**MODERN AGRICULTURAL PRACTICES**

**Introduction**

The story of agriculture is usually told as an epic struggle between people and nature. Agriculture is the cultivation of animals, plants, fungi and other life forms for food, fiber, biofuel, medicines and other products used to sustain and enhance human life. Agriculture was the key towards the development of human civilization. The history of agriculture dates back to thousands of years, and its development has been driven and defined by greatly different climates, cultures and technologies. However, all farming practices generally rely on techniques to expand and maintain the lands that are suitable for raising domesticated species. Until the Industrial Revolution, the vast majority of the human population labored in agriculture. Pre-industrial agriculture was typically subsistence agriculture or self-sufficiency, in which farmers raised most of their crops for their own consumption than for trade.

A remarkable shift in agricultural practices has occurred over the past century in response to new technologies and the development of world markets. This also has led to technological improvements in agricultural techniques. Today apart from the production of essential food crops, agriculture has become a source of livelihood, supply food as well as fodder; signify to international trade, marketable surplus, source of raw material, foreign exchange resources, great employment opportunities, economic development, food security, etc. Agriculture is the mainstay of Indian economy. About 70% of our population depends on agriculture. One third of our national income comes from agriculture. The development of agricultural society has much to do with our economic welfare. Modern agronomy, plant breeding, agrochemicals such as pesticides and fertilizers and technological improvements have sharply increased yields, but at the same time have caused wide spread ecological damage and negative human health effects. Agricultural food production has increasingly become one of the global issues on debate.

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During the latter half of the 12th century, what is known today as modern agriculture was very successful in meeting the growing demand for food by the world population. This boost in food production has been mainly due to scientific advances and new technologies, including the development of new crop varieties, the use of pesticides and fertilizers and the construction of large irrigation systems.

Modern agricultural systems have been developed with two related goals: to obtain the highest yields possible to get the highest economic profit possible. In pursuit of these goals, six basic practices have formed the backbone of modern agriculture. They are intensive tillage, monoculture, application of synthetic fertilizers, irrigation, chemical pest control and genetic manipulation of crop plants. Modern agricultural practices have a great promise for the economic development of a nation. Modern agriculture tends to see its success as dependent on linkages: access to resources, technology, management, investment, markets and supportive government policies.

However, for almost every benefit of modern agriculture there are usually problems. Ecological principles were ignored in modern agriculture. Excessive tillage led to soil degradation, loss of organic matter, soil erosion etc. Large monocultures are especially prone to devastating pest outbreaks. When used excessively, chemical fertilizers and pesticides easily leach out from soil into nearby water bodies causing pollution. Modern agriculture has become such a large user of water resources that overuse, depletion, saltwater contamination, salt buildup in soil, fertilizer leaching and soil erosion have become common. Genetically engineered seeds has contributed greatly to the loss of genetic diversity and increased the risk of massive crop failure, as well as an increased dependence on synthetic and non-renewable inputs needed for maintaining high yield.

To satisfy the increasing world population food supply is the major significance of modern agriculture. Modern agriculture enables farmers to utilize new innovations, research and scientific advancements, sustainable and affordable food. Increased production steadily improves diets, reflecting increased availability of all foods, dietary diversity and access to high protein food products, thereby to drive away hunger and malnutrition.

Traditional farming is an indigenous practice of cultivating land to raise crops, breeding and raising livestock while managing natural resources in order to produce nutritious and continual food supply without external contribution but using self-reliance and locally available resources.

**Major differences between Traditional and Modern Agriculture:**

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| --- | --- |
| **Traditional Agriculture** | **Modern Agriculture** |
| Small – scale. | Large – scale. |
| Self – sufficiency. | Commercial. |
| Manual. | Mechanized. |
| Local inputs. | External inputs. |
| Labor intensive. | Capital intensive. |

**CROPS AND MANAGEMENT**

Crop management involves a group of agricultural practices used to improve the growth and development and yield of agricultural crops. Such a management system usually includes considerations regarding the selection of the crop to plant, the preparation of the land where the crop will be planted, the application of fertilizers and pesticides, and other practices aimed at improving crop yields. The combination, timing and sequence of the practices used in crop management also depends on the biological characteristics of the crops, the harvested form, the sowing methods, the age of the plants and the soil, climatic and weather conditions.

