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RESEARCH ARTICLE

IMPROVING FOOD SECURITY THROUGH SUSTAINABLE AGRICULTURAL PRACTICES AND STRENGTHENING LOCAL BIODIVERSITY MANAGEMENT - A CASE STUDY OF INDIGENOUS PRACTICES FROM INDIA

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Abstract

Indigenous people play a key role in the domestication, conservation and adaptation of genetic resources and agricultural biodiversity. Due to gradual change in lifestyle, particularly influenced by globalization and industrialization, it has been observed that the traditional knowledge and practices are being lost. This study particularly takes into account the role of women, the key stakeholders in agriculture, in an indigenous community to sustain their living through subsistence farming and improving the ecosystem through crop diversity. The study has been derived from the project being implemented by Prayatna Samiti with the support of KehitysmaayhdistysPääskyt and Ministry of Foreign Affairs, Finland in 10 villages of Salumbar and Lasadiya blocks of Udaipur in India. The area exhibits extremely hilly terrain dominated by semiarid agro-climatic environment occupied by tropical dry deciduous forest. The major tribes dwelling in the area are Meena and Gameti. The sources of livelihood for these tribes are agriculture and animal husbandry practiced by both men and women. Interventions through trainings on minor millets and vegetable cultivation; formation of Self-Help Groups (SHG); and awareness programmes have resulted in creation of grain seed banks, nutrition gardens, organic manures and green house nurseries thereby bringing reforms in traditional agriculture and ensuring food security. A total of 107 families were surveyed based on the criteria of crop production and its impact on livelihoods. Lead women members were selected as primary respondents for the FGD. Other methods included household survey, individual interviews, and field monitoring. Some of the challenges identified in the study area are existing small holder farmers who lack skills and face acute shortage of natural resources to deal with livelihoods. As the major village population working in the fields are women and thus there is a need to focus on role and challenges of women specific needs. The developmental programs must be directed to the holistic development of women with the concept of 'No-one left behind.'

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Introduction:-

Indigenous peoples have been recognized as the guardians of 80% of global biodiversity with 370 million self-identified indigenous people around the world (FAO, 2019b). In the Asia-Pacific region, 36 sites in 7 countries (1

site in Bangladesh, 15 sites in China, 3 sites in India, 11 sites in Japan, 1 site in Philippines and 4 sites in Republic of Korea, 1 site in Sri Lanka) are designated as globally important agricultural heritage systems (GIAHS)(FAO, 2019a).The degradation and destruction of natural ecosystems act as serious threats to crop diversity and global food stability(Whitmee et al., 1973).More than 800 million people do not have access to enough food and more than 2 billion people are critical micronutrient deficient (Ramakrishnan, 2002), leading to the global burden of diseases.On the other side, the concept of family farming holds a very important position for indigenous people, as they work on diversified agricultural systems and preserve traditional food products, contributing a balanced diet along with safeguarding agro-biodiversity. At the same time face many challenges, for instance more than 80 percent global farms are below two hectares where women perform nearly 50 percent of the farm work but only 15 percent have the farm holding rights (FAO, 2019c). Indian indigenous people contribute to about 8.6 percent of national population comprising of 705 officially recognized ethnic groups and many more unrecognized. Various laws exist such as the 5th Schedule for Central India and the 6th list for certain areas of northeast India that recognize the right to land and self-government for indigenous people but is yet far from successful implementation. The major concentrations of indigenous people are seen in the central tribal belt ranging from Rajasthan to West Bengal and the seven northeast states of India. Amidst various critical issues like crime against indigenous people, threat of eviction, limited collective and individual rights, development induced displacement, accessibility to land rights, the situation of tribal women and girl remains challenging. Traditionally the knowledge, innovation and practices of indigenous and local communities around the world carry unique social, cultural, spiritual, economic and political dimensions. Their resource management practices and techniques contribute to the maintenance and adaptation of productive, sustainable ecosystems. India, Thailand and many other countries in Asia are home to various indigenous practices that can influence the steps taken towards sustainable future. Indigenous people play a key role in the domestication, conservation and adaptation of genetic resources and agricultural biodiversity, not just for their immediate surroundings but also for the larger landscape. Due to gradual change in lifestyle pattern, particularly influenced by globalization and industrialization, it has been observed that the traditional knowledge and practices are being lost.

