

3.6.12 Weeds and plant population

The weeds and plant population has inverse relationship. Weeds growth and population in field is more means it lesser the plant populations which can be optimized by proper weed management. Sparse density increases the weed population whereas optimum population keeps the weeds population under control (Donald, 1963)

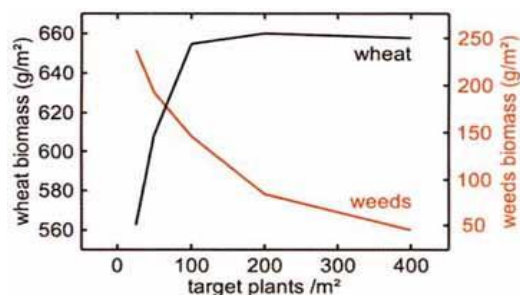


Figure 5: Effects of plant population on crop wheat and weed biomass.

3.6.13 Soil and plant population

Generally, good soil physical property favors good germination of seeds thereby increasing the plant population as desired (Gardner, Laryea, & Unger, 1999), whereas hard and cracked soil surface reduces the plant growth and development. In dry year, at very low bulk densities, yields gradually increase with a slight increase in soil compaction as slightly compacted soil can speed up the rate of seed germination because it promotes good seed-to-soil contact but further increases beyond optimum, yields begin to decline. In wet weather, yields decrease with any increase in compaction as it decreases soil aeration, increasing de-nitrification and increased risk of root diseases (UMN, 2018).

3.6.14 Proper plant pest Management

Insects, diseases and weeds are the major pests of crop that seriously damage the plants in early stage of their life so they cannot withstand properly by intra and inter-specific competition. Preventive and curative measures along with integrated approach can save the plant in early stage and maintain optimal plant population as desired.

3.6.15 Growing of submergence and Drought tolerance variety

Suitable submergence or drought tolerance variety can be used for obtaining optimum plant population. For e.g. Submergence tolerant varieties of rice are Sworna sub-1, Sambha mahasuri sub-1, sheherang sub-1 and drought tolerance variety of rice are Sukkha-1, Sukkha-2, Sukkha-3, Sukkha-4 etc in Nepal.

3.7 Crop plant competition

3.7.1 Interplant competition

When plants are grown in a community, growth is affected by neighboring plant, one plant compete with another for the resources like light, nutrients and water. This competition may modify or changes the growth of crop. For example, plants growing under the high density compete for the light and plant height become taller to receive adequate light interception. The thickness of leaves becomes thinner and vertical to receive more light. Crop like rice, wheat would modify their Tilling behavior and their Tilling number is reduced. Similarly the crop like cotton, pigeon pea may have less number of branches per plant under the high density condition.

3.7.2 Intra plant competition

Intra plant competition is the competition within the plant. When the flower primordia are formed in large numbers, it leads to the formation of large number of inflorescences. The large load for inflorescences leads to the competition for assimilates among the inflorescences and seeds on the same plant. This leads to the intra plant competition. The intra plant competition may be intense at low densities, resulting in a fewer seed and

reduced seed size compared with the denser stand. At the widest spacing, both type of competition are absent, during the early stages of growth but at the reproductive stages the intra plant competition may occur because of the large number of reproductive sink developed due to no competition at early stages.

4. CONCLUSION

Plant density is an important agronomic factor that manipulates the micro- environment of the field and affects the growth, development and yield formation of crops. Inadequate plant stand is one of the most common yield retardants. Competition has negative effect on plant growth which increases with higher plant population. Optimum plant population provides highest crop yield and profit. Number of factors such as crop factors, input factor and management factor affects the optimum plant population. Careful consideration on those factors right from seeding to harvesting, gap filling, defoliation, thinning, weeding must be done for managing plant population and competition.

REFERENCES

- Ajadi, Table 5: Effect of Normal Transplanting and Double Transplanting in Rice S., Fagbohun, A., & Adebooye, O. (2006). An Accurate Mathematical Formula for Estimating Plant Population in a Four Dimensional Field of Sole Crop. *Journal of Agronomy*, 5: 289-292.
- Baker, E. (1964). Plant Population and Crop Yield. *Nature*, 204, 856-857.
- Crickman, C. S. (1958). The use of land in the corn belt. . *USDA yearbook of Agriculture*, 122-128.
- Drew, J. L. (2009). How Do Plant Populations Affect Yield? University of Nebraska--Lincoln, drew.lyon@wsu.edu .
- FAO. (2005). Optimizing plant population, crop emergence and establishment. Retrieved from www.fao.org.
- Gardner, M., Laryea, K., & Unger, P. (1999). Soil Physical constraints to plant growth and crop production. *FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS*.
- Liu, S. B. (2017). A method to estimate plant density and plant spacing heterogeneity: application to wheat crops. *Plant Methods*, 13, 38.
- Mathiew, N. (2011). Using right planting density is critical for optimum yield and revenue for vegetable crops. Michigan State University Extension, Department of Horticulture.
- Paul, A. K., & James, C. (2019). *Competition in Plant Communities*.
- Pratley, J., & Stanton. (2002). *Crop establishment and management*. 1-37.
- Rana, S., & Rana, M. (2011). *Cropping System*. Department of Agronomy, Forages and Grassland Management College of Agriculture, CSK Himachal Pradesh Krishi Vishvavidyalaya, Palampur-176062 (India) .
- Satapathy, B., Singh, T., Pun, K., & Rautaray, S. (2015). Evaluation of rice (*Oryza sativa*) under double transplanting in rainfed lowland rice ecosystem of Asom. *Indian Journal of Agronomy* , 60 (2), 245-248.
- Sayed, N. A.-A., & Squire, . R. (2002). *Principles of Tropical Agronomy*. In CABI publishing.
- UMN. (2018). Soil compaction. In extension.umn.edu, Soil Management and Health.
- Weiner, J. (1993). *Competition among plants* . Treballs de la SCB.
- Wiley, R. W., & Heath, S. (1969). The Quantitative Relationships Between Plant Population And Crop Yield. *Advances in Agronomy*, 21, 281-321.
- Zaimoglu, B. H., Arioglu, H., & Arslan, M. (2004). Effects of Seed Quality on Plant Population and Seed Yield of Double Cropped Soybean in the Mediterranean Region of Turkey. *Asian Journal of Plant Sciences*,, 3, 574-577.