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# NATURE BASED SOLUTIONS FOR RESOLVING AGRICULTURAL ISSUES

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**Abstract**

The escalating problems of climate change, global hunger, and deteriorating land and water resources needs immediate attention for achieving sustainability. Around the global there is constant search for alternate practices for addressing these emerging problems. With this nature based solutions were introduced to address the problems such as climate change, extreme weather conditions, desertification and land degradation, food scarcity and biodiversity along with improving the production to achieve food security.

**Introduction**

The demand for food is increasing exponentially with increasing growing population which is expected to reach a population of 9.8 billion by 2050 from current population of 7.9 billion. However, the very foundation of productive systems such as soil and water systems, healthy lands have already been under immense pressure. It is estimated that around the globe approximately 52% of the land is under degradation. Under this situation, the emerging threat of climate change has severe impact on the global food security through reduction in crop productivity, crop damage, and extreme weather hazards and loss of native habitats and diversity threating the future food security. In addition, fossil fuel based agriculture and land conversion activities are further responsible to about quarter of the global greenhouse gas emissions contributing to climate crisis further amplifying the multiple risks including the nature loss and food safety. In order to maintain the future agriculture food system there is need for transition from agricultural practices that adapt to and mitigate the climate change, regenerates the land scape and conserve or promote the agricultural bio-diversity (Iseman and Wilhelm, 2021). Among such, one is nature based solution which are defined as the actions, which protect, sustainably manage and restore the natural or modified ecosystems which that address the societal challenges effectively and adaptively while conserving the bio-diversity and maintaining the wellbeing of humans (Wyunberg et al., 2023).

**Nature based solutions for addressing agricultural issues**

The nature based solutions can be classified in to different categories based on agricultural issues they are addressing. The solutions can be categorized in to four classes

**Nature based solutions as sustainable practices**

The agricultural practices which improve the crop production, soil health and soil water relations are classified as sustainable practices. Agricultural practices such as organic farming systems, residue retention, agro-forestry, natural farming practices, legume intercropping, tank silt application, bio-char application and open pollution by insects. It was observed that following of organic production system improved the pigeonpea equivalent yield by 79 kg ha-1 compared to conventional fertilizer application (Gopinath et al., 2023). Similarly, contour planting along with narrow opening grid bamboo mats as geotextile significantly improved the above ground biomass and yield of rice by 22 and 11 per cent, respectively compared to no geo-textile usage (Bhattacharyya et al., 2012).

**Nature based solutions as green infrastructure**

The conventional practices such as down the slope planting, excessive tillage practices, monocropping and excessive grazing on the land slopes have led to excessive soil and water erosion. The practices that are adapted to mitigate the erosion of soil and water and stabilizing the slope are classified as green infrastructure. Some of the practices that included are contour cultivation practices, maintenance of native prairie strips, maintaining grass or weeds as buffer strips at regular interval across the slope and contour hedge rows. It was observed that contour farming along with 10m buffer strip reduces the annual sediment loss up to 74% compared to downslope planting with no buffer strips (Gathagu et al., 2018)

**Nature based solutions as amelioration techniques**

The land degradation and desertification of land as well as climate change are the burgeoning issues in agriculture. The practices need to address these issues by ameliorating the land by improving the physical, chemical and biological properties of the land and adapt to the changing climatic situations such as elevated temperature and carbon di-oxide ($CO_2$) as well as extreme weather parameters such as drought, flood etc. The practices that inclusive under these categories can be listed as conservation agricultural practices, biochar application, green manuring, selection of tolerant varieties, bio remediation, phyto-remediation, improved land management practices etc. It was observed that Amaranthus sp. can be effectively used for phytoremediation of contaminated agricultural landscapes because of its characteristic accumulation of broad spectrum of contaminants in different parts of the plants.

**Nature based solutions for conserving bio-diversity**

Intensive chemical based agricultural practices and monocropping have led to the decline in the overall diversity of agricultural ecosystems ranging from decline in soil microbial biodiversity followed by beneficial insect diversity to the crop diversity in the agriculture land scape. Some of the practices such as conservation agriculture, organic farming, strip intercropping, bee hive keeping etc. enhance the diversity of agriculture farm. It was reported that strip intercropping of winter wheat with oil seed rape significantly reduced the wheat aphid population by 50%

and pollen beetle larvae by 20% (Alarcon-Segura, 2022)

**Conclusion**

The nature based solutions is an effective way to counter the future agricultural issues. These solutions are still at an nascent stage of popularization because of lack of extension activities regarding these practices which needs to addressed and attended. The majority of these neither require extensive investment nor extra care. Just tweaks in the agricultural practices can lead to better sustained production while adapting to the changing situation and minimizing the damage to nature.

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