

## Traditional Crop Protection Techniques of Gond, Kolam and Pardhan from Gondwana Region of Maharashtra

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**Abstract:** This research paper is based on the conducted field work in the six tribal villages of the Gondwana region of the Maharashtra state. The major aim of this paper is to explore the Traditional Crop Protection Techniques of Gond, Kolam and Pardhan tribal communities from the same region. It has been pointed out that these local tribal communities have developed traditional and indigenous knowledge, tools and techniques of crop protections in their regions. However, their traditional knowledge, arts, skills and techniques are varied across the regions and communities. These communities have their social, cultural and economic cognizance about the use of the natural and local resources. They have developed their arts, skills techniques, traditional knowledge based on their own experiences and wisdom in their natural settings. Thus, their knowledge, wisdoms, arts and skills are region wise and specific to certain communities. In the case of this region, study focused on the pre and post harvesting traditional crops protection techniques of the Gond, Kolam and Pardhan communities of the Nanded and Chandrapur district in Gondwana region of the Maharashtra state. In the present context, due to the many forces, the indigenous knowledge of the local tribal communities is in crisis and in endangered positions, thus, this study has significance and

*importance in the present context to explore and document the traditional techniques of these local tribal communities who have been using to protect their crops from the various attacks by insects, nematodes, mollusks, rodents, or birds, or infestations by fungi, bacteria, or viruses. Thus, the major findings of this study would be helpful to provide policy inputs to the natural resources managements, agriculture departments, crop protection strategies for strengthening the organic farming for sustainable growth and the development of agriculture.*

**Keyword:** Agriculture, Crops, Knowledge, Protections and Techniques

## Introduction

For centuries agriculture is the main stay of Indian Economy as well as Primary source of employment opportunity and livelihood of rural and tribal communities in India. In past, the tribal communities used to do hunting, food gathering and doing agricultural. The tribal communities used to do shifting cultivation. They used to adopt traditional ways of doing agriculture based on the indigenous tools, technologies, seeds, varieties, organic pesticides and fertilizers. They used to do agriculture for subsistence and livelihoods. Mostly, they cultivate staple foods. They preserved many indigenous varieties of seeds. They gave priority to take staple foods. They practiced of multi cropping patterns in their lands. These tribal communities were self-sufficient. They don't rely on the markets. In case of tribal agricultural, most of the tribal communities used to do jhum cultivation / shifting cultivation. They don't use plough and modern agricultural implements. They have developed their own techniques of doing agriculture. They did not also use hybrid seeds, fertilizers and pesticides. They prepared their own fertilizers and pesticides by using local resources. They used to keep pet animals such as cows, ox, goats and sheep for getting dung for their lands. They consider and worship agriculture in form of mother earth. They thought that to use plough on the land is cut the stomach of the mother earth. They worshiped land in forms of mother earth. They developed their culture with the nature and agriculture. Tribal culture can't be separated from the agriculture. They have developed constructive, organic, symbolic relationship between nature and culture. Thus, tribes are nature worshipers. They have developed their culture along with the agricultural operations. Each and every step of the agricultural operations such as; land preparations, sowing seeds, weeding, nurturing and reaping or harvesting. In each and every agricultural activity, they have rituals attached with the agricultural operations. Before sowing, they worshiped earth called *Bhumipuja*. They celebrated various local festivals attached with the agricultural operations such as weeding and harvesting and so on. But After independence, the attempt has been made to bring out changes in the Indian agriculture to become self-sufficient in food. The effort had been taken to bring out rapid development of agriculture, the national policy of Agriculture focused on the strengthen rural and tribal infrastructure to support faster agricultural development and efficient use of natural resources like soil water and fair application of modern technology practice of High Yielding varieties of crops (HYV), use of pesticides for control of diseases, use of chemical fertilizers, provision of bank loans, introduction of subsidy policy etc for agricultural growth and development. However, these polices have neglected to incorporate the indigenous skills,

arts, traditional knowledge of crop protection of the local tribal communities in general and Gond, Kolam and Pardhan communities of Gondwana region of Maharashtra is particular. Thus, there is urgent need to explore and document the existing knowledge of the local tribal communities for the sustainable growth the development of the agriculture. Their local knowledge is contextual and relevant; they developed these traditional techniques on the pre and post harvesting crop protections on the basis of their own experiences and wisdoms. They got this from their forefathers. This knowledge is sustainable and not harmful to the biodiversities. This knowledge helps to maintain the fertility and sustainability of the agriculture without harm to any other species. Thus, this study makes attempt to explore and document the traditional crop protection techniques of the Gond, Kolam and Pardhan communities of this region.