This study attempts to bring forward a case study from an indigenous community in India motivating us to look back through the window of our traditional practices and acknowledge how communities have been able to sustain themselves. This study particularly takes into account the role of women in an indigenous community to sustain their living through subsistence farming and improving the ecosystem through crop diversity. Focused group discussion (FGD),house-hold survey, individual interviews, and field monitoring were conducted in 7 villages of Salumber block in Udaipur district of Rajasthan, India, to document the experiences of improving food security through sustainable agricultural practices and strengthening local biodiversity management for a sustainable future. The survey particularly highlights the parameters that define living standards and their repercussion on accessing food crops that are necessary to lead a healthy life and raise incomes. The three cases brought forward indicate the family background, project objective, issues addressed, beneficiary interest and approach, applied process, results and thus highlighting the good agricultural practices (GAP) and learnings.

Study Area:

Udaipur district of Rajasthan exhibits extremely hilly terrain dominated by semiarid agro-climatic environment. The district is marked by diverse castes and ethnic groups with tribes in majority. Salumber, located around 65 kilometers from the district, is one of the blocks (tehsil) dominated by the tribal population. The project villages are remotely located, forming the disperse tracks of settlements within tropical dry deciduous forest. The major tribes dwelling in the area are Meena and Gameti. The sources of livelihood for these tribes are agriculture and animal husbandry practiced by both men and women.



Figure 1:- Study Area.

The agricultural land is uneven, sloppy and is surrounded by rocky hillocks and forest. Due to the small amount of crop cultivated area, farmers are unable to earn sufficient incomes. Coupled with land limits the loss of crop diversity has emerged as major threat to the ecosystem.

Market-driven agriculture has caused a huge set back in production of traditional grains which are good sources of nutrients necessary for human health. At the same time rapid use of chemical fertilizers has degraded the important soil constituents. This development has had a very negative impact on food security of small farmers.

The project titled “Improving Food Security through Sustainable Agricultural Practices and Strengthening Local Biodiversity Management”, being implemented by Prayatna Samiti with the support of KehitysmaayhdistysPääskyt and Ministry of Foreign Affairs, Finland, addresses vulnerable ecosystem by fostering minor millets and vegetable cultivation with the set of Good Agricultural Practices (GAP) and good governance for better management of natural resources in 10 villages. The villages covered are Sarwani, Ven, Panninal, Samarjhap, Baran, Pavati, Ghagri, Dhaikheda, Khajoori and Kalipol. The project addresses women as primary beneficiaries with the objective to increase food security, improve livelihoods, and conservation of biodiversity and strengthened participation of local communities, including women through bio-resource management. The project till now has addressed 108 families.

About Prayatna Samiti:

Prayatna Samiti is a non-government organisation working since 1989, committed to the socioeconomic development of poor and vulnerable rural communities of Udaipur district located in southern region of Rajasthan state of India. The working method involves people’s role through local institutions which is best believed to disseminate rural development activities. The expertise lies in promoting local institutions, microfinance, natural resource management (watershed development, community forest management, climate change adaptation, pastureland management). The aim of Prayatna Samiti is to promote self-empowerment and leadership abilities amongst deprived sections of rural communities for their sustainable livelihood. The organization promotes self-empowerment and leadership abilities among deprived sections of rural communities. As all people have the ability and the right to provide for themselves and contribute to a healthy, sustainable economy. The organizations efforts are concentrated in developing institutional structures; managing capacity and leadership abilities in these people so that they can achieve social justice and equality of their own.

Other stakeholders:

Considering the involvement of the people in the ongoing progress the project builds the stakeholders as the frontiers of the project. The stakeholders include women's Self-Help Groups, Biodiversity Management Committees, Village Panchayats, and Gram Sabha. Besides these other actors who are participating are Janpratinidhi (people's representatives), community leaders who are elected by the villagers through informal voting to lead them for their rights. The major bilateral stakeholders are The Swallows of Finland, Ministry of Foreign Affairs, Finland and Prayatna Samiti and the timeframe of the project is from the year 2017 (January) to 2019 (December).

