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+91 99405 72462



+9163819 07438



ijmrsetm@gmail.com



www.ijmrsetm.com



Harmful Effects of Fertilizer on the Soil of Banswara District of Rajasthan

Anil Kumar

Assistant Professor, Dept. of Chemistry, Shri Govind Guru Government College Banswara, Rajasthan, India

ABSTRACT: Fertilizers are substances used to add nutrients to the soil to promote soil fertility and increase plant growth. Today fertilizer has become essential to modern agriculture to feed the growing population. Use of fertilizers, especially, the chemical fertilizers has brought in blessings on humanity, which helped contain hunger and death in different corners of the world. Though chemical fertilizers increase crop production; their overuse has hardened the soil, decreased fertility, strengthened pesticides, polluted air and water, and released greenhouse gases, thereby bringing hazards to human health and environment as well. It has already been proved how chemical fertilizers pose serious challenges to the balanced and sustainable growth. Accordingly, scientists and researchers are seen arguing in favor of organic fertilizers as the best solution to avoid soil pollution and many other threats to environment and life caused by overuse of chemical fertilizers. Since salt content is one of the most critical characteristics of chemical fertilizers; they are expected to be harmful to agriculture in the long run as salts are harmful for plants as well as soil. Continuous use of these chemical fertilizers depletes essential soil nutrients and minerals that are naturally found in fertile soil. When we use chemical fertilizers; they do not help replenish soil nutrients and its fertility contrary to the popular belief; but, replenish only nitrogen, potassium and phosphorous. And we know phosphorous does not dissolve in water and its overuse may cause hardening of soil. Likewise alkaline fertilizers like sodium-nitrate develop alkalinity in soil reducing its fertility and making it barren. So to say; soil fertility and vegetation depend much on the balanced supply of essential nutrients and minerals. As such, overuse of specific nutrients may cause imbalance in the supply of soil nutrients further resulting in soil degradation and the loss of equilibrium of a stable soil. Though chemical fertilizers will help plants grow faster; plants will not be healthy and strong as plants grown in that manner do not have enough time to mature to develop a good root growth, strong stems, or nutritious fruits and vegetables. Even they will be less likely to survive because they will be more susceptible to pests and diseases as they lack good immune system and enough resistance against these forces. Besides this, chemical fertilizers can cause root burn or fertilizer burn, as chemical fertilizers do not allow enough water intake for the plants. As already said; chemical fertilizers are high in nitrogen salts, and when the nitrogen is absorbed by soil too quickly; it will dehydrate and dry up the plant. Another important issue of using nitrogen fertilizers is the groundwater contamination. Nitrogen fertilizers break down into nitrates and travel easily through the soil. Because it is water-soluble and can remain in groundwater for decades, the addition of more nitrogen over the years has an accumulative effect. The present review deals with harmful effects of fertilizer on the soil of Banswara district of Rajasthan

KEYWORDS: harmful, fertilizer, soil, Banswara, Rajasthan, chemical, acidic, alkaline, salts, contamination

I. INTRODUCTION

Poor adoption of newly generated agriculture and allied technologies is main constraint in the district. The reason is predominance of scheduled tribe farm families, illiteracy, poor socio-economic condition, limited extension reach, etc. Looking to the problems of farmers, the centre assessed and refined large number of technologies developed by university and ICAR institutions. In the last five years, KVK refined 9 recommended technologies in crop production, horticulture and live stock with farmers perspective. The refined technologies have been included in the package and practices of zone-IV B of Rajasthan and widely adopted by the farmers in the adopted villages as well as in the Banswara district. Wheat is a major rabi crop of the district and cultivated in an area of 80000 ha in the district. Farmers of the district generally used low dose of phosphorus and apply nitrogen in two splits, i.e., at 25 and 45 DAS which causes nutrient imbalance in wheat. Further, due to continuous adoption of cereal-cereal crop rotation field were also showing zinc deficiency. After identifying problem and its causes, an OFT was planned and executed on balance fertilization in wheat. It was observed that application of 120:40:30 kg N, P₂O₅ and K₂O/ha with 25 kg ZnSO₄/ha and full amount of P, K, Zn as basal and N in three split doses at basal, first & second irrigation resulted in higher grain yield (53.3 q/ha), which was 46.02 per cent higher over farmer's practice. [1,2]



Refined recommendation has been adopted by a large number of farmers in the district covering more than 35000 ha area of wheat.