Tribes especially Gond, Kolam and Pardhan from Gondwana region of Maharashtra have evolved their own crop protection techniques which are based on indigenous wisdom. It is an economically affordable and caters the need of the crop protection requirement by tribal farmers. Their age-old enriched knowledge has helped in finding local solution for the pest problems. In fact, their culture has been revolved around the agricultural livelihood. Various practices and beliefs system shows their deep understanding towards natural resources which are available locally. It has been already pointed out that the local tribal communities have developed their livelihood patterns based on the local resources such as, agriculture, water, forest and medicinal plants in their natural settings. However, their livelihood patterns and occupations are varied across the regions. The earlier some studies pointed out the relationships between communities and local natural resources. However, the certain resources are community specific in the specific regions. The local tribal communities have developed their constructive, symbolic, and organic relationships with the natural resources such as land, agriculture, forest, water, hill, animals, trees, medicinal plants and other species. These local and traditional communities have very deep and rich knowledge, wisdom about these bio diversities, varieties and their uses. It has been pointed out that the present generation got this cultural heritage and indigenous knowledge systems from their forefathers and old aged generations and they pass to the next generations. But, in the present context, the young generations is in dualism and confusions, whether they stick to the traditional and indigenous knowledge systems or go for adopting new one modern or western knowledge systems. But in the present context, study found out that the young generations is not serious about the preservation of the old techniques, arts, skills of old aged people. These cultural heritages and indigenous knowledge systems are in crisis and in endangered positions. Due course of times, their knowledge, wisdoms, skills, arts, tools, techniques are not properly documented and not incorporated in the policies and planning on the one hand, and on the other hand, this knowledge system is undermined and neglected to incorporate in the natural resources managements and agricultural policies. Instead of incorporating old aged knowledge, wisdoms and experiences of the local people, as results, the new modern, technologies are adopted and the same techniques are imposed upon the tribal communities under the name of modernization and development of agriculture. Hence as result of this, new modern technologies are not only replacing old, traditional tools and techniques of the local tribal communities, but also their skills, arts and wisdoms. Thus, Modernization of agriculture is posing major challenges on the sustainability of the traditional cropping patterns, indigenous knowledge systems and local varieties of the tribal communities in this region. Thus, there is urgent

need to document and explore such endangered indigenous and traditional knowledge systems of the local tribal communities.

## Methodology

The present study was undertaken in the identified six tribal villages of the Nanded and Chandrapur Districts of the Gondwana region of the Maharashtra state. Historically, Gond, Kolam and Pardhan tribal communities have been residing in this region. The sample selection of the study made at three levels, first, the tribal districts are identified then second tribal villages and third informants. In the view of study setting, six tribal villages are identified for the in-depth studies. All these six identified tribal villages are selected on the basis of the following criteria such as, coverage under the *Panchyat* Extension to Scheduled Areas (PESA). Under this act, the tribal people are given more freedom to take decision for their own development at Panchyat levels. Coverage Under the Tribal Sub-Development Plan (TSP) Plan, these tribal villages are linked with the developmental projects and attached to the Integrated Tribal Development Project (ITDP) and in the present context, Traditional Forest Dwellers and Tribes are covered under the Forest Right Act, 2006, (FRA) are allotted for *patta* on their names and they are linked with the agricultural department. However, some of them got *patta* under this act for cultivation. Thus, by looking all these issues in the mind, study made attempt to cover the tribal villages for in-depth studies in detail. Despite these administrative initiatives, plans and programs, this region has its own history and culture. The Gond was dominated tribe in this region; therefore, this region is identified or called as Gondwana region after the name of Gond. The Gond was the ruler of this region. The Pardhan was administration secretarial of the Gond. The Kolam played as role of Priest in the socio-cultural and religious activities and functions of the Gond tribe. However, these three tribal communities have socio-cultural some linkages and similarities having maintaining their own distinctive features. However, here this study will make brief attempt to explore and document the traditional crop protection techniques of these three tribal communities in the present contexts which are in crisis and endangered positions. In the present context, the people are more worried about the nutritious and healthy foods, fruits and vegetables without containment of fertilizers, chemicals and pesticides. However, still the local tribal communities living with very close to the forest, agriculture and nature. These people have still possessed indigenous ways, seeds, traditional knowledge, arts, skills and techniques of protection of indigenous methods and varieties of crops. They developed their own methods and way of doing agriculture and preserved and conserve the indigenous and traditional techniques of crops protection in their regions, thus, this study has very wide scope to document such knowledge for the future generation for sustainable development and growth. Therefore, study made attempt to use purposive sampling method to select tribal villages of Gond, Kolam and Pardhan communities of this region on the above criteria. In this view, this study selected six tribal villages of this region. Out of these six tribal villages, three villages are identified from the Kinwat block of Nanded district and other three villages are identified from the Jivwati block of the Chandrapur district of the same region.