Methodology:-

The project was initiated in January 2017, a baseline survey was conducted in 7 villages. A total of 107 families were surveyed, 15 from Pavati, 17 from Ven, 3 from Samarjhap, 15 from Panninal, 15 from Sarvani, 14 from Baran, 14 from Ghaghri and 14 from Kalipol. The survey was based on the criteria of education, income sources, land use pattern, production, crop type, pasture availability, forest land, animal husbandry, diseases and meal frequency. Lead women members were selected as primary respondents for the FGD as they would be the primary beneficiaries of the project activities. Other methods include household survey, individual interviews, and field monitoring.

Target Group:

The target group were the women and men that belong to tribal communities of Meena working on food crop production. Each beneficiary looked after one household consisting of average 5 members – men, women, and children who will be addressed through Self-Help Groups (SHGs), Biodiversity Management Committees (BMCs) and Gram Sabhas. The basic occupation of the families was found to be agriculture and animal husbandry with the income restricted to 2000 INR per month as they had limited fertile land and lacked cultivation skills. Animal husbandry was seen at loss as animals were not fed with quality fodder.

Findings:

The average woman member per household was recorded as 1.3 which indicates that there is 1 lead woman in each family taking care of the household. The adult male average per household is also 1.4. An average of 2.7 children per household was seen. Out of the total 580 family members in 107 households, there were 140 females, 147 male and 293 children, with average of 5.4 members per household. This family size justified the optimum need of food, clothing and shelter necessary to lead a quality life. Agriculture was found to be the most demanded occupation in the villages with an average annual income of 24496.6 INR per household through traditional agricultural livelihoods. The second most acceptable occupation was found to be animal husbandry contributing to an average annual income of 1546.9 INR per household. This was seen to be quite low due to lower number of animals, low milk production, lack of feeding skills and medication. The villagers also practiced as laborers under the National Rural Employment Guarantee Scheme (NREGS) which gave them an average annual income of 1182.2 INR per household. Migration often took place to nearby cities by men for a period of six months contributing to an annual average income of 9757 INR per household. The annual average income per household was found to be 38285.6 INR which is about 3190.5 INR per month. Amongst the various livelihood by the villagers, traditional farming activities was found to be most promising. It was found that 75 percent of the income generated in production of grains is meant for self-consumption. However, the agriculture produce in the village has not been able to satisfy the daily need in cropping seasons. The per capita availability of grains is only 0.5 kg per day. It was proved that agriculture is directly proportional to poverty and impinges its effect on food availability. Thus, there should be more emphasis on enhancing sustainable and traditional agricultural activities.

Actions and Impact:

Eight (8) Self Help Groups (SHG) consisting of 108 women members were formed in 5 villages. During SHG meetings a total of 1,23,962 INR has been saved for inter-loaning meant for developmental activities. The strategic intervention of the project through SHGs have promoted good practices of millets and vegetable cultivation. Women were observed taking part in decision making and moving towards self-mobilization.

Looking at the need of knowledge promotion and awareness on GAP among masses, five (5) types of effective information, education and communication (IEC) material had been developed. The poster on nutritional importance of minor millets shows that minor millets like Foxtail, Proso, Kodo and Finger millet – constitute essential vitamins, amino acids and minerals which are conducive to health and protects from disorders. They provide good mental health, muscular power, calcium for bones, long and healthy hair, and prevent early ageing. The poster on vegetable cultivation guides people to develop nurseries and nutrition garden. The poster for preparation of organic manures promotion shows the utilization of biodegradable products for preparation of organic manures which are environment friendly in nature. The IEC is interactive and disseminated to people during the trainings.

Twenty (20) trainings were provided to promote GAP for minor millets and vegetable cultivation. Based on the training chapters women followed row sowing of foxtail millet; utilized fallow land for cultivation; organic manures like cow dung water, panchagavyam, five leaf extract and amritpani were prepared at home. People came to know the importance of minor millets and vegetables in promoting health.

In order to address risk mitigation and ensure sustainable livelihoods greenhouse nurseries were promoted in the villages. The nurseries nurtured vegetable seedlings in the vegetable trays. The seedlings were sold to the people by the farmers. Women planted fruits and cucurbits to ensure food security through the green houses.

Grain Seed Banks (GSB) were promoted to ensure minor millet grain available at home. 53 GSB were established with 4 kilograms of seeds provided to each beneficiary. Seeds of Proso millet (*Panicum miliaceum*), Kodo millet (*Paspalum scrobiculatum*), Foxtail millet (*Setaria italica*) and Finger millet (*Eleusine coracana*) were provided to women. Eight (8) people planted foxtail and finger millet in crop land. Mixed cropping along with maize was also showcased by few women. Around 2 hectares of area was sown at beginning. Foxtail attained the height of 12.5 centimeters with matured spike growing at the shoot tips.

