Chapter I

CONCEPT OF AGRICULTURE

Part 2

What is Agriculture?

What is Agriculture?

Agriculture is derived from Latin words ***Ager*** and ***Cultura***. *Ager* means land or field and *Cultura* means cultivation.

It means…

- ✓ cultivation of land
- ✓ the science and art of producing crops and livestock for economic purposes
- ✓ It is also referred as the science of producing crops and livestock from the natural resources of the earth.

The primary aim of agriculture is to cause the land to produce more abundantly, and at the same time, to protect it from deterioration and misuse.

What is Agriculture?

Agriculture is the systematic raising of useful plants and animals under the management of man.

It is a purposeful work through which the elements of nature are harnessed **to** produce plants and animals to meet human needs.

It is a broad industry engaged in the production of plants and animals for food and fiber, the provision for agricultural supplies and services, and the processing, marketing and distribution of agricultural products.

Agriculture as art, science and business of crop production

- ✓ It embraces knowledge of the way to perform the operations of the farm in a skillful manner.
- ✓ It involves physical and mental skill.

As an art...

Agriculture as art, science and business of crop production

- ✓ It utilizes all modern technologies developed on scientific principles such as crop improvement/breeding, crop production, crop protection, economics etc., to maximize the yield and profit.
- ✓ hybridization, transgenic crop, biotechnology etc.

As a science…

Agriculture as art, science and business of crop production

- agriculture as a business aims at maximum net return through the management of land, labor, water and capital, employing the knowledge of various sciences for production of food, feed, fiber and fuel. In recent years, agriculture is commercialized to run as a business through mechanization.

As a business...

