**ABSTRACT**

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| **Title of the Thesis**  | **:** | **Performance of Ultra High Intensity Rice Based Cropping System Models in Irrigated Sub-Tropics of Jammu**  |
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**ABSTRACT**

A field experiment entitled **“Performance of Ultra High Intensity Rice Based Cropping System Models in Irrigated Sub-Tropics of Jammu”** was conducted at Research Farm, Faculty of Agriculture, SKUAST-Jammu, Main Campus, Chatha for two consecutive years from *kharif* 2019 to summer season of 2021. The soil of the experimental field was sandy loam in texture, slightly alkaline in nature and medium in organic carbon, available nitrogen, phosphorus and potassium with electrical conductivity in the safer range. The experiment consisting of five rice based cropping system models of cropping intensity varying from 300-600% *viz*. **T1:** Rice (Basmati-370) – Wheat (HD-3086) – Cowpea (Lobia Super-60) having 300% cropping intensity, **T2:** Rice (Basmati-564) – Potato (Kufri Badshah) – Wheat (Raj-3765) – Mixed fodder (Maize+Cowpea+Charri in 2:2:1 ratio) having 400% cropping intensity, **T3:** Rice (SJR-129) – Knol khol (G-40) – Potato (Kufri Sindhuri) – Green gram (IPM-02-3) having 400% cropping intensity, **T4:** Rice (Pusa-1121) – Radish (CR-45) – Green onion (Nasik Red) – French bean (Anupama) – Okra (Seli special) having 500% cropping intensity in relay cropping from fourth crop onwards and **T5:** Rice (IET-1410) – Fenugreek (JF-07) – Knol khol (G-40) – Green onion (Nasik Red) – Dry onion (Selection-1) – Black gram (Pant U-19) having 600% cropping intensity in relay cropping from third crop onwards was laid out in a randomized block design with four replications. Crops taken in different cropping system models were raised as per their respective recommended package of cultivation except for the nutrient requirement of all the crops in the systems, excluding pulse and vegetable crops, whose nutrient need were met either through inorganic or organic sources as per recommendations. Of these total requirement of nitrogen, 25% was supplemented through farm yard manure and 75% through inorganic sources. The inorganic sources for nitrogen, phosphorus and potassium were urea, diammonium phosphate and muriate of potash, respectively.

The results of the study based on overall mean data of two years revealed that all the treatments having 400% and more cropping intensity recorded significantly higher Basmati-370 rice equivalent system productivity, system gross and net returns from treatment T1 having 300% cropping intensity. Further, treatment T4having 500% cropping intensity (CI) recorded significantly highest Basmati-370 rice equivalent system productivity of 25058.38 kg ha-1 {Basmati-370 rice equivalent yield of individual crops *viz*. Rice (Pusa-1121) 2607.37 kg ha-1, Radish (CR-45) 4765.17 kg ha-1, Green onion (Nasik Red) 5394.94 kg ha-1, French bean (Anupama) 6278.04 kg ha-1, Okra (Seli special) 6012.86 kg ha-1}, system gross returns (Rs. 9,81,512.16 ha-1), system net returns of Rs. 4,56,392.80 ha-1 and Rs. 6,68,812.29 ha-1 without and with family work force, respectively and numerically highest Basmati-370 rice equivalent system production efficiency of 75.71 kg ha-1 day-1 and employment generation of 667 man days ha-1 year-1. It was followed by treatment T5having 600% cropping intensity (CI) which recorded Basmati-370 rice equivalent yield of 19227.92 kg ha-1 with Basmati-370 rice equivalent system production efficiency of 52.82 kg ha-1 day-1 and employment generation of 605 man days ha-1 year-1 and numerically highest system land use indices i.e. land use efficiency (99.59%), multiple cropping index (600%), rotational intensity (600%) and cultivated land utilization index (1.46). The data pertaining to system energetics indicated that treatment T4 having cropping intensity of 500% recorded highest system energy input, output and net energy returns, however, treatment T1 recorded higher system energy efficiency, energy productivity and energy intensity.

System soil fertility status in terms of available nitrogen and potassium after each crop cycle was significantly influenced by different rice based cropping system models. The data pertaining to balance sheet of major nutrients showed that there is a net build up of available N, P and K in all the treatments and the buildup of available nitrogen and phosphorus were significantly higher in treatment T5 whereas, treatment T4 recorded highest buildup of available potassium and it was at par in available nitrogen and phosphorus with treatment T5.

Based on the results obtained from overall mean data / mean data (where analysis was not possible/required) of two years study, it is concluded that all the cropping system models having 400% and more cropping intensity have proved their superiority over the cropping system model of 300% cropping intensity in terms of production, productivity, employment generation and net returns and can be recommended as alternative cropping system models for the irrigated subtropics of Jammu. However, amongst different ultra high intensity rice based cropping system models treatment T4: Rice (Pusa-1121) – Radish (CR-45) – Green onion (Nasik Red) – French bean (Anupama) – Okra (Seli special) having 500% cropping intensity can be regarded as the first choice followed by treatment T5, T3 and T2 for the farmers of this belt. Further based on the individual crop yield, sowing and harvesting dates of the individual crops taken under different cropping system models as well as their system productivity, two more new cropping system models having cropping intensity of 500% {Rice (IET-1410) – Fenugreek (JF-07) – Green onion (Nasik Red) – French bean (Anupama) – Okra (Seli special)} with system net returns of Rs.5,04,337.54 ha-1 year-1 and 400% {Rice (Pusa-1121) – Knol khol (G-40) – Potato (Kufri Sindhuri) – Okra (Seli special)} with system net returns of Rs. 3,80,620.88 ha-1 year-1 have been carved out which are not only equivalent in system productivity of newly recommended alternative cropping system models in terms of productivity and profitability but are superior to the cropping system model having cropping intensity of 300%.

**Key words:** Basmati rice, Cropping systems, Productivity, Profitability, Sustainability, System productivity and Ultra high intensity

**Signature of Major Advisor Signature of the Student**