The researcher has field exposure of this region from the last one decade. However, for this research study, qualitative methods are used. Six field visits are arranged, one visit in each village. At initial stage, the attempt is made to identify the following six tribal villages of the Gond, Pardhan

and Kolam villages named (Pseudonym names) Bhavpur, Ravpur and Shyamguda from the Jivwati block of the Chandrapaur district and Kazipod, Kolamkhed and Bhimguda from the Kinwat block of Nanded district. All these tribes of these villages are cultivators and doing allied occupations to agriculture. The old aged farmers, experienced informants and key informants are identified for in-depth interviews and interactions from these selected six tribal villages of this region. Six focus Groups Discussion (FGD) were conducted in the all studied villages. One FGD was conducted in each tribal village. The major focus was given to explore their personal and group experiences, wisdoms on the agricultural activities, land preparations, sowing, cropping, harvesting, pest managements, protections and marketing. Case studies were gathered of farmers of elderly aged people of these communities; their traditional practice of crop protection and grains store preservation techniques were given major focused. As, it is seen and observed in this region that these three tribal communities are depended upon on the agriculture, forest, local resources and daily wages for their survival and livelihoods. These communities developed their way of livelihoods pattern on the basis of the local resources in this region. Thus, they have individual and personal experiences, wisdoms and knowledge about the different uses of the local varieties such as seeds, crops, fruits, vegetables, medicinal plants and so on.

### **Crop Protection**

Here the major concern for the discussion is crop protection as it includes indigenous knowledge as well as it also is significant for the crop production which meets the ultimate basic necessity of the tribes. Pertaining to the history of crop production Glass and Thurston (1978) noted that, according to archaeologists' crop production began between 8,000 and 10,000 years ago, with maize, beans, or cucurbits in the Americas and wheat, barley, and peas in the Near East. Interestingly, pertaining to crop protection Zadoks (2007) opined that crops and their pests are the products of domestication, the ancestors of the pests still exist in nature. He further says that old cropping systems had man-made ecological sustainability but do not have economic sustainability in modern time. According to E. H. Glass and H. D. Thurston (1978), traditional agriculture entails known and unknown crop protection practices. They further opined that studies on various practices of traditional crop protection are significant in modern agriculture.

Pertaining to the history of crop protection F.E. Dayan et. al. (2009) noted that, the need for large-scale food production in specific areas emerged as nomadic hunter-gatherer populations began settling into more permanent communities. For thousands of years, agriculture depended largely on crop rotation or mixed planting to enhance natural pest control. As a result, the idea of 'natural pesticides' developed early in agricultural history (4022-4025). There is long history of crop protection is practiced from the past and have been unrecorded. Pertaining to the significance of crop protection for agriculture is must as Edson (1980) noted that, crop protection methods and materials can boost productivity by preventing yield or quality losses from pests and by improving the efficiency of labour and machinery (93). Agriculture as a whole is very much challenging as it involves a number of factors which ultimately contribute in the production, hence on the same line, Edson (1980) noted that, In agriculture, any factor that negatively impacts germination rate, plant establishment, growth, maturation, crop yield, harvesting speed and effectiveness, storage durability before processing or consumption, crop quality, or the performance of future crops is considered counterproductive. These

effects can result from the presence of annual and perennial weeds and grasses, as well as attacks by insects, nematodes, mollusks, rodents, or birds, or infestations by fungi, bacteria, or viruses. These competing organisms are, for all practical purposes, as permanent as humans. When their populations and impacts become a threat to agriculture, swift, effective, and sustained control is essential. Failure to manage them, or the inability to do so, can lead to financial hardship or even hunger, along with their associated consequences.

