The objectives of this research were to design, construct and test a heat pump dryer for paddy seed working with a mixed flow (LSU type) dryer. In this study, paddy seed was dried in an open air-loop from initial moisture content of 13.5% w.b. to 22.2% w.b. to final moisture content of about 12% w.b., inlet drying air temperature was 43 °C, specific airflow rate was 9 m³ lmln-m³ paddy and evaporator bypass air ratio was 0%, 30% and 50%. The effects of evaporator bypass air ratio on specific energy consumption. COP hp, SMER, and MER were investigated. Experimental results showed that COP hp and SMER increased to maximum at evaporator bypass air ratio of 0% and decreased with increasing bypass air ratio. Quality of paddy seed was very good with mean germination of sun drying and heat pump drying of 98% and 97% and mean vigor of sun drying and heat pump drying of 96% and 95%, respectively. From cost evaluation of paddy seed drying with an initial moisture content of 22.2% w.b. and final moisture content of 12.4% w.b., it was found that total cost of seed drying was 2.81 baht/kg water evaporation of which Baht 0.63 (US$ 1 = Baht 40) was energy cost, Baht 0.41 was maintenance cost and Baht 1.77 was fixed cost.