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INDIGENOUS KNOWLEDGE AND BELIEF ON RICE FARMING IN EASTERN INDIA

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ABSTRACT

One possible missing link in integrated Crop Management strategy is inadequate involvement of indigenous technological knowledge (ITK). These technologies have developed through wisdom and experience of ancestor farming community keeping in view of the available farm resource as well as technologies needs for a locality/region. Further, the traditional technologies are eco-friendly because of being free from use of chemicals. Rice is the most important crop in eastern India. The paper documents some ITKs and belief in rice cultivation in eastern India.

INTRODUCTION

Integrated Crop Management is the ultimate panacea for sustaining the high level agricultural production. However, one possible missing link in this strategy is inadequate involvement of indigenous technological knowledge (ITK). The merit with this know ledge is that it has developed through wisdom and experience of ancestor farming community keeping in view of the available farm resources as well as technological needs for a locality/region. Further, the traditional technologies are eco-friendly because of being free from use of chemicals. It is an imperative need for sustainable agriculture. Hence, ITK should form an integral part of Integrated Crop Management. The agricultural problems and available resources are largely location specific. Hence, the traditional technologies are often location specific.

METHODOLOGY

As part of the field experience training programme of the author at Orissa University of Agriculture and Technology, Bhubaneswer, 25 farmers were selected from the adopted village of the university and another 25 village from the non-adopted village in Puri district, Orissa. In addition to these farmers, local leaders and village agricultural Workers (VAWs) were also consulted about the indigenous agricultural prevalent in the region and their merits. Information was also collected from other farmers and my experiences during field visits around Central Rainfed Lowland Rice Research Station, Kharagpur, West Bengal and Regional Rainfed Lowland Rice Research Station, Gerua, Assam, besides experiences in my village.

RESULTS AND DISCUSSION

Selection of seed

Farmers select the bold grains for seed purpose. Fields having healthy crop growth are selected for this purpose. Second selection is done in the threshing floor. While threshing manually, the bold seeds those are easily shattered by the first two beating operation are considered. This process is effective in separating out the partially filled and diseased grains. The seeds selected by this process high vigour. Storing of rice seeds in containers made of paddy straw (Straw bin).

Due to high rainfall and high temperature, the relative humidity is high in Eastern and North-Eastern stated. These weather parameters encourage the build-up of storage insect-pest, pathogen and mite population leading to the deterioration of seed viability. It has been observed that paddy seeds stored in straw bin posses better viability than the seeds stored in gunny bags. This difference is more I years receiving high rainfall during summer season, which is the period for seed storage. Several layers of paddy straw covering the seeds act as barrier for circulation of atmosphere are into it. Thus, the atmospheric air with high humidity does not enter into the seed mass. This microenvironment with low humidity helps in decreasing the pest activity and hence, maintaining the seed viability for a longer period. Experiment conducted by Sahoo et.al., 2002 shows that temperature and humidity fluctuation of the seed mass inside the straw bin is less as compared to that inside gunny bags.

Sowing time for deep and semi-deep water rice

Direct seeding largely raises deep and semi-deep water rice crop. Time of seeding the critical input deciding the success and failure of this crop. Farmers growing deep-water rice in Puri districts of Orissa decide the sowing time based on age-old experiences.

(a) Sowing time based on frequent flying and high pitch sound made by mole cricket (Gryllotapa Africana): It has been observed that mole cricket come out of soil and frequently fly from trees to trees. During flight, high pitch sound is created due to rubbing of legs with the wings. This biological change is very much perceptible due to frequent high pitch sound and usually occurs during May in coastal Orissa. Farmers sow the deep and semi-deep water rice when the mole cricket starts creating sound in the month of May. This may be due to sensation of this insect to rainfall in near future and change in weather. It has been observed that this insect makes it's presence in the month of April in Assam indicating the early advancement of monsoon and early sowing of Bao rice which coincides with the real situation.

(b) Sowing based on the initiation of flower bud in Tamarind (Tamarindus indicus) tree: Some farmers start the seeding operation of deep-water with the onset of flower bud in Tamarind plant. There may be some biological sensing by Tamarind plant to the advancement of monsoon wind.

