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Impact of Modern Methods of Agriculture on Agricultural Production

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ABSTRACT: Modern agriculture uses technology to increase efficiency, productivity and sustainability in agriculture. Some modern farming technologies include: Precision farming – uses technology such as GPS-guided tractors and drones to improve crop management and resource utilization. Vertical farming—growing crops in stacked layers or inclined surfaces, often indoors. This technique is often used in urban settings to save space. Hydroponics and aquaponics – uses swelling farming methods where plants grow in nutrient-rich water solutions. In aquaponics, fish waste provides nutrients for plants. Biological pesticides use natural predators, parasites, or pathogens to control pests. Controlled Environment Agriculture (CEA) – crops grown indoors with controlled temperature, light and humidity. CEA crops can be grown at any time of the year and in any country. Cover crops—Cover crops such as beans, rye, or clover are included among cash crops during the fallow period. These cover crops protect the soil from erosion and retain moisture. Minichromosome Technology – Uses genetic engineering to increase the nutritional content and resistant traits of production. Conservation methods – used to protect water quality by slowing water runoff and trapping sediment and nutrients. Buffer strips, terraces, and grasses are some examples of waterway conservation methods Keywords-modern farming, agriculture, crop management, conservation Introduction Agricultural production has become increasingly dependent on the application of modern technologies to improve productivity, sustainability, and efficiency. In this mini-review paper, we review various modern agricultural technologies, including genetic engineering, precision agriculture, and smart farming, and how they can be applied to agriculture. In the introduction, it emphasizes the importance of modern technologies to address the challenges faced by agriculture, such as global food demand, limited resources, and environmental degradation.

Concerns. The paper then gets into specific techniques starting with genetic engineering. The paper then describes genetic engineering techniques and tools, including transgenic techniques and genome editing techniques such as CresPR-Cas9. The review discusses the many applications of genetic engineering in agriculture, including disease control and resistance, crop improvement, and environmental sustainability. As a next step, the review examines precision agriculture, which uses remote sensing, GPS, and drones to improve farming practices. Major applications of precision agriculture in agricultural production are precision seeding, precise nutrient and water management, and effective weed control. Also, the paper discusses the concept of smart farming, which uses technologies such as the Internet of Things and data analytics. The article discusses the application of smart agriculture to agricultural production, including livestock management, crop monitoring, and efficient resource use. Furthermore, the article examines the advantages and challenges associated with the adoption of modern farming techniques. We evaluate the benefits of increased productivity, reduced environmental impact, and optimized resource use along with potential downsides and considerations of economic, environmental, and social consequences. The objective of this mini-review paper is to highlight the importance of adopting modern agricultural technologies to meet the demands of a rapidly changing society. [1,2,3] Discussion As we know modern agriculture improves its ability to produce food, increases food supply, ensures food security, increases sustainability, and also produces more biofuels. But at the same time, it also causes environmental problems as it is based on high input-high output technology using hybrid seeds of high yielding variety and abundant irrigation water, fertilizers and pesticides. The effects of modern agriculture on the environment are discussed: Soil erosion The top fertile soil of agricultural land is removed due to excessive water supply. This leads to loss of nutrient rich soil which hinders productivity. It also causes global warming because the odor of water bodies induces the release of soil carbon from particulate carbon content. Groundwater contamination

Productivity – higher inputs in exchange for higher returns and productivity (commissioners worldwide now make up for most of the shortcomings). Four important considerations – what happens to the land, the food that is produced, the people who eat it and the communities lost – are ignored. 1 Land exhaustion Continuous use of artificial fertilizers,

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combined with lack of crop rotation, reduces soil fertility annually. 2 Fertilizer High yield levels are produced by applying large quantities of artificial fertilizers rather than maintaining the natural fertility of the soil. About half of the nitrate in artificial fertilizers used on crops is dissolved by nitrate run-off rain. Dissolved nitrate runs off the fields to contaminate water courses. 4 Soil erosion Where deep cultivation is repeated to turn the land, heavy rains can carry away the top and leave the land unfit for cultivation. 5 Soil compaction Damage to soil structure by compression is a serious problem in areas that are intensively farmed. Traditional tillage may involve a tractor passing over the ground six or seven times, and the wheelbarrow may cover up to 90 percent of an area. Even a single tractor pass can compress the soil surface enough to reduce soil porosity by 70 percent, increasing surface run-off and, therefore, water erosion. In the worst cases, surface run-off can approach 100 percent – none of the water penetrates the surface. 6 Agricultural Fuels As crop yields increase, so does the fuel needed to produce them. European farmers now use 12 tons of fuel to farm a square kilometer of land; American farmers use about 5 tons (1987 figures). 7 Biocide sprays are the only control chemical used against weeds and pests. Most crops receive several doses of different chemicals before they are harvested. 8 Cruelty to Animals On most "modern" farms, all animals are kept crowded indoors. Feeding them requires complex systems of machinery, while preventing disease requires constant medication. Cruelty is involved in management, breeding. The raising and slaughter of animals on today's farms is unimaginably repulsive and horrifying. 9 Animal slurry indoor pens with multiple animals packed together, Their manure accumulates at great speed. It is often discharged into lagoons that leak into local watercourses, contaminating them with disease-causing organisms and contributing to algae-blooms. 10 Imported Animal Feed Many farms are not self-sufficient in animal feed; Instead they rely on feed brought into the field. It often comes from countries that may be ill-equipped to part with it. 11 Burning In countries where stubble is burned, large amounts of potentially useful organic matter pollution disappears into the sky in clouds of smoke. 12 Loss of biodiversity in farming Big and other chemical farms tend to be monocultures of a single crop and increase crop diversity. 13 Threats to indigenous seed and animal breeds and species Native welfare and animal breeds lose to exotic species and hybrids. Many native animal breeds are threatened with extinction today. The same is true for many indigenous plant varieties that have disappeared within the space of a generation. 14 Habitat Destruction Agribusiness farming demands that anything that stands in the way of crop production is uprooted and destroyed. Wild animals and plants that were a common sight around the farms are deprived of their natural habitat and die. 15 Contaminated Food Food, both plant and animal products, leaves the farm contaminated with the chemicals that were used to prepare it. 16 Destruction of traditional knowledge systems and traditions Rural indigenous knowledge and traditions, both agricultural and non-agricultural, have always been linked to agriculture and farming systems. 17 Control of agricultural inputs and food distribution channels The supply and trade in agricultural inputs and produce is in the hands of a few large corporations. This threatens food security, reducing the profits and importance of the first and last part of the supply chain – farmers and consumers. 18 Threat to individual farmers Chemical agriculture is a threat to their livelihood and changes their lifestyle, unfortunately not for the better.