Majority of the farmers of the district were using only dap in soybean. this blanket application of fertilizers reduced yield and oil content in soybean. looking to the problem an oft was planned and executed with farmers participation to solve the problem. soil test based fertilizer recommendation (25:40:10 kg n, p₂o₅ and k₂o/ha) were given in which 50 % n was applied through organic manures and remaining by inorganic fertilizer and p was given through ssp. this treatment resulted 58.33 % higher yield over farmer's practice of nutrient management. more than 50 per cent soybean growers in kvk adopted villages started analysis of soil samples and also adopted this refinement. Rabi maize is cultivated in an area of 40000 ha in the district. due to favourable climatic condition, there is ample scope to realize potential productivity in rabi maize. imbalance fertilization in rabi maize was major constraint and resulted in low yield. an oft was laid out to find out optimum dose of fertilizer in rabi maize. balance use of fertilizer, i.e., application of 150:60:30 kg n, p₂o₅ and k₂o/ha with 25 kg znso₄/ha resulted in 34.34 % higher yield as compared to farmer's practice of nutrient management. presently, more than 40 per cent farmers in the district adopted this refined recommendation in rabi maize.[3,4]

The centre laid-out large number of assessment trials on greengram varieties in the district and farmer did not accepted some of the new varieties due to small grain size, disease susceptibility, taste etc. the centre conducted an oft to screen high yielding and disease resistant varieties of greengram with farmers participation. result of oft indicated that ganga-8 and sml-668 varieties of greengram proved better in terms of yield (3.62 q/ha and 2.58 q/ha, respectively) and disease resistance as compared to local check (2.05 q/ha). farmers accepted ganga-8 and sml-668 due to bold grain size, disease resistance and taste. varieties ganga-8 and sml-668 spread in kvk operational area and 54 per cent farmers are using these two varieties. In kvk operational area farmers were using 2, 4-d and isoproturon for weed control in wheat but these chemicals failed to control narrow leaved weeds completely due to resistance. after identifying problem and its causes, an oft was designed with farmers active involvement on introduction of new herbicides. newly introduced herbicide clodinafop 60 g a.i. + metsulfuron 4 g a.i. per ha controlled 83.3 % weeds upto 40 days after sowing and resulted in higher yield (53.5 q/ha) over use of isoproturon (48.5 q/ha) and 2,4-d (42.0 q/ha). refined recommendation has been adopted by a large number of farmers in the district covering more than 30000 ha area of wheat. To overcome malnutrition in children and women of tribal households, kvk established large number of nutri-gardens. but these households did not use nutrient in these nutri-gardens and which resulted in less production. to increase awareness among tribal farm women, an oft was conducted about use of vermicompost in kitchen gardening. result showed that 25 to 60.7 per cent increase in yield of different vegetable crops were recorded by use of vermicompost. now, majority of farm households have established nutri-garden with vermicomposting. The system of rice intensification is a new methodology for increasing the productivity of irrigated rice by changing the management of plants, soil, water and nutrients which resulting in healthy soil and plants, supported by greater root growth and the soil microbial abundance and diversity. an oft was carried out to study the influence of crop geometry on grain yield of rice under sri. the grain yield of rice (76.35 & 4.44 %) was superior with 30x30 cm planting distance during both the years in comparison to farmers practice and 25x25 cm planting distance, respectively. the 10-15 per cent rice grower has started this technique in their fields. The continuous use of sub-optimal doses of nutrients in an unbalanced proportion led to serve depletion or nutrient resources of soils, causing multiple nutrient deficiencies and decline in crop productivity under such a situation, balanced nutrient management has assumed a great importance and has vital role in the enhancing of soil viz- a- viz crop productivity. an oft was laid out to assess the effect of balanced nutrient management in hybrid chilli for enhancing productivity. the chilli yield was highest with application of balanced nutrient management which was to the tune of 36.6 and 82.71 per cent higher than general recommended doses of fertilizers and farmers practice of nutrient management, respectively. the b:c ratio was also higher (4.78) with balanced nutrient management as compared to 2152 with farmer's practice of nutrient management.[5,6]