Beushening in direct seeded lowland rice (Oryza sativaL)

It is the traditional practices of running a light plough across the rice field in standing water (15-20 cm) condition followed by light laddering. It is popularly known as Beushen in Orissa and Baug/ Bidauni in Bihar (singh et.al., 2000). It is practiced around 30 days after germination of rice seed in direct sown situation. The broadcast seeded rice invites more weed pressure as compared to transplanted crop because under direct seeded condition the seeds of rice and weed germinate almost at the same time the weed pressure is more in direct sown shallow and intermediate lowlands and hand weeding is drudgery in broadcast seeded crop. Moreover, rainfed lowlands are prone to drought and submergence. In such aberrant rainfall situation, transplanting is not feasible. Hence, Beushening technology is appropriate for broadcast sown crop under rainfed shallow and intermediate lowland situation. The benefit from Benefits from Beushening include (i) Thinning of crowded seedlings: under rainfed situation, high seed rate is used to cope up with aberrant rainfall. In the event of normal rainfall, seedling density becomes high. Even in the same field, the seedling density is not uniform due to uneven distribution of seed or soil moisture at the time of germination. Wet ploughing and laddering are effective in reducing the plant population to an optimum level. (ii) Weed control: Ploughing followed by two to three laddering is sufficient to incorporate the weeds. Echinichlora spp. Are very problematic for rice crop because of high density and similar morphology as that of crop plant making it difficult to distinguish and weed out. It has been reported that Echinichloa spp are highly susceptible to Beushening (Rautaray, 1994). (iii) Stimulated root growth and enhanced tillering: Beushening loosens the top soil. Roots get damaged and new roots are promoted. Plough helps in releasing nutrients from soil and decomposed weed mass. New roots become active in uptake of the available soil and decomposed weed mass. New roots become active in uptake of the available soil nutrient and enriching the mothe culm. This leads to enhanced tillering. (iv) Low labour and fertilizer requirement: Labour requirement under Beushening is less because of the saving made during various farm operations viz. weeding, nursery raising, puddling and transplanting. The problem of non-availability of labourers during peak transplanting is not faced under Beushening because the cultural operations are spreadover long period of time. In this system, fertilizer requirement is also because thye crop can use the nutrient released from the soil with initial wetting (Buresh et al, 1993). Also, the decomposed weeds and seedlings supplement the nutrient requirement. The long, duration rice varieties are suitable for this system, which require less fertilizer. (v) Less insect-pest problem: during wet plough and laddering, the initial pest population and eggs mass on rie plant is destroyed. The pests thriving on weeds (alternate host/collateral host) are also damaged. (vi) Stable yield: the system facilitates minimum assured yield even grown under uncertain climatic conditions and with low inputs (Singh et al, 2000). (vii) Beneficial effect on post rice crop: soil physical conditions are better under direct seedling as compared to transplanting. Better soil condition is especially desirable for upland crops like legumes. Beushened crops are harvested two weeks earlier than the transplanted crop facilitating early establishment of Rabi season crops.

Double transplanting of rice seedlings

Double transplanting (popularly known as Kharonha in Bihar) is a method for seedling multiplication under seedling scarcity situation (Anonymous, 1997). This situation usually arises when the established crop is damaged in field due to flood. Long duration photoperiod sensitive rice varieties are suited for this purpose. For Lower Assam situation, photoperiod sensitive rice varieties flowering in the last week of October are ideal. Seeds of suitable varieties are sown in nursery in the month of June and transplanted at one-month age in the second nursery. This second nursery should be in shallow lowland, where the seedling is free from the risk of damage by flood. As the objective is to multiply the seedling, hence, the transplanting in second nursery are uprooted. Hills are splitted in to small ones, each containing 2 tillers. Such small hills are transplanted in the main field. Even in absence of flood, seedling, raised through double transplanting technique and used at about two-month stage performs better than the normal seedlings transplanted at one-month stage. In delayed planting situation, it is not possible to maintained seedling health for two to three months in the same nursery due to overcrowding, nutrient deficiency and incidence of diseases like brown spot and leaf blast. Thus, double transplanting is desirable as contingent measure in flood prone lowlands of eastern India. This technology can be applicable for rice hybrids, because their seeds ate cost prohibitive (Hussan and Siddiq, 1988).