The environmental impact of agriculture is the impact that various agricultural practices have on the ecosystems around them, and how those impacts can be traced to those practices. [1] Environmental impact of agriculture Qualifications vary widely depending on the practices employed by farmers and scale of practice. Farming communities that try to reduce environmental impacts through modifying their practices will try to adopt sustainable farming practices. The negative impact of agriculture is an age-old issue that remains a concern, even as experts design innovative means to reduce destruction and increase ecofactuality. [2] Animal agriculture practices tend to be more environmentally destructive than agricultural practices focused on fruits, vegetables, and other biomass. Ammonia emissions from cattle waste continue to raise concerns over environmental pollution. [7,8,9] When evaluating environmental impact, experts use two types of indicators: "means-based", which is based on the farmer's production methods, and "impact-based", which is based on the impact that Farming practices have implications for emissions to the farming system or the environment. An example of an instrument-based indicator would be groundwater quality, which is influenced by the amount of nitrogen applied to the soil. An indicator reflecting nitrate loss would be impact-based. [4] Means-based evaluation looks at farmers' practices of agriculture, and impact-based evaluation considers the actual impacts of the farming system. For example, means-based analysis might look at the pesticides and fertilization methods that farmers are using, and impact-based analysis would consider whether CO2 is being emitted or what the nitrogen content of the soil is. [4] The environmental impact of agriculture includes impacts on a variety of different factors: soil, water, air, animal and soil diversity, people, plants, and food itself. Agriculture contributes to a number of environmental problems that cause environmental degradation: climate change, deforestation, biodiversity loss, [5] dead zones, genetic engineering, irrigation problems, pollutants, soil degradation, and waste. . [6] Because of the importance of agriculture

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to global social and environmental systems, the international community has committed to increasing the sustainability of food production as part of Sustainable Development Goal 2: "End hunger, achieve food security and improved nutrition. Achieve and promote sustainable agriculture". [7] The United Nations Environment Programme's 2021 "Making Peace with Nature" report highlights agriculture as both a driver and industry at risk from environmental degradation. [10,11,12]

The environmental impacts of agriculture can vary depending on the region and the type of agricultural production method being used. Listed below are some specific environmental issues in different regions around the world. [22,23,24] Hedgerow removal in the United Kingdom. Soil salinization, especially in Australia. Phosphate mining in Nauru Methane emissions from livestock in New Zealand. See Climate change in New Zealand. Environmentalists say algal blooms are being encouraged by nitrogen fertilization of hypoxic zones in the Gulf of Mexico. Systems coupled with agricultural trade leading to cascading effects and spillover systems leading to regional impacts. Environmental Factors (Socioeconomic Drivers section) Sustainable agriculture is the idea that agriculture should occur in such a way that we can continue to produce what we need without infringing on the ability of future generations. [13,14,15] Exponential population growth in recent decades has increased the practice of agricultural land conversion to meet the demand for food, which in turn has increased impacts on the environment. The global population is still growing and will eventually stabilize, as some critics doubt that food production can support the global population due to reduced yields from global warming. Agriculture can also have negative impacts on biodiversity. [5] Organic farming is a versatile sustainable agricultural set of practices that can have a low impact on the environment on a small scale. However, in most cases organic farming results in low yields in terms of production per unit area. [65] Therefore, widespread adoption of organic agriculture would require additional land to be cleared and additional water resources to be extracted to meet the same level of production. [19,20,21] A European meta-analysis found that organic farms tended to have higher soil organic matter content and lower nutrient losses.

(Nitrogen leaching, nitrous oxide emissions, and ammonia emissions) per unit of field area but higher ammonia emissions, nitrogen leaching, and nitrous oxide emissions per product unit. [66] It is believed by many that conventional farming systems lead to less rich biodiversity than organic systems. Organic farming has shown on average 30% higher species richness than conventional farming. On average, organic systems also contain 50% more organisms. There are some problems with this data as there were many results that showed negative effects on these things when in an organic farming system. [67] Opponents of organic farming believe that these are negative issues with the organic farming system. What started as a small-scale, environmentally conscious practice has now become as industrialized as conventional agriculture. This industrialization can lead to issues like climate change, and deforestation. [16,17,18]

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