### **Various Ways of Crop Protection**

It has found that there are various ways of crop protections; they are evolved over the period of time. Hence, there is need to see present types available for crop protection, as Edson (1980) discusses three types of crop protection i.e., physical, biological and chemical. In physical, he writes that we can aim to control the crop's environment so that it offers a least level of attractiveness to resident or incoming pests. This includes mainly physical acts, concerning seeds, soil, water or wet vegetation, all coming under the heading of good husbandry and hygiene on the farm. In biological, several control methods are under thorough investigation, with some already in practical use, that leverage biological strategies—often based on the principle of using one organism to control another, much like “setting a thief to catch a thief.”(Edson 1980: 94). The third chemical control, the use of chemicals is carefully selected to control unwanted organisms while ensuring crop safety. This is achieved through factors such as the chemical composition, precise placement, timing, dosage, formulation, or a combination of these elements. Here the major concern is that along with the modern agricultural crop protection traditional crop protection is always sustained with the agricultural farmers since from time immemorial and its emergence is based on indigenous wisdom. To record indigenous crop protection by Gond, Kolam and Pardhan is necessary at present context.

### **Traditional Crop Protection Techniques**

Before understanding the tribal crop protection techniques, it is necessary to see how traditional techniques are evolved, and on the same line, Glass and Thurston (1978) noted that most traditional crop protection systems evolved through centuries of trial and error, natural selection, and careful observation, relying on empirical knowledge and experience. Interestingly, Conklin's (1954) account of a primitive tribe's agriculture in the Philippines suggests that traditional farming holds valuable knowledge on crop protection: it has been noted that, shifting cultivators possess remarkably extensive, precise, and practical knowledge of soils, food plants, and cropping techniques, for instance, the Hanunoo, an indigenous mountain people of Mindoro in the Philippines, classify soils and minerals into 10 basic and 30 derivative categories. They understand the suitability of each type for different crops and recognize the impacts of erosion, exposure, and over cultivation. Their agricultural knowledge includes a repertoire of 1,500 useful plant species, with 430 being cultivated, and they can identify subtle variations in plant structures.

However, in the case of India, there are very few studies available on traditional crop protection techniques in India i.e. a study by Narayanasamy (2006) in Tamil Nadu covers very significant information on traditional crop protection techniques by tribals. Pertaining to the use of locally available resources which helps in crop protection Narayanasamy (2006) noted that, to safeguard their

crops in the field and during grain storage, tribal communities have traditionally used various plant-based materials, crop residues like husks and ash, and animal products such as red earth and cow dung. A study observed that tribal groups in Tamil Nadu cultivate a diverse range of crops, tribes such as the *Kurumbas*, *Irulas*, *Todas*, *Kotas*, *Mullakurumbas*, and *Panias* practice intensive farming, incorporating various agricultural techniques. Tribal women play a key role in selecting seeds, storing food grains and tubers, and safeguarding them from insect infestations. Pertaining to women contribution in crop protection Narayanasamy (2006) noted that especially *Malayali* tribal women have developed simple and useful indigenous methods of selecting the seeds and protecting them from the pests and the diseases. In all the *Malayali* tribe houses, *attis* is a common structure where seeds are preserved (64). Pertaining to grain pests Narayanasamy (2006) noted that, “major store grain pests like rice moth, red flour beetle, pulse beetle and rice weevil could be tackled effectively with certain tribal pesticides” (67).

