## **2.4 Direct seeding of Rice**

In the Direct Seeding method of crop establishment, the rice seeds are sown directly in the field. Direct seeding of rice is practiced in both wet and dry soil as wet direct seeding and dry direct seeding and water seeding through broadcasting, dibbling, drilling or sowing of seeds in lines (IRRI Rice Knowledge Bank, 2018). Wet direct seeding is the method of sowing pre-germinated rice seeds in to the puddled soil whereas sowing of dry seeds is practiced in Dry direct seeding of rice. The seeds are sown in the standing water conditions at the Water seeding method which is sub divided in to aerobic and anerobic according to the oxygen content available in the ambient water of the germinating seeds (Hassan Akhgari, 2011). The main purpose of the Water seeding is to control the invasive weeds and weedy rice which are the major constraints in Direct seeding (Hill et al., 1990). Dry direct seeding is practiced in the areas which are prone to floods and in low lands, uplands where rainfed paddy cultivation is done. The lands where irrigated cultivation of rice is done commonly used the Wet direct seeding method (Pandey et al., 2000).

The cultivation of rice through direct seeding is widely practiced in America, Russia, Japan, Cuba, India, Western Europe including Italy, French as a result of the shortage of skilled labor and high wages demanded by them (Iqbal et al., 2017). According to the Weerakoon et al., 2011 direct seeding is practiced in about 95% of the total cultivated area of rice in Sri Lanka and the wet direct seeding is the most commonly practiced method of direct seeding primarily as a solution to the labor intensity. The Direct seeding of rice became the most common method practiced by the farmers in spite of the efforts of the Department of Agriculture to popularize the transplanting method as the most favorable planting technique for rainfed and irrigated environments (Pathinayake et al., 1990).

Although in the Asian region farmers mainly followed the traditional transplanting method of rice, at present the farmers tend to adopt to the direct seeding as the most suitable option to the increasing labor shortage during the peak transplantation period and high costs on wages. The land area at which the direct seeding method of rice is followed in Asia, is rapidly increasing because the ultimate goal of the farmers in this area who earn their lives through rice cultivation is to increase the productivity and profitability to gain high net retain as the income (Pandey et al., 2000).

Mainly the farmers tend to use direct seeding when there is lack of available resources like land, labor, water and if there is a necessity for the early maturity of the plants (IRRI Rice Knowledge Bank, 2018). The improved short duration rice varieties and the availability of selective herbicides at cost effective prices impelled the farmers more on the Direct seeding (Pandey et al., 2000).

The invasion of the weeds and weedy rice is concerned as the most distractive problem in direct seeding of rice (Gunawardana et al., 2013; Marambe, 2009). The damages from the diseases and the insect pest attacks, severe in the direct seeding compared to the transplanting as the increased plant density creates a shadier, humid, cooler environment inside the plant canopy which is favorable for the multiplication of them (Pandey et al., 2000). As the chemicals are available at cost effective prices the farmers tend to use excessive amount of them to control the weeds, weedy rice, pest and diseases which cause the contamination of ground water that laid the foundation for the kidney diseases and also weed varieties with resistant genes for the herbicides are formed due to frequent application of chemicals (Illangakoon et al., 2017; Rajapakse et al., 2016). The available nutrients and the moisture content for the direct seeded plants is at low level compared to transplanting, due to the increased weed density and the shallow nature of the roots which caused it unable to absorb sufficient amount of nutrients to the plants through deep penetration (Singh et al., 1981). As a result of these reasons there is a significant reduction in the grain yield obtained form direct seeding compared to the transplanting of rice (Akbar et al., 2007)

Akbar, N., Jabran, K., Habib, T., 2007. COMPARISON OF DIFFERENT PLANTING METHODS FOR OPTIMIZATION OF PLANT POPULATION OF FINE RICE ( Oryza sativa L .) IN PUNJAB ( PAKISTAN ) 44, 597–599.

Gunawardana, W.G.N., Ariyaratne, M., Bandaranayake, P., Marambe, B., 2013. Control of Echinochloa colona in aerobic rice: effect of different rates of seed paddy and post-plant herbicides in the dry zone of Sri Lanka. role weed Sci. Support. food Secur. by 2020. Proc. 24th Asian-Pacific Weed Sci. Soc. Conf. Bandung, Indones. Oct. 22-25, 2013 431–437.

Hassan Akhgari, 2011. Assessment of direct seeded and transplanting methods of rice cultivars in the northern part of Iran. African J. Agric. Reseearch 6. https://doi.org/10.5897/AJAR11.973

Hill, J.E., Bochchi, S., Clampet, W.S., Bayen, D.E., 1990. Direct seeded rice in the temperate climates of Australia, Italy and the United Satates, in: Direct Seeded Flooded Rice in the Tropics. IRRI, Seoul,Korea, pp. 91–102.

Illangakoon, T.K., Piyasiri, C.H., Kumar, V., 2017. Impact of varieties, spacing and seedling management on growth and yield of mechanicaly transplanted rice 112–128.

Iqbal, M.F., Hussain, M., Rasheed, A., 2017. Direct seeded rice: purely a site specific technology. Int. J. Adv. Res. Biol. Sci. 4, 53–57. https://doi.org/10.22192/ijarbs

IRRI Rice Knowledge Bank, 2018. Direct seeding - IRRI Rice Knowledge Bank [WWW Document]. URL http://www.knowledgebank.irri.org/step-by-step-production/growth/planting/direct-seeding#wet-direct-seeding (accessed 11.28.18).

Marambe, B., 2009. WEEDY RICE: EVOLUTION, THREATS, AND MANAGEMENT B. Marambe Department of Crop Science, Faculty of Agriculture, University of Peradeniya, Sri Lanka. Trop. Agric. 157, 0–15.

Pandey, S., Mortimer, M., Wade, L., Tuong, T.P., Lopez, K., Hardy, B., 2000. Direct seeding:research issues and opportunities. Proc. Int. Work. direct seeding Asian rice Syst. Res. issues Oppor. Work. direct seeding Asian rice Syst. Res. issues Oppor. 383.

Pathinayake, B.D., Nugaliyadde, L., Sandanayake, C.A., 1990. Direct Seeding practices for Rice in Sri Lanka, in: Direct Seeded Flooded Rice in the Tropics. IRRI, Seoul,Korea, pp. 77–90.

Rajapakse, S., Shivanthan, M.C., Selvarajah, M., 2016. Chronic kidney disease of unknown etiology in Sri Lanka. Int. J. Occup. Environ. Health 22, 259–264. https://doi.org/10.1080/10773525.2016.1203097

Singh, R.K., Pande, R.S., Namdeo, N.K., 1981. Response of Ratna to mathods of planting and nitrogen levels.Oryza. F. Crop. Res. 18, 182–183.

Weerakoon, W.M.W., Mutunayake, M.M.P., Bandara, C., Rao, A.N., Bhandari, D.C., Ladha, J.K., 2011. Direct-seeded rice culture in Sri Lanka: Lessons from farmers. F. Crop. Res. 121, 53–63. https://doi.org/10.1016/J.FCR.2010.11.009