### **2.51Wet bed for Random transplanting**

Wet bed is the conventional nursery method practiced by the farmers when they are rich with sufficient amount of land and water to be used in the nursery management practices. The seed bed should be equivalent to the 1/10 of the area of the field which is to be transplanted. The seed bed is puddled and leveled properly with drainage canals to facilitate the removal of water. It is very essential to take care of the nurseries after seeds sown for weeds, pests and disease attacks (Gaikwad et al., 2015; IRRI, 2007).

In manual transplanting the seedlings are uprooted from the nursery and transplanted in the puddled soil. There are mainly two methods of transplanting including Straight row method and Random transplanting method. The straight row method follows a uniform spacing between the plants which is around 20-25 cm made of wood, wires or twines (Rice Knowledge Bank, 2009; Sangeetha and Baskar, 2015).

In the Random transplanting method of rice seedlings are transplanted without a standard spacing between the plants (IRRI, 2007). Random transplanting method of plant establishment is the most common transplanting method followed by the farmers. It is mostly practiced by the women or sometimes entirely by the men, depending on the regions were farming practices are done. In Random transplanting three to five seedlings are poked in to the puddled field at about 1.5-2.5 cm depth using the first two fingers and the thumb through walking backward while covering the space until the reached the other end. The farmers prefer the Random transplanting mostly as it is faster than the straight row planting method which reduced the time spend and cost on labors, ultimately reducing the cost of production (IRRI Rice Knowledge Bank, 2018; Rice Knowledge Bank, 2009; Wopereis, M.C.S. et al., 2009).

The number of plants per unit area, numbers of tillers per plant is reduced in the Random transplanted fields which is commonly used by the farmers than the Standard line transplanting method as there is no uniform plant stand in the field. The intercultural operations using machineries are difficult in Random transplanted fields like weeding through rotary-weeder due to un even spacing between the plants (Awan et al., 2011).

### **2.52 Parachute method**

The Parachute method which is known as Broadcasting of seedlings, introduced recently with the aim to cope with the problems in conventional transplanting method of rice (Akbar et al., 2007). In the Parachute method the seedlings raised in plastic sheets are broadcasted in to the puddled soil using a machine or manually (IRRI, 2007).

The nurseries are prepared using plastic sheets which are known as bubbled trays by adding 2-3 seeds per each hole. The time require for establishment of nurseries is less and the management practices of nurseries is easy compared to traditional methods of transplanting. The plastic sheets used for the parachute nurseries is a durable sheet available at low cost which can be utilized for about three years duration. When compared with the manual broadcasting of seedlings in parachute method it also consumes less time compared to manual transplanting. And with the use of power blower for field establishment of seedlings, the cost on labors can be reduced as the women and the children in the farm families are engaged in this process. The Mechanical transplanting of rice requires specialized machineries and skilled labors which make it more expensive for the rural farmers to bare up although the final yield can be increased. The farmers tend to adopt to this new technology due cost effectiveness and as a potential solution to overcome the shortage of labor (Akbar et al., 2007; Akhter and Sabar, 2002; Cheng, 2000; Nabii et al., 2003; Sabar, 2003).

In the parachute method the seedlings were thrown with in one-meter distance above the field in order to facilitate the seedlings to be settled in puddled field in upward position. The seedlings are flowing down under the gravity using the weight of seedling clumps, towards the ground and roots penetrated to the soil (Akhter and Sabar, 2002). In the uprooting of seedlings for the field establishment the damages to the roots is at a minimum level compared to other transplanting methods. The reason for this is seedlings are grown inside the small cups in the plastic trays in which roots remained intact. So at the uprooting of 12-15days old tender seedlings for transplanting the roots are not damaged and the transplanting shock is reduced because the damaged roots are the main contributor to the transplanting shock (Akhter and Sabar, 2002; IRRI, 2007; Nabii et al., 2003; Sabar, 2003).

The seedlings transplanted through parachute method contains greater root length and a greater number of roots than the conventional transplanting method due to minimum damage on the roots at the transplanting. So the plant growth started immediately after transplanting without being suffered from the transplanting (Nabii et al., 2003). A optimum plant population with uniform stand of plants can be obtained (Akhter and Sabar, 2002; Awan et al., 2008). And also, the number of tillers obtained for square meter is increased compared to the conventional transplanted fields. A high yield per hectare can be obtained from the Parachute method when considering with the other transplanting methods which is the ultimate goal required by the farmers (Akhter and Sabar, 2002; Awan et al., 2008; Nabii et al., 2003; Sabar, 2003).

A recently developed method for rice transplantation “parachute method” however, over-comes some of these problems in the two traditional methods. It requires less labour, less time and is more efficient. Other

advantages are good and quick stand

establishment, higher tillering and thus higher paddy yield. However, parachute method of rice transplanting requires more skilled labour for nursery raising and transplanting. This study reports a comparison and an

COMPARISON OF DIFFERENT PLANTING METHODS FOR OPTIMIZATION OF PLANT POPULATION OF FINE RICE ( Oryza sativa L .) IN PUNJAB ( PAKISTAN )