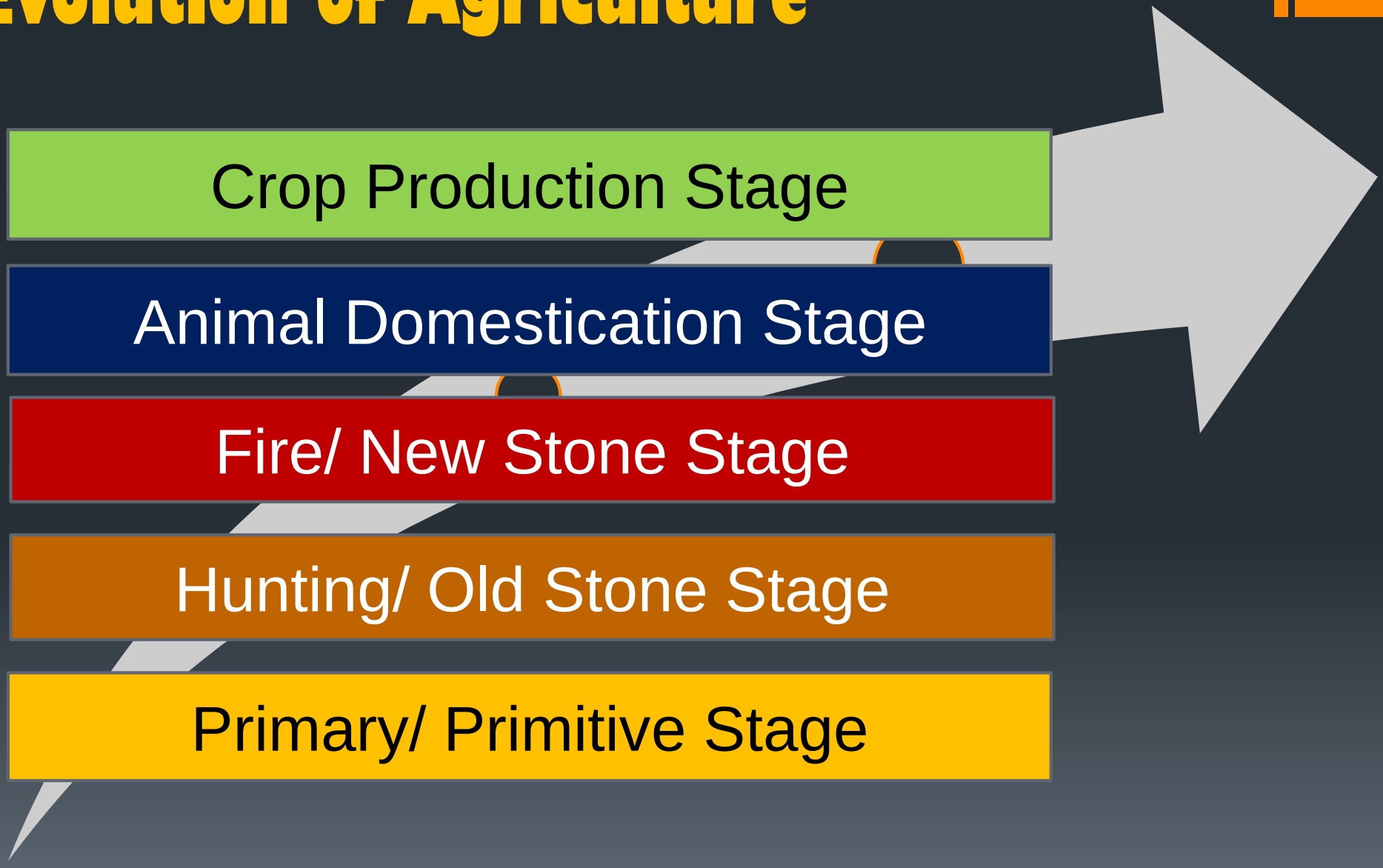
Branches of Agriculture

- **Crop Science-** Deals with economic plants .e.g., rice, jute, potato etc.
- **Animal husbandry-** Deals with animal production, e.g., cattle, buffalo, goat, poultry etc.
- **Veterinary** -Deals with the diseases and treatments of animal.
- **Fisheries-** Deals with pisciculture (rearing and managing fishes).

Branches of Agriculture

- **Agricultural engineering-** Deals with farm mechanization.
- **Agricultural economics-** Deals with economic management and marketing of agricultural products.
- **Agro-forestry**- Deals with integrated crop and forest plants production.
- **Agricultural engineering-** Deals with farm mechanization.

Evolution of Agriculture



Primary/ Primitive Stage

- ✓ Human being came on the earth.
- ✓ People were helpless and nomad and they had no houses.
- ✓ They were always afraid of wild animals.
- ✓ They used to take shelter together in the cave, earth-hole and branch of trees to escape themselves from the wild animals.
- ✓ They had no idea about food and crop production and used to live on natural fruits and roots.

Hunting/ Old Stone stage

- ✓ People had learned to save themselves from the wild animals by throwing large sized stones to those animals.
- ✓ They learned to make arms by breaking large sized stones for hunting. They used to eat flesh of wild animals.
- ✓ Gradually, women used to collect fruits and roots from near households. Thus they started to eat fruits and roots by flesh of wild animals. Women started to wear animal skin.

Fire and New Stone Stage

- ✓ **People were able to make fire** and prepare improved arms. They got the idea of making fire when they used to break the large sized stones into small pieces.
- ✓ They were able to **make sharp and pointed arms** by rubbing one stone with another.
- ✓ People learned to **burn the flesh of wild animals and thus started to eat burnt flesh**. Thus gradually the insecure condition of the people was changed.

Animal Domestication/ Husbandry Stage

- ✓ At that stage, men became expert in hunting wild animals.
- ✓ They used to hunt more than one animal and ate them as per requirement.
- ✓ Excess and gentle animals were kept for future use. Thus, animal domestication was started. Less stronger animals like cattle, goat, sheep, dog, etc. were domesticated first.

Animal Domestication/ Husbandry Stage

- ✓ Women and children used to take care and manage feed for those animals. Thus, animal husbandry was started first.
- ✓ They used to eat natural fruits and roots and did not know how to produce them. So, people used to move from one location to another for their own food and animal feed.