Water management

(a) Frequent croaking by frog: this indicates happening of rainfall and accordingly farmers schedule their irrigation and drainage practices. It is observed that this indigenous belief is largely true.

(b) Drainage in morning and irrigation in the afternoon to Boro rice: In Boro season, low temperature (Daily minimum temperature of 5 to 10 0 C) in the North East region and North Bihar severely restricts growth and subsequently leads to death of rice seedlings in nursery. In order to partly overcome this problem, farmers irrigate the rice field in the afternoon and drain away the cold water in the morning. Water is having very high specific heat (1 cal/g/0C) as compared to soil. Hence, it absorbed more of solar energy during daytime as compared to soil. Due to high specific heat, water gets cooled slowly and hence, keeps the plant warmer during night. By morning, water gets cooled and its drainage helps exposure of soil to direct sunlight and fast warming up.

(c) Removal of dew from the canopy of the rice seedling in the morning with the rope or dew stick : Dew is the consideration of water vapor from atmosphere due due to low temperature Removal of this cool water from the canopy may be beneficial in reducing the cold injury. Farmers in North

Bihar remove the dew deposits on rice seedling daily in the morning with the help of stick or rope. The atmospheric dew deposit and the plant water exuded through guttation are fallen on to the soil surface in the nursery area. This may be helpful in increasing then moisture content of soil. As moist soil has more specific heat as compared to dry soil, the former may be helpful in overcoming the cold injury.

(d) Running water in rice field helps in higher yield than in stagnant water situation: Farmers in the coastal district believe that rice growth is better in years in which water flows from field to field than in years in which movement of water from field to field is restricted. This may be due to partial washing away of salinity with the running water.

Mixed sowing of Ahu and Bao rice in flood prone rainfed lowlands

Farmers in Assam follow the practice of Mixed sowing of Ahu (Pre-autumn upland rice) and Bao (Semi-Deep and Deep water rice) rice in flood prone rainfed lowlands. This provides an insurance against the total crop failure in the event of aberrant rainfall in terms of time of occurrence with respect to crop growth stage or total amount and its distribution, finally leading to drought or flood. In the years of early season deficit rainfall and slow rate of water accumulation in field, the drought tolerant Ahu rice becomes successful and the Bao crop fails. However, if there is early season flood, then the flood tolerant Bao crop survives and the Ahu crop perishes. In the years of early and normal rainfall, both the Ahu and Boro rice become successful. Hence, mixed cropping of Ahu and Bao provided a minimum assured yield in the event abnormal rainfall situation.

Rice-cum-fish culture to increase the farm income and provide balanced nutrition

In Eastern India, water stagnated in the lowlying rice fields for prolonged peiod of 3 to even 8 months and provide favourable habitat for fish farming. Farmers in this region adopt Rice-cum-fish culture to utilize the natural resource of stagnating water. This system is also practiced in Apatani valley in Arunachal Pradesh since time immemorial (Melkania, 2001). The paddy fields with one to two feet standing water, locally known as Pani kheti are used for this system. In Eastern and North Eastern India, the population of cattle, goat and sheep is low. The general health of these animals is also poor in this rainfall region of India. Fish protein is the solution to milk and meat and rice-cum-fish culture provides ample scope to increase fish production.

Control of stink bug/Gundhi bug (Leptocorisa varicornis Fabrians and L. acuta Thunberg) of rice