It is evident that effective crop storage is essential for maintaining a stable domestic food supply while preserving seed quality and vigor (Asogwa et al. 2017). On the other hand, it is also noted that insect pests are a major factor in reducing the quantity, quality, and germination potential of stored seeds, making proper storage essential. Storage facilities not only ensure a steady food supply between harvests but also allow farmers to increase their income by storing crops and selling them at higher prices when demand exceeds supply later in the post-harvest period (Asogwa et al. 2017:81). It is important to note that a diverse range of food preservation techniques is practiced worldwide, influenced by various factors. Many of these techniques are based on common physical principles, including heat transfer, moisture removal, and the prevention of enzymatic and chemical reactions (Joardder and Masud 2019). Glass and Thurston (1978) noted that there is a vast, untapped reservoir of knowledge on crop protection in traditional agriculture that remains to be explored and documented. It is essential to study and learn from the practices of traditional farmers. Thus, it has been pointed out by the earlier studies of the scholars that crop protection techniques are specific to the region wise and communities wise. Similarly, Gond, Kolam and Pardhan tribes from Gondwana region has developed their own crop protection and preservation techniques based on their indigenous wisdom, this wisdom of Gond, Kolam and Pardhan from Gondwana region of Maharashtra is still unexplored hence in order to meet this gap and attempt was made under this study to record traditional crop protection techniques, are discussed as follows:

### ***Pre-Harvesting Crop Protection and Preservation Techniques by Tribes***

The local tribal communities like Gond, Kolam and Pardhan have developed their own agricultural seasonal calendars. They have their own season wise calendars based on their traditional wisdoms, experiences and knowledge. It is seen and pointed out that these three tribal communities have used their age-old indigenous wisdom and developed their own indigenous crop protection techniques, it is noted that with the help of this indigenous crop protection techniques they keep pests away from their indigenous crops. Most of the tribal farmers from Gondwana region believe that their indigenous crop protection technique is cost effective and easily available in their surrounding area. As it was said by the old aged tribal farmers of this region that these tribal farmers were self-sufficient in the early days, but in the present, they are depending upon the agricultural markets. In the early days, they

used to cultivate for their own consumptions not for markets. But now they are shifting their way of production from substance agriculture to markets. They also used to follow multiple cropping patterns and indigenous green pests for controlling attacks on their crops. But in the recent era, they are using mono cropping and cash cropping patterns in their lands. They did not depend upon the markets in the old days. They preserve their own indigenous seeds for sowing and harvesting. Still, the old aged farmers of these communities have preserved different kinds of local varieties of the indigenous seeds of *jowar*, *dhan* (rice), *tur* (Pigeon pea), *mung*, *udid* (black gram) and *mirchya* (Chilli) and *vange* (brinjal).

There are a number of pests' attacks on crops grown by tribal like Gond, Kolam and Pardhan. Some of the pests they mentioned and known locally as *Burshi* (Fungus), *Kohodkida* (root eating insect), *Bond ali* (insect on cotton boll), *Lashkari Ali* (Insects on leaves) etc., they attack on the crop and destroy it. Gowardhan, and elder person of 70 years old from Chandrapur shared information on the possible conditions when pests get active and attack on the crop like when there is a cloudy whether it create humid climate which leads to emergence of *Bond Ali*, hence, considering the climatic condition we need to intervene with pest control.