Crop Production Stage

- ✓ After thousands of years, people wanted to settle down in a permanent site, as nomad life was unbearable.
- ✓ People observed that plants come up from maize seeds kept on the graveyard. Probably women by her intrinsic insight nurtured the sprouts to harvest near households. Thus, women are the pioneers of agriculture.

Crop Production Stage

- ✓ Then people started to use fire and digging land by sticks to prepare garden plots in which they would grow small grains.
- ✓ They started cultivation by pointed sticks and branches of trees.

Modern agriculture was started from 18th century

Green revolution was started in 1960s.

Importance of Agriculture

❑ Food

- ✓ **Carbohydrates-** cereals, potato and sweet potato
- ✓ **Protein-** meat and fish, egg, milk, pulses
- ✓ **Fat-** mustard and grape seed, soybean, groundnut, sunflower, sesame
- ✓ **Vitamin and Minerals-** various fruits, vegetables, milk, butter etc.

Importance of Agriculture

Clothes

Agriculture provides us fibre to make clothes. In the world, 70% of the fiber comes from cotton (*Gossypium* spp.). Other sources are jute, wool, silk, natural fiber etc., which are also obtained from agriculture.

Importance of Agriculture

Houses

People gradually felt the necessity of making houses to escape themselves from wild animals, rain, sunshine, cyclone etc. Maximum housing materials are the products of agriculture. Such as, timber, bamboo, straw, rope etc.

Importance of Agriculture

❑ Industry

Agriculture provides raw materials in different industries.

- ✓Medicine Industry
- ✓Paper Industry
- ✓Rubber Industry
- ✓ Soap, Candle, and Paint Industry

- ✓Perfume Industry
- ✓ Beverage Industry
- ✓ Bakery
- ✓ Sugar Industries
- ✓ Narcotic
- ✓ Leather Industry

Importance of Agriculture

❑ Fuel

Fuel of brick fields (timber, jute-stick, dry leaves etc.). Coal, petrol and gasses are obtained from plant materials. Biodiesel is one of the new ideas where diesel can be obtained from plant named *Jatropha*.

Importance of Agriculture

❑ Earning source

People take agriculture directly or processing of agricultural products as an occupation and thus earn money.

Around 62% people are directly engaged in agriculture where most of the people are related to crop enterprises. Agriculture still employs about **47.5% of total employment of the country.**

Importance of Agriculture

Foreign Currency

Some agricultural products directly or in processed condition are exported and thus earned foreign currency. Such as, rice, jute, wheat, tomato, frozen fish, vegetables etc.

Importance of Agriculture

- **International Relationship**

By exporting and importing of agricultural commodities a country can **establish a good relation with the foreign countries.**

Importance of Agriculture

Revenue Income

From the rent and taxes of agricultural land, agricultural products, government can earn revenue income. Agriculture contributes around 19.29% of total GDP in Bangladesh where crops plants alone contributes 13.44% .

Importance of Agriculture

Natural Beauty

Flower, ornamental grasses and plants bring natural beauty, which is the contribution of agriculture. Such as, roses, jasmine etc.

Importance of Agriculture

Environmental Balance

Plants liberate O_2 and animals liberate CO_2 to the atmosphere and thus the gaseous concentration of the atmosphere is balanced. Agriculture helps in environmental balance by producing plants and animals.

Part 2

Agricultural Development

What is Agricultural Development?

- **Agricultural development** should be such that agriculture development brings about a revolution in the agriculture industry to give birth to an agriculture which is profit giving and at the same time eco-friendly.
- Agricultural development promotes the proper conditions for farming so that planting, harvesting, and processing can be done effectively, which ultimately can reduce poverty and save lives.

What is Agricultural Development?

A. Seeds
B. Fertilizer and Chemicals
C. Irrigation
D. Transportation
E. Research Extension and Communication
F. Credit Facilities
G. Technological advancements

History of Agricultural Development in the World

- NEOLITHIC ERA

✓ **7000 BC-** sowing and harvesting reached Mesopotamia.

