes or making them in a smaller span of time. Preparation of botanical sprays like neemastam can be used as dry products so that farmers can use it and store them for later. The main principle behind the preparations is soil microbes. They are majorly a part of an animal gut. Ruminant animals have a lot of diversity in their gut, and that helps in converting organic matter into biogas and compost. These microbes are useful for nutrients and minerals in the soil to convert them into a form, for plants to utilize better. These microbes are cultured and then fermented in the form of solutions. These fermenters can be called bio reactors. They will multiply thousands of microbes into millions. When the microbial activity is more in the soil, there is a nutrient availability for our plant and crops will give you a much better yield.

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