During the study it was found that there are many locally available resources which have been used by tribes as pest's controllers. Some of them are like ash of the burnt wooden is used for the soil's good health. *Cow urine, cow dung and jaggery* is mixed and used as crop growth promoter in the fields. *Garlic, Chilli, cow urine, cow dung mixture* is used to deal with keep away disease like *mava and tududa*, it is believed that crops blackness goes away. *Dashparniprayog* (mixing 10 type of tree's leaves extract) in this indigenous pesticides tribes from Gondwana region takes ten types of trees leaves i.e., *Sitafal* (*Annona squamosa*), *Karanja* (*Millettia pinnata*), *Besram* (*Ipomoea carnea*), *Papaya*, *Nirgudi* (*Vitex negundo*), *Kadu Nimb* (*Azadirachta Indica*), *Pipal* (*Ficus religiosa*), *Yerandi* (*Ricinus communis*), *Tambaku* (*Nicotiana tabacum*), *Bhoilimb* (*Andrographis paniculata*), leaves form these plants are taken and mix together. The extract is used for spraying in the fields, as a result it helps crop grow well. Gond, Kolam and Pardhan tribes use cow dung water and spray it for the crop's growth. Another pest controller is *Nimboli Ark* which is also sprayed to control the pests on the various corps throughout the year. Thus, these local tribal farmers have knowledge about the medicinal values of the different types of local varieties. They preserve and conserve such varieties in their agriculture and forest. They protect and also worship them. Despite the use of medicinal plants, they also used to keep pet animals for making land fertile. It is seen and observed in this region that still Gond, Kolam and Pardhan keep cows, ox, goats and sheep. These tribal communities worship land in form of mother earth. They started their each and every agricultural functions and operations with the worships and pujas. These farmers are well aware of the soil's health hence, they allow ships and goats to stay for certain duration on their farm, doing this they believe that the ships and goats urine and dung increases the fertility of the soil. There is the widely spread problem of rats in the farmers all farmers from across the globe face this problem. Gonds, Kolam and Pardhan tribes of the Bhilgaon, Limguda and Jawarla villages from Kinwattribal belt of the Nanded district through *Pandharfali flowers* in the fields, doing this they believe that it keeps away rats from the fields.

Animal as foragers, especially entering *Harin* (deer), *Rohitad* (Nilgai), Pigs in the field amajor problem for the tribal farmers as they are very close to the forest, hence to ward off these wild

animalsGond, Kolam and Pardhan burn the chilies in the farm, as they believe that this ward off animals especially deer's because its smell. To keep away from the agricultural crops from the attack of animals, they used to do this practice to save their crops from the attacks of these animals. It is evident that soil's health and crops growth and diseases are well understood by tribes and hence in order to deal with various problems associated with crop cultivation, whether it is diseases, pests attack, or soils health is taken into consideration throughout generation and indigenous wisdom have helped them in crop protection. It is also seen that the above indigenous crop protection techniques play vital role in pre harvesting and is employed by the tribes from Gondwana region which also has significance in farming.



**Fig. 1: Saree and Jhilli(A Glittering Film) Protection From Birds and Pests**

(Source: Field Work, 2024)

It was observed that fencing the *Katnis* Jowar crop with old saree's saves crops from the attack by the pests which may cause potential harm to the crop production. It is seen and observed in this region that local tribal farmers used this method to protect their *jowars*, *turs*, *mug* and *udits* in the seasons. It was observed that this is common practice in these studied two districts Nanded and Chandrapur. Many Gonds, Kolam and Pardhan farmers from Babapur, Kolamguda, Pimpalga on villages from Nanded and Chandrapur districts apply this technique to save their Jowar crop from pests. Tribal farmers believe that sarees prevent entrance by the pests and becomes a shield for the crop. On the other hand, *Jhilli* the glittering film is tied on the wooden poles, on the surrounding side of the crops is fixed. It is believed that it prevents the birds from entering into the fields as the glittering plastic film ward off birds and wild animal in the night due to its visuals and noise. Another, locally crop protection is well known that is scarecrow known as *Bhujadi*, it is installed to ward off birds from entering into the fields.



Fig. 2: Scare Crow *Bhujadi*

(Source: Field Work, 2024)

### *Post Harvesting Crop Preservation and Protection Techniques*

**Case study 1:** Ramrao, a 70 years old Gond person from Kazipod (Pseudonym) shared traditional grain protection techniques they could prevent various pests called *Kide* (Pest on grains) and *Burshi* (Fungus on the grains). Ramrao said that earlier people had *Dola* which was a cylindrical or squire shape bamboo grain storage container. The container is plastered with a mixture of mud and cow dung to prevent leakage and pilferage of grains. The top is also covered with mud and cow dung mixture or gunny bags cover for added protection.

Ramrao also shared another food grains preservation technique known as *Pev*, it is important to note that *Pev* is no more in use now a days because of the ample of plastic and iron made containers in the market. According to Ramrao, *Pev* is an underground structure or simple pit used for storing grains, especially Jowar. For making a *Pev* a pit in cylindrical size was dug with the help of spade. There used to be 3 feet of width and up to seven feet of height of the *Pev*, the single *Pev* had a storing capacity of up to one quintal. The *Pev* was dug in Murrum soil that is laterite soil. Filling the *Pev* with Jowar and covering it with placing wooden sheets on it and then soil. According to Ramrao there used to be two to three *Pev* in one farmer's farm and it was very difficult to find them once it was covered with soil. *Pev* could store Jowar up to three years. Jowari stored in the *Pev* was not used as seed but as food supply for the household.