- In Greece and the Aegean, evidence of emmer and einkorn wheat, barley, sheep, goat, and pigs.

✓ **6000 BC-** farming was entrenched on the banks of Nile River; agriculture was developed in the Far East, probably in China, with rice *(Oryza sativa*) rather than wheat (*Triticum aestivum*) as the primary crop.

- **Indus Valley-** presence of wheat and some legumes.

History of Agricultural Development in the World

NEOLITHIC ERA

- ✓ **4500-6000 BC-** archaeological evidences of domestication of plants and animals were found in Iberian Peninsula.
- ✓ **5500 BC- Ceide Fields (Ireland)-** oldest known field systems in the world.
- ✓ **5000 BC-** domestication of rice and sorghum in Sahel Region of Africa.
- ✓ **4000 BC-** horse was first domesticated in Ukraine.

History of Agricultural Development in the World

❑ NEOLITHIC ERA

- ✓ **3500 BC- Indus Valley-** advanced cotton growing and cotton textiles were quite advanced.
- ✓ **3000 BC-** farming of rice had started in the valley.
- ✓ **3000-2700 BC-** maize (*Zea mays*) was first domesticated in the Americas.
- ✓ **2500 BC-** rice was an important component of the staple diet in Mohenjodaro near Arabian Sea.

- Indians had large cities with well-stocked granaries.

-Three regions of Americas independently domesticated corn, squashes, potatoes and sunflowers.

History of Agricultural Development in the World

ROMAN ERA

✓ Romans laid the groundwork for the manorial economic involving serfdom, which flourished in the Middle Ages.

FOUR SYSTEMS OF FARM MANAGEMENT

1. Direct work by owner and his family;
2. Slaves doing work under supervision of slave managers
3. Tenant farming or share farming;
4. Farm was leased to a tenant.

History of Agricultural Development in the World

- MIDDLE AGES (1500-500 AD)

Muslim farmers in North Africa and the Near East developed and disseminated agricultural technologies including the ff:

- ✓ irrigation systems based on hydraulic and hydrostatic principles;
- ✓ use of machines such as norias;
- ✓ use of water raising machines
- ✓ construction of dams and reservoirs

History of Agricultural Development in the World

MIDDLE AGES

- ✓ location-specific farming manuals were developed;
- ✓ wider adoption of crops including sugarcane, rice, citrus fruit, apricots, cotton, artichokes, aubergines, and saffron;
- ✓ lemons, oranges, cotton, almonds, figs, and sub-tropical crops such as bananas were brought to Spain.

History of Agricultural Development in the World

- ✓ **1400s-1500s-** Explorers introduced plants and agricultural products from Asia and the Americas into Europe.
- ✓ **Early 1700s-** New crop rotation methods evolved in Europe's Low Countries and in England, improving previous systems.
- ✓ **1701- Jethro Tull-** introduced the seed drill to English farmers.

History of Agricultural Development in the World

- **Late 1700s- Robert Bakewell (England)-** pioneered the selective breeding of cattle and sheep to produce meatier animals.
- **1793- Eli Whitney (United States)-** invented the cotton gin, a machine that separated fiber from seed much more quickly than people could do it by hand.
- **1834- Cyrus Mc Cormick (United States)-** the first practical reaper or grain harvesting machine.

History of Agricultural Development in the World

- ✓ **1837- John Deere (United States)-** patented the steel plow.
- ✓ **1842- John Bennet Lawes (England)-** founded the first factory to manufacture superphosphate.
- ✓ **1850s- 1900s-** development of railroads and steamship lines were expanded.
- ✓ **1866- Gregor Mendel's** studies in heredity were published in Austria.

History of Agricultural Development in the World

- **Early 1890s-** first gasoline-paved tractors were built, replacing steam powered tractors and animals for draft.
- **1890s**- combine harvester were built.
- **Late 1920s-** scientists improved the seeds from which farmers grew corn.
- **1939-** introduction of DDT; it is also a beginning of agriculture's heavy use of chemical pesticides in developing countries.