With an aim to demonstrate frontline technologies on farmers field, to generate production data and feed back, kvk laid out 10663 fld's on field crops viz., maize, cotton, rice, soybean, blackgram, wheat, barley, gram, greengram in 4252 ha. area on newly released varieties and technologies of different crops during last five years. for popularization of vegetables and fruits production, live stock production and fisheries, kvk also laid out 10159 demonstrations on vegetables (chilli, okra, tomato, brinjal, onion, cabbage, cauliflower, bottle guard, water melon, long melon), fruit crops (mango, papaya, lime, sapota), livestock (sirohi goat & buck, green fodder, mineral mixture, backyard poultry, murrah he buffalo, water drinker, milk cane, azolla). a brief illustration about these demonstrations are being given as under.



With an aim to demonstrate yield potential of newly released hybrids of maize, 4616 frontline demonstrations in 1852.6 ha. were conducted by using hybrids bio-9681, pehm-2, bio-9682, prabal, dkc-7074 and hqpm-1. the average yield of these hybrids was recorded 46 to 52 q/ha, which was 26.9 to 38.29 per cent higher over local check. other technologies demonstrated in fld's were seed treatment, sowing at 60 cm row spacing (in place of 45 cm), recommended seed rate of 25 kg/ha, use of inm, weed management and ipm. presently, 92 per cent farmers have adopted single cross maize hybrids in the operational area of kvk. in case of rabi maize cent per cent farmers adopted hybrids.

Rice: Fields on rice were laid out in 60 ha area on 167 farmers field during the period under report. variety p-1460 recorded an increase of 25.9 per cent yield over local check. variety p-1460 is gaining popularity in the operational area of kvk and farmers are adopting suggested cultivation practices and technologies especially seed treatment, inm and nursery raising . farmer's of adopted villages are also producing seed of p-1460 and providing to farmers of adjoining villages. at present, 60 per cent paddy growers of adopted villages are using this variety and harvesting bumper yield of quality rice grain.

Wheat : KVK introduced newly released thermo- insensitive wheat varieties viz., raj-4037, raj-3765, raj-4079, mp-3288 and raj-3777 in the district through 2351 flds in 985.3 ha. area. variety raj-4037 is now popular among farmers and is being grown in more than 60-65 per cent of the wheat area. due to its suitability to climatic condition of banswara. the variety raj - 4037 gave average yield of 36.7q/ha which was 35.95 per cent higher over local check (variety lok-1). varieties lok-1 and raj-3077 were grown in large area, but after the introduction of raj-4037 in last two-three years, 60-65 % wheat area in the district is being covered under this variety. in addition to this, most of farmers of kvk adopted villages have also started to reduce their wheat seed rate to 150 kg/ha instendrs 200-250 kg/ha, adopted balanced fertilization along with application of nitrogen in three splits and top dressing of urea after irrigation instead of nitrogen in two splits and top dressing of urea before irrigation and thereby reduced n loses in wheat cultivation.[7,8]

Barley : KVK Introduced barley varieties rd-2035 and rd-2052 in the district through 872 flds in 349.2 ha area. variety rd-2035 becomes popular and now grown in more than 45-50 per cent barley area due to its suitability in climatic condition of banswara under temperature fluctuation conditions. the variety rd - 2035 gave average yield of 40 q/ha which was 35 per cent higher over local check.

Pulses

Blackgram : KVK Demonstrated pu-31 variety of blackgram through 350 fld's in 140 ha area and an increase in yield of 100 to 215 per cent was recorded. looking to the performance of pu-31 variety, the area under this variety increased four fold in last two years in the adopted villages.

