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Semidry Rice System of Cultivation

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Introduction

Rice (*Oryza sativa* L.) holds a significant position as a primary staple crop globally, playing a crucial role in ensuring food security. India, being the second largest producer of rice globally, with an area of 46.38 million hectares, yielding a production output of 130.29 million metric tons and a productivity rate of 2809 kilograms per hectare (Directorate of Economics and Statistics, 2021-22). According to the Food and Agriculture Organization (FAO), about 34 - 43 % of global irrigation water is used for rice cultivation. Water scarcity is a major issue in countries such as India and China, where rice is the staple food crop and is cultivated on large extent of area. In India, the cultivation of rice is executed through three primary methods, specifically transplanting, dry seeding, and wet seeding. Of these, the irrigated ecosystem covers an extensive area of 26.51 million hectares, accounting for 64.97% of the total land area. (Directorate of Economics and Statistics, 2019-20). Irrigated rice requires about 150 ha-cm of water and engagement of labour for transplanting. To decrease the percentage of water utilized in rice farming, it is imperative to introduce innovative methodologies for cultivating rice that necessitate lower water consumption, all the while sustaining increased yields and enhancing water utilization efficiency. Under these circumstances, dry methods of rice cultivation like dry direct seeded rice (DSR), system of rice intensification (SRI), semidry rice (SDR), alternate wetting and drying (AWD) etc., are gaining importance.

Major Reasons Responsible for Semidry Rice Method of Cultivation

1. **Water scarcity:** Water is becoming a fast precious commodity due to its multipurpose uses in various sectors like household, industries and Agriculture. Irrigated rice is consuming large share of water in the agriculture sector. Among all agricultural crops irrigated rice consumes large share of water making water resources unavailable for the crops.

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2. **Delay of monsoons:** Due to frequent failure or delay of monsoons, irrigation water release from canals to crop fields gets delayed in the command areas. It results in delay of transplantation of rice and subsequently delayed sowing of pulses in rice-pulse cropping system expecting subsequent rainfall during the cropping period. Irrigation tanks and water harvesting structures, also a major source of irrigation in the rain fed areas, usually dry up during the drought period. To overcome the above problems, alternative methods of rice cultivation should be developed.
3. **Labour availability**: Both puddling and transplanting activities require a significant amount of labor in the traditional establishment approach. Finding labor at the crucial moment of transplanting is challenging due to the rising demand for labor in non-agricultural industries and rising labor expenses brought on by rural laborers migrating to urban areas. There is acute shortage of labour at the time of paddy transplantation resulting in delay transplantation.

Semidry Rice Method of Rice Cultivation

Semidry rice is a system associated with upland condition in the early and low land situation at later stages of crop growth. In semidry system, rice is grown as rainfed crop for about 40-45 days, and when sufficient water is available, it is converted into wet conditions by stagnating the water (Chatterjee and Maiti, 1985). In India, area under semi-dry rice cultivation was 17.53 m ha with production of 36.48 per cent.

Advantages of semidry rice

1. Semidry method of rice cultivation is most relevant in the project areas where the release of project water is not in time there by transplanting is not being done well in time.
2. In the drought areas, where harvested rain water in tanks is the only reliable source for supplemental irrigation, semidry rice method is advantageous.
3. Semidry method of rice cultivation cut down the initial water consumption of 30 % by avoiding raising of seedlings in nursery, puddling, and transplanting under puddled soil.
4. It eliminates the need for nursery raising, puddling, and transplanting, saving 25 % of the labor used in rice cultivation overall.

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5. Semidry rice soils have loose and friable physical conditions that are very effective to run the seeding equipment for sowing maize and other crops in the following season under zero or conservation tillage.

Challenges In Semidry Rice Method of Rice Cultivation

Semidry method of rice cultivation, though has multiple benefits, yields are low due to moisture stress, micronutrients deficiency, pest and disease problem and weed growth. Among these constraints, severe weed competition is major issue. Due to the absence of stagnant water during the initial 4-6 weeks of rice cultivation, it provides congenial conditions for weed growth. Under direct seeding rice, weeds are a major constraint which limt crop productivity as both rice and weeds germinate almost simultaneously. Evidently weeds compete with the crop and the extent of yield reduction of rice due to weeds has been estimated up to 46 to 63.1% (Choudhary and Anil, 2018). Such weeds need to be removed either by manually, mechanically or with suitable herbicide application.

Apparently, early and effective weed management is essential for achieving the appropriate level of yield. To control various weed species during the cropping season, an effective and cost-effective weed management approach is required. Though hand weeding is effective, it is costly, labor-intensive, time-consuming, and frequently constrained by a shortage of labor. On the other hand, when used at the right amount and stage, herbicides provide efficient and cost-effective weed management. But continuous application of a single herbicide or herbicides with similar modes of action may cause weed shifts as well as the issue of weed resistance.

Integrated Weed Management in Semidry Rice

Integration of weed management is the best strategy to control weeds below threshold levels as cultural, mechanical, herbicides and biological methods are used in a suitable way. In integrated weed management approach, weeds are subjected to multiple attacks which helps to control the development of weed resistance to herbicides. Due to the concerns of the evolution of herbicide resistance in weeds, shift in weed population, there is a need to integrate herbicide use with other weed control methods.

During initial stages of semidry system of rice cultivation, inter-cultivation with harrows (danti, guntaka) at 20 DAS and 40 DAS helps to control weed growth as in irrigated dry crops. The mechanical weeding at 45- 50 DAS *i.e.*, after submergence of water with the

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power tiller helps to control the weed growth. Mechanical weeding not only controls weeds but also improves soil porosity and aeration. The physical disturbance of soil increases the crop growth, tillering capacity and crop productivity.

Fig. 1. Hand weeding semidry rice

Fig. 2. Mechanical weeding semidry rice

Conclusions

Semidry rice method of rice cultivation is advantageous in the command areas where canal water release was delayed or water scarcity occurs due to late onset of monsoons. It helps to reduce the share of water in rice cultivation and increases water use efficiency.