



Impact of current agriculture and agrochemicals on soil quality and management

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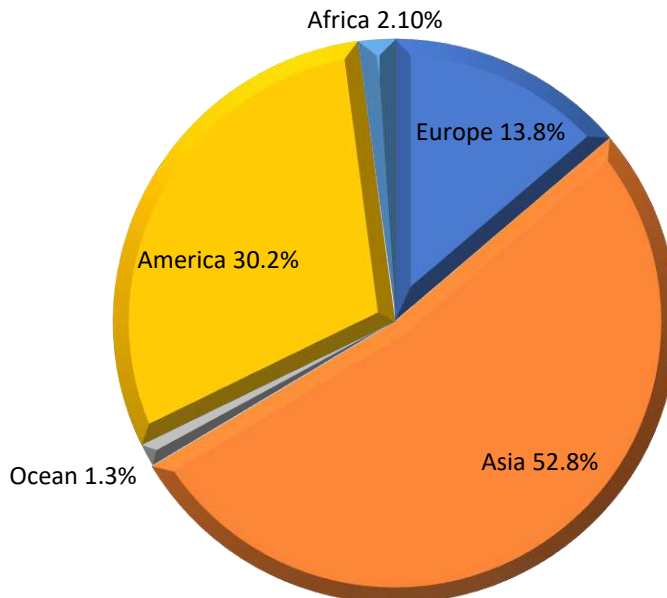
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Current form of agriculture is intensive agriculture in which agrochemicals are necessary evils and important tools for global food security. Introduction of synthetic pesticide play great role in pest control and chemical fertilizers in nutrients management but soil health get disturbed due to their long persistency in soil. Soil micro flora and other soil physical and chemical properties get changed. These agrochemicals not only contaminate soil but water and air also by leaching down to groundwater and releasing vapour in atmosphere respectively. So, there is a need for innovative and eco-friendly research in soil science. In this review, we will discuss effect of intensive agriculture and agrochemical and management options, which may help to manage soil health.

Soil is a complex structure has major components; these are organic matter (5%), air (25%), water (25%), mineral matter (45%), and soul of infinity microorganism. Soil play fundamental role in agricultural production as it act as medium for plant growth and source for nutrients and water, exchange of gases, flow of energy, detoxification of pollutants etc. The term soil health may be defined as continued capacity of soil to function as a vital living system, within ecosystem and land use boundaries, to sustain biological productivity, promote the quality of air and water, and maintain plant, animal and human health. Now a day, intensive agriculture is practiced which aim is to produce more and cheaper food per acre or indirectly aim to maximize yield from available land through various means such as use of heavy machineries and

equipment, pesticides, monoculture, use of saline water, chemical fertilizers or in other. In other words we can say food quality is going to deteriorating due to dilution factor because only amount of food is increasing. Furthermore, intensive agriculture kills beneficial insects and plant, degrades and depletes soil biodiversity. Agrochemicals *i.e.*, herbicides, fungicides, insecticides, nematicides, molluscicides, rodenticides, chemical fertilizers are being used non-judiciously and resulted in a huge amount of toxic effluents being emitted directly or indirectly into the soil, air, and water which led to emergence of new parasites or re-emergence of parasites. But it is also true that the much required improvement and stability in agricultural productions in the last century has largely been accomplished through the efficient control of pathogens and pests together with the adequate supply of requisite plant nutrients with the help of chemical pesticides and fertilizers only. This is important also to feed the continuous growing population. However, currently we have reached a stage where issues such as human and environmental health, conservation of soil biodiversity and maintenance of ecological balance also need attention with the goal of managing the rising food demands across the globe. The increasing global demand for quality protein-rich food resources and healthy food entitles for an ever-increasing world population a pressing need for the development of an ecologically sound strategy for sustaining soil health and advancing food security without degrading soil.

Percentage share of pesticide used by different continent



Impact of tillage on soil:

Impact of tillage on soil depends on numbers of tillage and machineries use in tillage. Heavy or advanced machineries compact the soil and introduce hardpan in subsurface and stop infiltration and plant growth. Tillage also enhanced the bulk density of soil. Soil pulverization and inversion by repeated tillage accelerates decomposition of organic matter and effect physical, chemical and biological properties which are key attributes of soil quality. Tillage deteriorates the soil

structure specially in rice. The breaking down of soil aggregates lead to increase in organic matter decomposition due to acceleration of microbial activity. Also high temperature in tilled soil resulted low soil organic carbon which is ultimately food for microbes. So farmer should go for zero tillage or reduced tillage. Or farmer should follow conservation agriculture which has mainly three parameter *i.e.* minimum disturbance, cover the soil or mulching and crop rotation.

Impact of cropping system on soil:

Continuous mono-cropping may result in depletion in nutrient in soil and its effect on environment are severe. Rapid nutrient depletion by intensive cropping may result in drastic yield reduction. So, maintenance and improvement of soil quality through cropping system is important. Rice-wheat cropping system in NW India is example of exhaustive cropping system. The short intervention after harvesting of rice crop

lead to burning of crop residue. So, crop rotation with legumes crop is important. Legumes enhance the soil fertility as it capture the atmospheric N and incorporate in soil. Hence, reduced the recommended dose of N of succeeding crop by 25 %. Growing of short duration variety of rice is good as it provide more time for land preparation for wheat crop. Intercropping play important role Indian condition for

complete the requirement of staple food or

Impact of agrochemicals on soil :

When fertilizers and pesticides are applied to plants or soil, they make their way into the ground water which cause water pollution. Microbes living in soil are adversely affected by these chemicals. They make the soil saline or alkaline depending on which chemical fertilizers is applied. No doubt, these fertilizers provide adequate nutrients to plants in very short time. And pesticides can show sudden control on pest (weed, insect, disease) but

Impact of irrigation on soil:

Irrigation is one of most important component for growing of crops. Without irrigation there is no use of any HYV. Irrigation helps to grow agricultural crop. Maintain landscape and make dry soil alive. So, selection of good quality water is important. A soil with good quality can be deteriorate if good quality water is not applied. Saline water build up the soil toxic and effect the plant growth as plant

Impact of residue burning on soil:

Now a days rice-wheat cropping system in emerging which lead to burning of crop residue mainly of rice straw. Burning of crop residue leads to soil pollution. It burn a huge amount of nutrients. Make the soil hard or lead to soil erosion. Residue burning kills the beneficial microbes living in soil. Due to high silica content in rice

where land availability is constraint.

re-emergence of that pest with new variant is biggest problem. Therefore, integrated management is option because we cannot follow the organic agriculture at once. So, application of organic manures along with chemical fertilizers improve productivity upto good extent. And pest can be control through biological agents. Other option is use of bio fertilizers. Biofertilizers contain nutrient which are even not present in chemical fertilizers.

cannot take proper nutrients from soil. A good quality soil behave as saline soil if a high concentration of salt in water applied to soil. Now a days, sodic water is becoming a problem. So, conjunctive use of water is better option in which good quality water is conjunctive with saline or sodic water. Other option to improve water use efficiency is micro-irrigation, fertigation etc.

straw, rice straw is not favourite food of animals. So, use of machineries such as happy seeder, zero tillage machine, baler, super seeder is option. Other alternate option is mixing the paddy straw with other fodder for animal feed, growing of paddy straw mushroom, use of straw as mulching.