To satisfy the nutritional needs 89 Nutrition Gardens were developed with SHG women. Tomato, bhindi, brinjal, bottle gourd, ridge gourd, spinach, cluster beans and chili seeds were distributed along with promotion of the set of GAPs. Women followed row sowing of seeds during nursery raising, which was never attempted in the region. Use of green net was taken as protective measure. After 25 days seedlings were transplanted to vegetable beds. They also came to know the importance of vegetable in invigorating health and income generation.

The project till now has successfully demonstrated the role of people's institutions in promoting skills and knowledge required to address food security and sustainable development.

Success factors:

Greenhouse nurseries were one of the success factors which addressed climate change. In order to raise the economies through traditional agriculture the technology is beneficial for the farmers of the dry land area. These are small and easily managed structures which protect the local crops from damage and promote their growth. The greenhouse design provided appropriate temperature and created a microclimate for optimum plant growth. The protection cover of the house which is made up of green net protected the plants from winds, high intensity rainfall, temperature, high intensity sunlight and insects.

Another success factor was use of supporter in the nutrition garden that was accepted by the women who promoted the gardens in the slopped land surfaces. The supporters are the wooden rods used to encourage the height of the shrubs. In this way the fruits attain the maximum growth and get rid of the soil borne pests. They were applied for tomato.

Bed based nutrition garden – The vegetables grew in the plant beds of maximum dimension of 8X16 feet that boosted drainage.

Organic manure to enrich soil in micronutrients and plant growth – Organic manures like Panchavagayam and Five leaf extract were used to enrich micro-nutrients in the soil, promote plant growth and avoid pest infection. As the result of the application of the manures plants grew healthy and yield was increased. Women prepared the cow dung water, Panchavagayam and Five leaf extract in their houses.

Challenges:

The greatest challenge faced was downpour during the monsoon. Most of the seeds and seedlings were washed away by the rains. Those who managed to compensate their harvest were recorded low, in case of minor millets. Further water logging in the low-lying area and excessive sheet erosion made the soil ineffective for the crop growth.

Apart from these particular case study, indigenous people have been facing various challenges over the years. The insight and knowledge of traditional practices that exists within the scope of these people is not well documented. There is limited co-ordination within projects and governments in terms of managing and maintaining information regarding creating maps, rotational farming, seed collection and preparing the crop calendar. Such activities and practices support in developing food security and mitigating the challenges of climate change.

Farmers' Cases developed through Focused Group Discussion (FGD):

Case 1: Foxtail wagged after a long span - Dhooli Bai



Figure 2:- Dhooli Bai with grain harvest (a) and matured spikes of foxtail millet in the field (b).

Family background:

Dhooli Bai is a forest dweller belonging to Meena tribe of India. Residing in Ven village of Salumber block of Udaipur, her family consists of 2 adults and 3 children. Family's sources of income depend mainly on agriculture which contributes to INR 44100 (non-profitable) annually with some additional income leading to a total of INR 70100.

Project objective:

The project titled "Improving Food Security through Sustainable Agricultural Practices and Strengthening Local Biodiversity Management", being implemented by Prayatna Samiti with the support of KehitysmaayhdistysPääskyt and Ministry of Foreign Affairs, Finland, addresses vulnerable ecosystem by fostering minor millets and vegetable cultivation with the set of Good Agricultural Practices (GAP) and good governance for better management of natural resources in 10 villages.

Issues addressed:

Lack of food security due to lack of natural resources such as seeds of minor millets, land and skills of cultivation. Setting up of 'Seed Bank' ensured the supply of seeds at home. In this way the minor millets will be promoted through cultivation in the field. Thus, food security will satisfy the need of nutritious grains and improve incomes.

Beneficiary interest and approach:

Dhooli Bai became interested in cultivation of minor millets as importance of millets to human beings and cultivation practices explained to her by Prayatna Samiti. It was 25 years back that she used to cultivate the foxtail millets but all of a sudden, the practice of traditional agriculture got diminished. The blame may be given to economy driven agriculture which preferred monocropping and use of chemical fertilizers. She wanted to revive the traditional agriculture through the reintroduction of minor millets and practices associated with them. This approach is helping her to maintain the seed supply and enjoy the grains' dishes with her family.