For seed preservation Ramrao shared another technique known as *Ghogurli Pan* covering (Jadhav 2024), the *Ghogurli* is a tree, and its leaf extensively used for the seeds storing, it has a potential of preserving of seeds for up to three years. *Ghogurli* was used by tribals of Gondwana region. Before

putting seeds into *Ghogurli* leaves seed grains were systematically separated from the plant heads ensuring that the seed does not break into pieces. Women used to beat Jowar heads with wooden sticks to get the grains separated; in fact, this was one way of traditional threshing. The seeds collected from beating threshing were only used for preserving in the *Ghogurli* leaves. Seeds up to four kilograms could be stored inside the *Ghogurli* leaves and it were packed using bamboo stems. The covered seeds were kept on the roof of the hut. According to Ramrao the *Ghogurli* leaves have potential to prevent any attack by pests. However, now a day's people have completely abandoned using *Ghogurli* leaves for preserving the seeds.



**Fig. 3: Traditional Dolla of Gond, Kolam and Pardhan tribes in Gondwana Region**

(Source: Field Work, 2024)

*Dori* (rope) covering Indigenous Technique, Ramrao also shared another *Dhan* seed (Paddy) preservation technique. In this technique tribe from Gondwana region used to take *Dhan* leaves, golden and brown colour, leaves and stems of the Paddy crops were used for weaving a rope out of it. The rope was placed in a round shape making sure the structure becomes cylindrical in shape and inside this structure *Dhan* seeds were kept for the next sowing season. *Dori* covering was very effective and had a potential of preserving seed up to three years. The irony is that this preservation technique is no more in use by Gond, Kolam and Pardhan. According to Asogwa et al. (2017), drying is one of the oldest and prominent methods of food preservation. Drying can be in the form of the ordinary sun drying which involves spreading the food material on the bare grounds, road sides or on the roof tops. However, sun drying is a key traditional and inexpensive method of food preservation. This is because of its versatile application to numerous foods. Almost all food items can be sun dried tubers, cereals, vegetables, fruits, fish, meat etc. (78). Same is the case with Gond, Kolam and Pardhan tribes from Gondwana region they have adopted sun drying technique since from time immemorial.



**Fig. 4: Brinjal Seeds are Dried for Next Sowing**

(Source: Field Work, 2024)

Gonds, Kolam and Pardhan from Nanded and Chandrapur have sun drying practice. There are various crops like *Jowar*, *Dhan*, *Tur*, *Udid* etc., are dried using sun. This practice is since from time immemorial and is still in the practice. The practice sun drying by tribal involves no cost of preservation.



**Plate 5: Barbati Beans Sun Dry**

(Source: Field Work, 2024)

It is seen and observed in these villages of this region that, the local farmers gathered indigenous seeds of the local varieties and preserve them for future use. Even they gathered plenty amount of the

seeds, fruits and vegetables in the seasons and they use the same dry fruits, vegetables in the period of food crisis. Even today, these old generations' people did this practice. It is pointed out that mostly, these families did not depend upon the markets for purchasing seeds of local varieties such as *brinjals*, *chillies*, *turs*, *mugs*, *udits*, *jowars*, *channa* and other vegetables and they used their own preserved seeds in their lands.