Gram: Flds on gram were laid out in 489.6 ha area with 1234 farmers during the period under report. varieties gng-469, jg-11, rvg-202 and pratap chana-1 along with ipm modules to manage gram pod borer, recorded increase in yield up to 87 per cent as compared to farmer's practices. the demonstrations varieties have been spread throughout the district and grown in more than 50 per cent gram area.

Summer Greengram: KVK Demonstrated sml-668, pdm-139 and g-8 varieties of greengram during zaid season through 893 fld's in 321.2 ha area and an increase in yield of 18.6 to 38 per cent was recorded in fld's over local check. looking to the performance of sml-668, it is being spread in operational area of kvk and nearby villages also.

Soybean

KVK Demonstrated js-9560 variety of soybean through 160 flds in 60 ha. area and an increase in yield of 37.82 to 47.38 per cent was rewarded. looking to the performance of js-9560 variety, the area under this variety increased in last two years in the adopted villages.

Cotton

KVK Introduced bt. cotton mrch-6025, rch-134, sigma, ncs-138 through 87 fld's in 35 ha area and an increase in average yield of 30.5 per cent over local check was obtained and farmers also gained more return due to less use of insecticides. now, bt. cotton area in the district spread like wild fire and more than 90 per cent area of cotton is under bt. cotton.



Vegetables and Spices

To Enhance income of marginal and small tribal farm families through crop diversification, kvk made special efforts. besides Its own mandate, kvk generated funds from deptt. of tad, gor, nhm, rkvy and naip, to introduce vegetable cultivation for higher income and generate additional employment to farm households in the district. in the adopted villages, 7410 flds in 1490.2 ha area on vegetable crops, viz., chilli, okra, tomato, brinjal, bottle gourd, cabbage etc. and spices (ginger and turmeric) were laid out in tribal dominated villages. this intervention changed the socio-economic status of farmers. farmers earned net income of rs. 20,000 to 50,000/- just from 0.2 ha land. earlier they were getting only rs.4000 to 10000/- from same piece of land. vegetable cultivation not only enhanced family income but also generated additional employment. presently in kvk operational area all most more than 45 per cent tribal families adopted vegetable cultivation. the farmers achieved state of art in vegetable cultivation especially in talwara & garhi block of the district.[9,10]

Orchard

Though KVK has limited fund for orchard establishment but funds received under naip and nhm helped in establishment of orchards. during last 5 years the kvk established 85 orchards of mango, lime, guava and papaya as intercrop in 41 ha area. now the orchards have started bearing fruits. the centre also established 148 orchards of papaya. in papaya taiwan (red lady-786) was found better due to early flowering (4 months after transplanting), higher yield (80-100 kg fruits/plant), long shelf life (8-10 days) and hermaphrodite nature. papaya red lady 786 has become very popular and spreaded throughout the district and about 60-70 per cent papaya growers have planted this variety. besides this, kendra also provided 186176 quality planting materials of mango, lime, guava, sapota, aonla, pomegranate and papaya to farmers on cost basis for orchards establishment during last five years.

II. DISCUSSION

“Nothing can beat a meal of the hot makka ki roti and jalar (cornmeal roti and dal). But those are things of the past. Maize is no longer the staple here. The times are a changing,” reminisces Paskelli, 50, a seed keeper of Aamlipara village in southern Rajasthan’s Banswara district.

It is now rotis made of wheat flour for the 1,300 people in 350 households in Aamlipara, which is about 75 km from Banswara town. A little off the highway towards Gujarat, the village inhabited mostly by the Bhil tribal community looks idyllic with lush green crops in February, mud and brick-and-mortar houses, and most remarkably, filled with people who swear by organic fertilizers.

Aamlipara stands out from other villages in the area because it is among the few that is determined to bring back the cultivation of traditional crops, and that too without using chemical fertilizers and pesticides.

Torchbearers

Villagers say that over the past several years, there has been a considerable change in their food habits. The diet has gradually moved away from traditional cereals and locally available vegetables to modern-day staples like wheat. But Aamlipara is now trying to buck this trend. By changing mindsets and food habits, a number of village women have become torchbearers of revival and preservation of traditional crops and seeds.