The process:

Dhooli Bai came to know the project's objective through the SHG named DholagiriSayamSahayataSamuha consisting of 15 members. In the meetings she was oriented on minor millets cultivations. A training was organised by Prayatna Samiti on "Minor Millets and Vegetable Cultivation Training" at Udaipur during which she interacted with experts and familiarized with importance and sowing technique of foxtail millet. Due to lack of time and looming rains she preferred broadcasting method of sowing. She utilized 404.7 sq. mt. irrigated crop cultivated to reintroduce traditional agriculture. Heavy downpour in the area resulted in set back to the farming measures. A loss of 2.5 kg was observed in the yield. Rains washed the seeds away which was coupled with soil erosion. It took 45 days from 1st July 2017 to get the first harvest.

Results:-

She harvested 4 kg grains from 0.5 kg sown seeds. Spike length extending to 12 cm pleased her as she revived

traditional agriculture. The grain was consumed by the family members. Chapatis were prepared and taste was appreciated by the family members. 0.5 kg of the harvest was added to the existing seeds in the traditional earthen pot. In this way the seed supply of nutritious grain was maintained at home.

Good Agricultural Practices and Learnings:

Maintenance of seed bank, minor millet cultivation, and utilization of irrigated area. To get desired production Dhooli Bai prepared to sow the seeds after wheat harvest in April.

Case 2:

Vegetable paradise in Ven village - Gomali Bai:



Figure 3:- Application of supporters to increase tomato growth (a), land use for vegetable cultivation by Gomali Bai (b), and nutrition garden by Gomali Bai (c).

Family background:

Gomali Bai, a forest dweller, belongs to Meena tribe of India. Along with her husband and 2 children she resides in Ven village of Salumber block of Udaipur. Agriculture contributes to more than 50 percent of the family's annual income of INR 64700.

Project objectives:

The project titled "Improving Food Security through Sustainable Agricultural Practices and Strengthening Local Biodiversity Management", being implemented by Prayatna Samiti with the support of KehitysmaayhdistysPääskyt and Ministry of Foreign Affairs, Finland, addresses vulnerable ecosystem by fostering minor millets and vegetable cultivation with the set of Good Agricultural Practices (GAP) and good governance for better management of natural resources in 10 villages.

Issues addressed:

Lack of food security as out of 4 bigha (1 bigha = 0.54 acres), 2 bigha land was unfertile, having sloped terrain and lack of skills for food crop cultivation. Setting up of 'Nutrition Garden' promoted vegetable cultivation for providing nutrition to the remotely located marginalized households. Thus, food security satisfies the need of food crops and enhances incomes.

Beneficiary interest and approach:

Gomali Bai became interested in vegetable cultivation as she wished to enhance the existing vegetable production which rarely yielded vegetables for her. She wished to learn the cultivation technique and procure seeds to enhance the production which she can use for family consumption.

The process:

Gomali Bai got familiarized with the cultivation method through her SHG named Dholagiri Sayam Sahayata Samuha consisting of 15 members. She participated in the training on "Minor Millets and Vegetable Cultivation" organised by Prayatna Samiti in Udaipur. Through the hands-on approach, she learned nursery raising. She got the lesson on transplantation of seedlings to promote plant growth. Prayatna Samiti provided her seeds of bottle gourd, ridge gourd, chili, cluster bean, spinach and tomato. Along with this she received orientation on vegetable cultivation through the IEC material.

Vegetable cultivation steps followed:

Step 1: Prepare Nursery raised above 6” from the ground level.

Step2: Seeds must be sown up to 3 cm deep in the furrows of the lines created on the mound. Cover the seeds with dry grasses to maintain optimum moisture for germination.

Step 3: Remove the grasses after 5 days. Leave the set up for 25 days. Spray with diluted five leaf extract at every 7 days. Follow weeding at the interval of 4 days.

Step 4: Uproot the seedlings after 25 days.

Step 5: Prepare separate beds 3 by 5' (min.) for 6 types of vegetables. Transplant the seedlings at the distance of 1 foot from each other.

Step 6: Support the plants to help them to grow erect.