Both nymphs and adults of stink bug suck the milky sap of tender rice grains. Affected grains in the panicle turn in to chaff and look white. Often the crop is damaged completely if control measure is not adopted in time. Hence, this pest is of economic importance from flowering to milking stage of rice crop. The pest is active from May to October coinciding with high atmospheric temperature and humidity. Weeds, volunteer rice and wild rice act as collateral host for this pest. Round the year rice cultivation in lower Assam also favours their perpetuation. This pest assumes special importance in upland rice because of the early flowering of the crop. Also, the upland ecosystem harbors high weed populations that act as host for this pest. In Assam, Boro (November/December-April/May), Early Ahu (January/February - April/May), Ahu (March/A[ril - June/July) and Sali (May/June - September/October) season rice are affected by this pest. Long duration Sali rice varieties and Deep water rice varieties, which flower late in the season (November), are relatively free from the incidence of this pest. Since, this pest damage the crop at flowering and early grain filling stage, spraying of insecticides is not desirable from the residual toxicity point of view. In rice-cum fish culture, spraying/dusting of insecticides can kill fishes in areas nearby apiculture. Further, indiscriminate application of pesticides is not desirable because of their adverse effect on natural enemies of many insect-pests. The problem of pest resurgence arises due to development of resistant biotypes against the repeated use of a pesticide. Considering the environmental aspects, the tradition non-monetary methods for managing stinkbug in pre/early flowering stage of rice crop are described below.

(a) Trapping with rotten crabs of eels/Kucha/Kochia (Amphipuous cuchia) : Control of stink bugs by using trap made of rotten crabs or eels is interesting. In this method, dead eels or crabs (after breaking the shell) are hanged in rice field with the help of threads attach to bamboo sticks. Sting bugs are attracted by the rotten smell of these trapping materials and feed on these. At this point, it is very easy to kill the pest mechanically with the help of a net or by introducing fire. It has been observed that rotten eels attract morenumbe of bugs than the rotten crabs. Further, rotten eels decay slowly. Hence, it can act as trap material for 8-10 days as compared to crabs, which are effective up to 5-6 days. Eight to ten traps when used in the beginning of flowering (before the pest population build-up) will be effective in managing the bug population. Fresh water crabs and eels are available in plenty in Brahmputra river valley. Lowlands ponds, beels river streams and other aquatic bodies cutting rice plants. Crabs holes in Boro rice field drain away the costly irrigation water. Hence, use of crabs in managing stinkbugs has sufficient potential considering the eco-friendly nature of this method.

(b) Repelling away with peels of grape fruit (Citrus paradisiacal) : Stink bugs are repelled away with the smell and odour emanating from the peels of grape fruit. The bugs are active on rice panicle at milking stage. Therefore, the peels of this citrus crop at flowering or milking stage. Also, during this period of the season grap fruit are available in plenty and hence, the technology is feasible.

(c) Encouraging predatory birds like Sky lark (Gurkha Baduli) in field : Birds like Gurkha Baduli are effective predators of stink bug. Providing supports like bamboo or wooden sticks at canopy level encourages the presence of these birds in rice field. The predatory birds sit on these supports and effectively eat away both the nymphs and adults of stink bug. Based on the pest pressure, 20-30 such supports per acre are sufficient for effective management of stinkbugs. It is interesting that these birds do not feed on the rice grains. The other benefit with this bird is that it predates on tick and mites from the body of cattle grazing in open filed. It has been observed by some farmers in lower Assam that the spraying of pesticides against stink bug on rice fields with the helicopters in nineteen sixties drastically reduced the population of these beneficial birds.

Growth of Dhaincha (Sesbania) on field bunds and putting of twigs of trees in rice field

Farmers believe that it is beneficial to grow few Dhaincha plants on the field border. Sometimes, they put the twigs of tree at few points in the field.these provide habitates for natural enemies like spider, dragonflies etc. Also, Dhaincha is a nitrogen fixer in symbiosis with Rhizobium.

Scaring away of sparrow from rice field

Birds are perennial pest in North Eastern India. Hills and hillocks interspersing the cultivated fields and presence of sufficient tree and bushes provide habitat for these pests. Sparrows are very common pest in rice field at maturity of the crop. These little birds move in groups and cause sufficient yield loss by eating away the grains. They can be scared away by keeping the black coloured pseudo-stems of arum (Colocassia) above the canopy level at the maturity stage of the crop. The pseudo-stems are given the shape of the head of snake by sharpening with a knife and then they are mounted on bamboo sticks. These structures are erected in rice fields at some interval so that the dark coloured pseudo-stem remains about 5 cm above the canopy level. This mimics the head of snake and hence, sparrows are scared away.

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