Banswara is the southernmost district in Rajasthan, bordering Gujarat. Hosting a sizable population of the Bhil tribal community, it is one of the most backward districts of the country in terms of economic and social development indicators. Although agriculture is the mainstay of the people in the district, crop yields are lower than the national average. There are nutritional challenges, particularly for children and marginalized sections of the population, in the region.

Only organic fertilizers are used in the lush farms of Aamlipara (Photo by Rakhee Roytalukdar)

Vaagdhara (Voluntary Association of Agricultural General Development Health And Reconstruction Alliance), a non-profit, has been working to revitalize the nutrition-sensitive farming system amongst tribal communities in the Banswara region. It has helped to build a team of women, called Annapurnas, who are furthering the cause of going back to traditional seeds and food, which have high nutritive value as well.[11,12]



Identifying traditional foods

“The focus in this malnourished district was to first identify the traditional indigenous food that were slowly disappearing from the diets of these tribal families, study their nutritive values and reintroduce them in the food system. And the aim was utilization of these indigenous foods into routine diets so that they could be leveraged to address malnutrition in this predominantly tribal community,” Jayesh Joshi of Vaagdhara told VillageSquare.in. “Before we embarked on the project, we realized that our first point of contact should be the village women, who doubled up as farmers and are more concerned about their family’s diet, especially children. Also with many younger men going out to find work in urban areas and some more interested in commercial crops, it seemed that women should be the target group, as they played a greater role in sustaining bio-diverse subsistence farming that is linked with ensuring food security for their family.”

Joshi says that women can play a greater role in saving and selecting seeds of traditional crops than men, who are often more into sourcing seeds of modern varieties and markets. “We also found women more receptive to the idea of conserving local seeds and crops, which are more adapted to local environments, and provide crucial options for adaptation to future climatic and market changes,” he said. “Hence, we decided upon building up teams of Annapurnas, who would go out and spread more awareness amongst the villagers.”

So Anita Damor, Karma, Paskelli and Sarla, farmers and powerful communicators, got together to learn more about the ill effects of nutrition transition. They learnt that at least 101 traditional food items native to the area have disappeared from their diets.

“Earlier we used to eat traditional millets like Bavta, Kang, Cheena, Kodra, Kuri and Sama. But now, only a few families grow and consume them. But these minor millets have all three major nutrient groups carbohydrates, proteins and fats. Leafy vegetable like Dheemdi, Rajan, Garmela, Bokna, Karinjada, Kachnar were all consumed earlier, but now only the leafy vegetables sold in the market are eaten by most families,” Damor told VillageSquare.in. “We were told that Rajan, Dheemdi, Garmela provide high potassium and magnesium nutrients and are rich in iron content and are versatile nutrient plants. They are good for growing children. So we have started growing these leafy vegetables again. We also dry them and have started preserving their seeds, so that we would not have to depend on the markets for our daily intake.”

Inspiring examples

“We were told about Sikkim, which has turned into a totally organic state and has banned synthetic fertilizers and pesticides. And also about women in Peru where women have more knowledge about native potato varieties and that they have been instrumental in conserving the Andean potato through local seed fairs where knowledge about indigenous seeds are shared and exchanged,” said Sarla, another villager. “Hearing their success stories, we meet weekly to discuss and share our knowledge. As Annapurnas, we go and make others aware about the usefulness of reintroducing our native crops into our food basket again.”

“Another story about how women farmers in Gallakot village in Central Himalayas have increased the cultivation of finger millet, a traditional crop has inspired us to grow our traditional crops,” said Karma, another woman farmer. “We have always used fresh tender leaves of tamarind, kachnar as vegetable. But somehow we have lost that recipe. Now we have again started using it in our dishes.”