Step7: Climbers must be supported with poles. Support helps in vegetable growth.

Step 8: Water the plants gently during evening time. Spray Panchagavyam, Cow dung water and Five leaf extract alternatively.

Following the steps, she prepared nursery of tomato and chili. She utilized 2 patches of land with a total of 215 sq. mt. area to prepare beds. She raised tomatoes, spinach, brinjals, chilies in the 2 patches with one located at the slope and another at the side of the existing crop field. The vegetables of each kind were raised in the separate beds. She prepared the supporters with locally available tree stems to raise the tomato plant growth. To avoid spreading diseases she prepared the Five leaves extract with mixing castor, neem, madar, dhatura and jharmar leaves. The spray was applied 8 times at an interval of 1 week.

Results:-

She is able to produce 40 kg of vegetable with 0.25 kg harvested daily. She saved INR 200 per week which she used to spend for purchasing vegetables from Salumber. Now all the vegetables are brought from the nutrition garden. Her family members are enjoying the diverse vegetables with two vegetables at a time in the regular meals. In 2018 she continued with the cultivation on the same land from the seeds extracted in the previous year.

Good Agricultural Practices and learning:

Nursery raising is necessary to support healthy plant growth. Spray of Five Leaf extract which is organic manure helps in controlling bacterial, nematode and viral infections. Use of supporters increases yield and size of the fruits. Row sowing of vegetables supports healthy growth of plants, fruits and leaves with soil and water conservation. New crops like cluster bean and bhindi will be sown in the summers.

Case 3:**Cheenasaid in the field - Nathi Bai:**

(a)



(b)

Figure 4:- Nathi Bai (a) and her agricultural produce, minor millets (b).

Family background:

Nathi Bai is a forest dweller belonging to Meena tribe of India. Residing in Sarwani village of Salumber block of Udaipur she along with her husband lives with 2 sons, 2 daughter in-laws and 1 granddaughter. Her income is

mainly dependent upon agriculture which contributes INR 35400 (non-profitable) to the total annual income of INR 44400. With an irrigated area of 1 bigha (1 bigha = 0.54 acres) it is very difficult to lead a dignified life.

Project objectives:

The project titled “Improving Food Security through Sustainable Agricultural Practices and strengthening Local Biodiversity Management”, being implemented by Prayatna Samiti with the support of KehitysmaayhdistysPääskyt and Ministry of Foreign Affairs, Finland, addresses vulnerable ecosystem by fostering minor millets and vegetable cultivation with the set of Good Agricultural Practices (GAP) and good governance for better management of natural resources in 10 villages.

Issues addressed:

Lack of food security due to lack of natural resources such as seeds of minor millets, land and skills of cultivation. Setting up of Seed Banks will ensure the supply of seeds in the home. In this way the minor millets will be promoted through cultivation in the field. Thus, food security will satisfy the need of nutritious grains, need of food crops thus enhance incomes.

Beneficiary interest and approach:

Nathi Bai became interested in cultivation of minor millets as importance of millets to human beings and cultivation practices explained to her by Prayatna Samiti. Threedecades back she used to cultivate the proso millet but all of a sudden, the practice of traditional agriculture got diminished. The blame may be given to economy driven agriculture which preferred monocropping and use of chemical fertilizers. She wanted to revive the traditional agriculture through the reintroduction of minor millets and practices associated with them. This will help her to maintain the seed supply and enjoy the grains' dishes with her family.

The process:

Nathi Bai came to know project's objective through the SHG named NathuBav ji SayamSahayataSamuha consisting of 15 members. In the meetings she was oriented on minor millets cultivations. A training was organised by Prayatna Samiti on “Minor Millets and Vegetable Cultivation Training” at Udaipur during which she interacted with experts and millet. Due to lack of time and looming rains she preferred broadcasting method of sowing. She utilized 374 sq. mt. irrigated crop cultivated to reintroduce traditional agriculture. Heavy downpour in the area resulted in set back to the farming measures. A loss of 2 kg was observed in the yield. Rains washed the seeds away which was coupled with soil erosion. It took 45 days from sowing to get the first harvest.

The results:

She harvested 4.5 kg grains from 0.5 kg sown seeds. The grain was consumed by the family members. Chapatis were prepared and taste was appreciated by the family members. 0.5 kg of the harvest was added to the existing seeds in the traditional earthen pot. In this way the seed supply of nutritious grain was maintained at home.