Principal crop management practices vary according to the class of crops. Special practices for individual crops include hilling, suckering, pinching, chopping etc. Other practices include crop irrigation and mechanical, biological and chemical methods of combating weeds, pests and diseases.

Now a day, Integrated Crop Management (ICM) techniques are practiced. ICM is described as a 'common sense' approach to farming.ICM is a Pragmatized approach to the production of crops, which focus on crop protection. It includes Integrated Pest Management (IPM), social and environmental management. It conserves and enhances natural resources while producing food on an economically viable and sustainable foundation. ICM is a method of farming that balances the requirements of running a profitable business with responsibility and sensitivity to the environment. ICM combines the best of modern technology with some basic principles of good framing practice. It is based on a good understanding of the interactions between biology, environment and land management systems. ICM means “an agricultural management system that integrates all controllable agricultural production factors for long-term sustained productivity, profitability, and ecological soundness.” Basic components of ICM are crop management, nutrient management, pest management, and financial management. Each of these components of ICM is associated with agricultural Best Management Practices (BMP). ICM also associates Integrated Farming Systems (Animal + Crops), Sustainable Agriculture, IPM/ IDM/ IWM/ INM (Focuses on Pest, Diseases, Weeds and Nutrient Management) and Crops and Livestock.

ICM is appropriate for small farmers. It aims to minimize dependence on purchased inputs and to make full possible use of indigenous technical knowledge and land use practices.

The major **principles** underlying ICM includes:

* Site
* Crop rotation
* Variety
* Crop husbandry
* Organization and planning
* Wildlife, habitat and landscape features
* Animal husbandry
* Energy efficiency
* Crop nutrition
* Crop protection.

**PREPARING THE FIELD**

Field preparation or Soil tillage is one of the routine activities in most agricultural systems. Soil tillage is the physical manipulation of the soil with appropriate implements to loosen the surface soil layer in order to achieve the desired seedbed to provide optimum environment for seed germination and plant growth. Land preparation influences the ability of the crop to emerge and produce a good, uniform crop stand. This is a major pre-requisite for a good yield. Land preparation has changed from a manual to a power assisted activities over the century. Today tractors provide the major power source for tillage, but still animal and manual assisted tillage is practiced.

Often tillage starts with burning fallow vegetation or previous crop residues in order to clear the land or to scare away wild animals. Burning is followed by soil tillage. Depending on the possibilities of the farmer tillage can range from extensive to very intensive. Tillage is done to prepare an adequate seed bed which permits a good germination of seeds. A well tilled soil is loose, leveled and with a lot of fine particles that favor’s contact between seeds and the soil.

**Major functions of soil tillage:**

* Prepare seedbed.
* Expose soil organic matter to oxygen and to release soil nutrients.
* Manage crop residues.
* Incorporate fertilizers and agro-chemicals.
* Control weeds.
* De-compact dense soil layers.
* Increase water infiltration.
* Shape the soil surface.
* Allows more uniform water distribution.
* Better crop stand.
* Uniform crop maturity and timely harvesting.
* To prepare a seed bed which permits optimal soil - air - water relations.
* To facilitate proper soil chemical and microbial activity.

Even then, tillage operations will eventually have negative effects on the soil productivity and the economic return of the crops.

**Tillage drawbacks:**

* Increased soil erosion and loss of soil fertility.
* Increased evaporation and moisture loss.
* Decreased capability of the soil to hold water.
* Tillage also consumes money and time.
* Reduces organic matter in the soil.
* Reduces microbes, earthworms, ants, etc.
* If tractors are used for tillage, large quantities of fossil fuel are consumed, contribute to cost and contribute substantial greenhouse gas emissions. If animals are used for tillage, farmers must feed the animals to keep them alive for the tillage, adding significantly to the cost of production.