Agriculture experts say women have been involved to spread awareness as preserving traditional seeds is intrinsically linked to food security and livelihoods of families of farming communities. “These Annapurnas were made to understand the difference between what they should consume, as many native crops with high nutritive value could be easily grown, and what was actually being produced,” said Rohit Samariya, one of the coordinators of Vaagdhara.[13]

Indigenous seeds

Teams comprising around 12 to 15 village Annapurnas were formed to disseminate information further amongst the villagers. Slowly, there is a growing realization that farming of indigenous seeds is useful because they are resilient and easy to grow, as nature has selected them and endowed them with a quality to survive under the harshest of conditions in their respective climatic zones. And that the indigenous foods with enormous natural diversity could contribute to nutritionally complete their undernourished diets.



“We already knew that our local crops have nutritional value and medicinal properties,” said Damor. “But as hybrid varieties of crops came into the market, local crops slowly disappeared from our diets and we forgot about our local crops’ strengths despite our traditional knowledge about them.”

Paskelli, another vocal Annapurna, said: “Earlier farmers selected the best plants in the fields to create seed for next season. Farmers did not have any kind of business model or profit earning motive in mind when he shared a seed with another farmer. The farmer, who received the seed could make any number of seeds from it and grow the same vegetable year after year, season after season. Farmers were seed keepers, who saved the seed for future. But now farmers buy seeds every season as the corporates who produce hybrid seeds, want them to buy every year instead of letting farmers multiply the seeds themselves. It is primarily to sustain their business model.”

“In this era of hybrid seeds, where farmers become dependent on the companies for their next sowing season, the tradition of preserving seeds has been lost completely,” she added. “What we are trying to do in our own way is to revive the tradition of preserving seeds. Each of us is becoming a seed guardian.”

III. RESULTS

Sustainable Farming Banswara Model

- A sustainable natural farming system adopted in southern Rajasthan’s Banswara district, which has created new livelihood sources and brought food security to indigenous tribal communities, has impressed the Chief Minister’s Economic Transformation Advisory Council.
- The model is being considered for replication elsewhere in the State.
- About Banswara Model:
 - The techniques and innovations in Banswara district’s Amlipara village have enabled the farmers to meet their daily food necessities by growing fruits and vegetables at a low cost.
 - The integrated system has also reduced the tribals’ dependence on market and improved nutritional status of the local population.
- About Banswara Model:
 - Farmers developed the community-managed seed system, which has facilitated diversification of crops.
 - The model entails adoption of organic farming, manure, medicines and pesticides and establishment of vermicompost units at agricultural fields.
 - The locally prepared organic manure is used for growing maize, wheat, urad and other crops.
 - Banswara-based Vaagdhara group has identified the key areas of intervention which would help ensure availability of food throughout the year.[14]
- Sustainable Farming:
 - It is a broad, umbrella term for growing food using methods that will also nurture society, the environment, and the economy.
 - It is an alternative to mainstream, industrial agriculture practices.
 - Sustainable farmers seek to support community health and well-being and to work with nature, while still being profitable businesses—though farms can also be run as non-profits or recreational projects.
- Why Is Sustainable Farming Important?
 - Sustainable farming is important because it offers a solution to the problems caused by the way most of our food is grown today.
 - Today’s industrial farming methods, many stemming from the Green Revolution of the 1950s and 1960s, are depleting our natural resources through monocultures and the overuse of pesticides and fertilizers, among other practices, while leaving people with unequal access to food and nutrition around the world.
- What Are Sustainable Farming Practices and Methods?
 - The term “sustainable farming” describes a general approach, and there is not an exact recipe for how to operate a sustainable farm.
 - Growers apply methods that make sense to them and that reflect their values.
 - popular terms you may hear as you learn more about sustainable agriculture.
- Agroforestry Practices: Forests have multiple layers, have a diversity of species, and store carbon. Agroforestry is when farmers plant crops using patterns observed in natural forests.