Good Agricultural Practices and learning:

Maintenance of seed bank, minor millet cultivation, and utilization of irrigated area. To get desired production Nathi Bai prepared to sow the seeds after wheat harvest in April 2017.

Future Needs and Requirements:

More people need to be approached through trainings on effective vegetable cultivation and minor millets farming along with the preparation of the organic manures. Seeds of minor millets and their storage need to be promoted. More land area is needed to be converted from fallow to rainfed. For this awareness camps and Gram Sabhas involving Panchayat, District Collector, and Forest Department need to be organized. The camps may focus on Forest Right Act and National Rural Employment Guarantee Scheme. Local biodiversity management can be addressed through effective documentation of age-old methods of crop cultivation and the uses of diverse faunal species. For this advocacy need be strengthened in the future and local leadership needs to be valued for conservation of biodiversity.

Sustainability:

The sustainability of the project lies in the income generation, strengthening local institutions, promoting social benefits in the form of nutritious diet to the people and supplementing biodiversity. The sources of livelihoods were generated through seed banks, green house nurseries, nutrition gardens.

The institutional sustainability was ensured through formation of 7BMCs and 8SHGs in the project villages. The BMCs ensured good governance as 38members represented the issues of food security in village panchayats which were addressed in Gram Sabha. People came to know the importance and access to food security. Through BMCs, people knew best practices like preparing compost pits and promoted the use of traditional organic manures.

8 SHGs promoted women empowerment and gave women leadership to address food securitythrough decision making. As the project withdraws SHGsand BMCswill act as leading institutions in promoting the activities.

The social sustainability was achieved by consumption and distribution of grains and vegetables in the villages. The revival of millets and other crops gave boost to the agricultural productivity. New sets ofagricultural practices were introduced which enhanced production. Production of minor millets willconserve the germ plasm of the traditional crops which were important in invigorating human health.

Conclusion:-

A bottom up approach is needed to reflect all inputs from these indigenous people and practices in the policy development. These issues should be addressed by the national policies in respective countries based on their local requirement in-order to formulate the plan and implement and translate it into action. At the same time, communities need to help themselves and build their capacities to handle cases of climate change and impacts of disasters for sustainable social development. Also, in other agricultural countries like Thailand, the Thai Meteorological Department (TMD) comes up with 5 days prior weather forecast of 3X3 km grid data having an accuracy of about 80 percent, but experts suggest that the indigenous people prefer to use traditional techniques to assess weather forecast. Certain initiatives like the Community Weather Forecast Center (CWFC) by OXFAM are already helping communities in Thailand with regular and precise weather updates in some provinces. Also, India has developed mobile SMS services from weather telecast system, but experts suggest that indigenous people do not use is because of unavailable appropriate funds and other reasons.

Some of the challenges identified in the study area in India are existing small holder farmers facing issues like lack of suitable land (existing sloppy land not good for cultivation), lack of seed variety, lack of skills, mobilizing people, land degradation, loss of nutritional grain and raising micro finance. Major village population working in the fields are women and thus there is a need to focus on role and challenges of women specific needs. There exist huge loans at individual level making it a barrier to access new opportunities and are majorly involved in subsistence farming. Communication is another important challenge for documenting and sharing information amongst the indigenous people. There is a need of building appropriate channels to share understanding of existing indigenous practices. At the same time, it is important to develop social and economic value to encourage and replicate such practices. Government needs to play major role in protecting indigenous ideas, wisdom and knowledge through appropriate policies to support theexchange and learning process of indigenous people for livelihood improvements and sustainability. Considering the concept of think macro act micro, strong advocacy is required at national and ground level to raise awareness, share and build capacities of indigenous women through national programs and come up with initiatives of indigenous food systems.

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Contribution of Ministry of Foreign Affairs of Finland: The MFA of Finland has granted 82755 Euros support for the project in the period 2017-2019 which accounts to 85 % of total budget.

Contribution of the Swallows: Swallows covers 15 % of the project budget. 7301 Euros in cash in addition to the voluntary work worth of 7301 Euros. In addition to financial contribution, the Swallows takes part and supports Prayatna Samiti in project planning, monitoring and evaluation. In Finland, the Swallows raises funds for the project and communicates to the public about the project and its results.

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