Preventive measures like construction of terraces are expensive. It is far more effective and cheaper to refrain from tillage and conserve the residues on the soil surface. As farmers seek to grow more crops with less cost and investment of time, they have developed minimum tillage methods.

**Minimum Tillage Methods:**

* In ***reduced tillage***, minimal soil disturbance is done to get a good plant stand.
* ***Conservation tillage*** is a form of reduced tillage where one-pass of the plow is done and a layer of residue is left on the soil surface. This helps to increase water infiltration, reduce erosion and reduce costs.
* In ***zero-tillage***, another variation of reduced tillage, the equipment used makes a narrow slot in the field where the seed is dropped and the rest of the field is un-tilled.

**SELECTION OF SEED**

**What is Seed?**

In broad sense, seed is a material, which is used for planting or regeneration purpose. Scientifically, a seed may be defined, as “structurally a true seed is a fertilized matured ovule consisting of an intact embryo, a store of endosperm and or cotyledons and a protective seed coat”. It also refers to propagating materials of healthy seedlings, tuber, bulbs, rhizome, roots, cuttings and all types of grafts and vegetative propagating materials used for production purpose.

Thus, seed is the most vital component for crop production, to increase productivity. Although the preparation of soil may be excellent, soil quality is good or the application of water is at desired level, good results will not follow unless the seed is of good quality. Good seed results in healthy, high-yielding seedlings. Seed selection mainly aims at obtaining healthy seeds and to improve the quality of the crop variety.

**Characteristics of a quality seed:**

* Genetically pure.
* Free form other crop seeds.
* Free from weed seeds.
* Free from diseases.
* High germination rate (80%) and vigour.
* Optimum moisture content (dried to less than 14%).
* Free of pest infestation.
* Free of inert matter.
* True to type.
* Free from other materials (plant debris, dead or broken seeds and other non-plant materials).

The importance of quality seeds has been recognized from ancient time. The old scripture *Manu Smriti* says *‘good seed in good soil yields abundantly’*. Seed quality has been treated as sacred, being an important factor in the improvement of agriculture and agrarian societies. The *Rig-Veda*, 2000BC indicated the importance of seed and the mother earth. In the 5th century, *Kautilya Artha Shasthra* mentioned the importance of seed, seed treatments to ensure good germination- seed dressing with milk, vidanga, cow dung and honey to protect seed during germination.

Although the importance of seed was recognized in ancient agriculture, the need for organized seed production was identified only at the beginning of 20th century, when Royal Commission of Agriculture (1925) recommended the spread of improved varieties and seed distribution.

**Importance of quality seed:**

1. **Seed is a vital input in crop production:**

It is the cheapest input in crop production and the key to agricultural progress. Crop status largely depends on the seed materials used for sowing. Response of other inputs in crop production depends on seed material used.

1. **The seed required for raising crop is quite small and its cost is so less compared to other inputs.**
2. **This emphasis the need for increasing the areas under quality seed production.**
3. **It is estimated that good quality seeds of improved varieties can contribute to about 20-25% increase in yield.**

The advent of modern plant breeding methods and biotechnological advances in seed industry plays a significant role in developing high yielding varieties and hybrids.

**Role of improved seeds:**

1. Carrier of new technology.
2. Basic tool for a secure food supply.
3. Principle means to obtain crop yields in less favorable production area.
4. Medium for rapid rehabilitation of agriculture after natural disasters.

**Benefits of using quality seeds:**

* They are genetically pure (true to type).
* Have high return per unit area as the genetic potentiality of the crop can be fully exploited.
* Less infestation of land with weed seed or other crop seeds.
* Less disease and insect problem.
* Minimization of seedling rate i.e., fast and uniform emergence of seedling.
* They are vigorous, free from pests and diseases.
* They can be adopted themselves for extreme climatic conditions and cropping system of the location.
* They respond well to the applied fertilizers and nutrients.
* Uniform in plant population and maturity.
* Crop raised with quality seed will be aesthetically pleasing.
* Good seed prolongs life of a variety.
* Prediction of yield is very easy.
* Handling in post-harvest operation will be easy.
* Preparations of finished products are also better.
* High produce value and their marketability.