- Integrated Pest Management (IPM): Farmers can use biological and mechanical ways of keeping away unwanted animals and insects from their crops. Chives, sage, and mint plants are examples of natural insecticides.
- Aquaponics and Hydroponics:
 1. Aquaponics is when people grow fish and vegetables in a mutually beneficial system of sharing water and nutrients.
 2. Hydroponic – Farmers grow plants without using soil and instead use materials like clay balls, coconut hair and fabric.
- Integrating Livestock and Crops: Farmers can plant cover crops to help them to manage manure and to feed domesticated animals like cows, goats, and sheep.
- Permaculture is a set of ecological design principles and methods that scientists took from Indigenous communities and codified. It is now a worldwide movement. One of the 12 principles of permaculture is to observe and interact.

Banswara to study the long-term effect of fertilizer of fertilizer use on crop productivity and soil fertility in maize (*Zea mays* L.)-wheat (*Triticum aestivum* L.emend. Fiori & paol.) cropping systems. Both maize and wheat showed declining trend in yields over years even with NPK application. Simillar trend was noticed at Banswara. There was build-up of availabler Nan P in the soil with NPK fertilization and a general decline in status under unfertilized plots. [15]

IV. CONCLUSIONS

More than a thousand women in Banswara's tribal district practice low-cost natural agriculture. These women are self-sufficient and earn enough to feed their families while also saving for the future. They prepare fertilizers, share seeds, and make homemade medicines. Natural farming is being promoted by the Central and state governments to remind and revive traditional agricultural practices, but little do they know that in Rajasthan's southern tribal belt, women in the Banswara district are already practising it and taking it forward by forming 'Saksham Samuh' (a group of self-empowered women). More than a thousand women in Banswara's tribal district practice low-cost natural agriculture. These women are self-sufficient and earn enough to feed their families while also saving for the future. They prepare fertilizers, share seeds, and make homemade medicines.

Agriculture is the only source of income for the women of Anandpuri village, so they have taken on the task of preparing every nook and corner of their land productive and high-yielding. Traditional farming has been practiced by women in Anandpuri village, Banswara district, for centuries, but they have only been able to provide food grains for their families. This is due to their hard work, but they were not trained enough to make their land high yielding.

But, now that they've formed a women's group, they're not only sharing ideas and seeds, but they're also having group discussions, and they've come to the conclusion that doing mixed farming will increase their earnings.

“When we had very little knowledge of mixed farming, we managed to grow grains to meet the need of the family for a year and thought it was enough for us, but now as we have learned the art of mixed farming, we women farmers are managing to not only meet the need of the family but also earning well. This year I planted onions in my 1 bigha land and managed to produce 5 quintals of onions, I sold them and earned Rs 15000, this was the additional income that I could save,” says Jashoda Phulchad Huwar, a resident of Deephor village of Anandpuri tehsil.

She further shared that she has 3 bigha lands, in 2 bighas she grew corn, and in the remaining land, she grew Pigeon Peas (Arhat Dal) and vegetables like brinjal, and chili, tomato. She grew crops worth Rs 50,000 and earned a good amount for her family.

One of the remarkable things about these women farmers is that they not only grow these vegetables and grains but also themselves go to the market and sell them.




Another group of women from Bor Khedi village, Kushalgarh block of Banswara district are preparing vermicompost; the end-product of the breakdown of organic matter by earthworms. They are also making efforts to increase the fertility and productivity of soil using Azolla, a nitrogen-fixing plant that is rich in proteins, essential amino acids, vitamins, and minerals.

They also prepare Brahmastra Organic Pesticide that helps get rid of insects that damage plants. Sharing the method of preparing Brahmastra, one of the women of the Saksham group shared, "Take two kg neem leaves, two kg cilantro, half kg hot red chili, two kg bitter gourd leaves, half kg garlic. The entire material has to be boiled in 10 kg of cow urine. It is to be boiled on the fire till the urine does not remain up to five kilograms. After that filter it and keep it. That much medicine is enough for one acre."

So, in Rajasthan's tribal belt, multi-cropping and organic fertilizers have transformed traditional subsistence agriculture into a reliable source of income for more tribal farmers. They are self-confident and are boosting the confidence of other women in their village too.[16]

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ijmrsetm@gmail.com

www.ijmrsetm.com