## Discussion

In the present context, this study pointed out different types of patterns of pre and post harvesting crop protection techniques of these tribal communities in this region. It is seen and pointed out in this region that these three tribal communities are depended upon the agriculture, forest, local resources and allied occupations. However, some of them have ownerships of the *patta*, but size of the land is not sufficient to meet their needs of the all-family members. Some of them are struggling to regularize *patta* of the land under the Forest Rights Act, 2006. Some of them are landless and they worked as wage labourers in the land of the other cultivators in agricultural seasons. In agricultural off season, they worked in construction site, brick kiln factory and wage labourers. Despite this, those tribes are very close to the forest cover and the same forest has resources in the same agricultural off season, they gathered Non-Timber Forest Products (NTFPs). But due to the deforestations and degradation of the forest cover, they are facing to get sufficient forest resources as they used to get in the past. In addition to this, Forest department posed many rules and regulations on the entry of the tribes in the forest for shifting cultivation, gathering forest products and hunting. As result of this, these tribal communities are migrating in search of alternative livelihoods sources in other places. However, agriculture is depended upon the rainy seasons, it was observed that there was lack of irrigation facilities and lack of agro based industries. Therefore, the tribes of Kinwat block of the Nanded district migrated to the Telangana neighboring state for daily wages. The tribes of Jivwati block migrated to coal and mining industries for work after the *Kharip* season. Thus, agriculture and forest department has failed to generate employment in this region for the local tribal communities. However, the old aged tribal farmers those have emotional attachment with the local agriculture, these tribal people still possessed indigenous knowledge and wisdoms related to the agricultural operations. However, the youth and younger generations of the tribal communities are not also interested to do work in the agriculture. It has been pointed out issues of the tribal youth of this region that they are not interested in the gathering forest resources and doing agriculture in traditional ways. On the other side, agricultural markets have intervened in this region to provide modern tools, techniques, equipment, implements for doing agricultures. As result of this, the young generations moved and shifting from indigenous knowledge systems to the modern or commercial agriculture. However, study pointed out that the younger generations of these tribal communities are using modern tools, implements, fertilizers, pesticides in their agriculture. They are also moving towards the mono and cash cropping patterns in the present context. Despite these field-based facts and realities, there are some old aged and middle-aged tribal farmers still they are interested to preserve and protect the indigenous seeds, tools and techniques. Still, there is hope to document and preserve this cultural heritage and indigenous knowledge from this generations and pass to the future generation. Because this is the last old aged generations who have possessed this knowledge, wisdom and techniques of protection and preservation about the local

varieties of seeds, cropping patterns, indigenous knowledge and techniques about water sources, land fertility, manures and green pesticides. If we failed to document these knowledge systems, we will lose the heritage and old aged wisdoms of our forefathers. Thus, there is need of the time for achieving goals for sustainable development and maintaining fertility of the land, there is need to go for organic farming by following indigenous ways and techniques. There is urgent need to incorporate this knowledge in the existing policies related to the agriculture, forest, water and land management. It is seen and pointed out that the earlier policies had neglected to incorporate the indigenous knowledge, wisdoms and experiences of the tribal people. Their knowledge and experiences are sidelined and undermined by the planners and policy makers. But now there is need to incorporate people's participation and followed bottom up of approach in natural resources managements.

### Conclusion

Tribes especially Gond, Kolam and Pardhan from Gondwana region have their own ways of dealing with crops issues in doing agriculture as major livelihood source of their survival. They have displayed their wisdom through various traditional techniques they employ for the crop protection in the farm. They have major challenges for the crop protection during different climatic condition which makes them alert for taking appropriate measures to deal with various pests. The traditional knowledge of Gond, Kolam and Pardhan have helped them in using local resources in crop protection various plants leaves and locally available resources are economically viable options for them. However, there is a need further detailed studies on these various traditional crop protection techniques as its written record is not available for tribes belongs to Gondwana region of Maharashtra. The various traditional crop protection techniques of Gond, Kolam and Pardhan are indeed a sustainable solution for various agricultural problems. However, in the present context, the local farmers are under the overburden of the input's expenditures on the agriculture. If these indigenous traditional techniques are explored and documented properly that can be used easily in the present context to control the attacks on the cropping patterns and help to maintain sustainability and fertility of the land. By using more doses of the fertilizers, pesticides, the land is saline and becoming unfertile in the present context. In this view, the indigenous techniques are suitable and helpful to maintain the fertility of the land. These indigenous techniques are not also harmful to the other species and biodiversities. These techniques are sustainable and easily available to the local farmers. The policy makers and planners have to strengthen these indigenous systems based on the local knowledge, wisdoms and experiences of the farmers to protect their crops. Thus, there is need to explore and document such multiple techniques of the local tribal communities across the states and communities for reestablishing the sustainability of the Indian agriculture.

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