History of Agricultural Development in the World

- ✓ **1945-1970-** machines and increased productivity in industrialized countries sharply reduced the number of people working in agriculture.
- ✓ **1950s- 1960s-** developing countries, including Philippines, experienced **Green Revolution.**
- ✓ **1970s- Present-** age of genetic engineering began.
- ✓ **1980s-** developed countries- farmers began to use computers.

Agriculture Developments in the Philippines

PRE-COLONIAL PERIOD

- ✓ Indo- Malayan migrants brought with them wet-rice agriculture, with carabao as a source of animal power for cultivation. This type of agriculture predominated near bodies of water like rivers and lakes.
- ✓ Slash-and-burn or *kaingin culture* or non-plow farming predominated in other areas.
- ✓ This indicated shifting agriculture rather than sedentary type of rice culture and the tribes were mainly nomadic.

Agriculture Developments in the Philippines

- PRE-COLONIAL PERIOD

  Main crops consisted of;

  - Rice
  - Taro
  - Yams
  - Bananas
  - Corn Millet
  - Coconuts
  - Citrus
  - Ginger
  - Clove
  - Cinnamon
  - Nutmeg

Agriculture Developments in the Philippines

PRE-COLONIAL PERIOD

- ✓ Farms were small, and chiefly backyard in coastal and riverbank settlements.
- ✓ Most barangays were self-sufficient.
- ✓ Land was abundant and population was estimated to about 500,000 by the mid-16th century.
- ✓ Private land ownership did not exist.

Agriculture Developments in the Philippines

COLONIAL PERIOD

- ✓ This period introduced a non-producing class for which Filipinos produced surpluses, leading to an increase in agricultural production.
- ✓ The development of haciendas allowed for the introduction of technological innovations in production and processing like steam or hydraulic-powered sugar mills.

Agriculture Developments in the Philippines

- COLONIAL PERIOD

Introduced crops are:

- ✓ Mulberry
- ✓ Cocoa
- ✓ Wheat
- ✓ Cucumber
- ✓ Cantaloupe
- ✓ Watermelon
- ✓ Coffee

Agriculture Developments in the Philippines

POST WAR PERIOD

- ✓ Introduction of technological improvements.
- ✓ **1950's-1960's-** campaign for use of modern farm inputs and farm mechanization.

  - building up of market for tractors and power tillers.

Agriculture Developments in the Philippines

POST WAR PERIOD

- ✓ Establishment of the International Rice Research Institute (IRRI).
- ✓ Introduction of high yielding rice varieties which was also termed the green revolution.
- ✓ Further development and expansion of international agricultural trading especially coconut and its by-products, tobacco, sugar, pineapple, etc.

Part 3

Philippine Agriculture

- Philippines is still primarily an agricultural country.
- Most citizens still live in rural areas and support themselves through agriculture.
- 4 sub-sectors of agriculture: farming, fisheries, livestock, and forestry.
- Country's most agricultural crops: rice, corn, coconut, sugarcane, banana, pineapple, coffee, mangoes, tobacco and abaca.

- Secondary crops; peanut, cassava, camote, garlic, onion, cabbage, eggplant, calamansi, rubber, and cotton.
- **Export countries**: USA, Japan, Europe, and ASEAN countries.
- **Export products**: coconut oil and other products, fruits and vegetables, banana, prawns.
- **Imported products**: unmilled wheat and meslin, oilcake and other soybean residues, malt and malt flour, urea, flour, meals and pellets of fish, soybeans and whey.

Concerns of Agriculture

- rampant conversion of agricultural land for commercial uses;
- farmer's continued reliance on chemical based fertilizers or pesticides;
- environmental damage (water pollution, coral reef destruction, forest destruction);
- lacks funding of critical projects i.e. irrigation systems;

Origin, domestication of some important crops

LABORATORY EXERCISE 1

1. Rice
2. Corn
3. Coconut
4. Sugarcane
5. Banana
6. Pineapple
7. Coffee
8. Mango
9. Tobacco
10. Abaca

Origin, domestication of some important crops

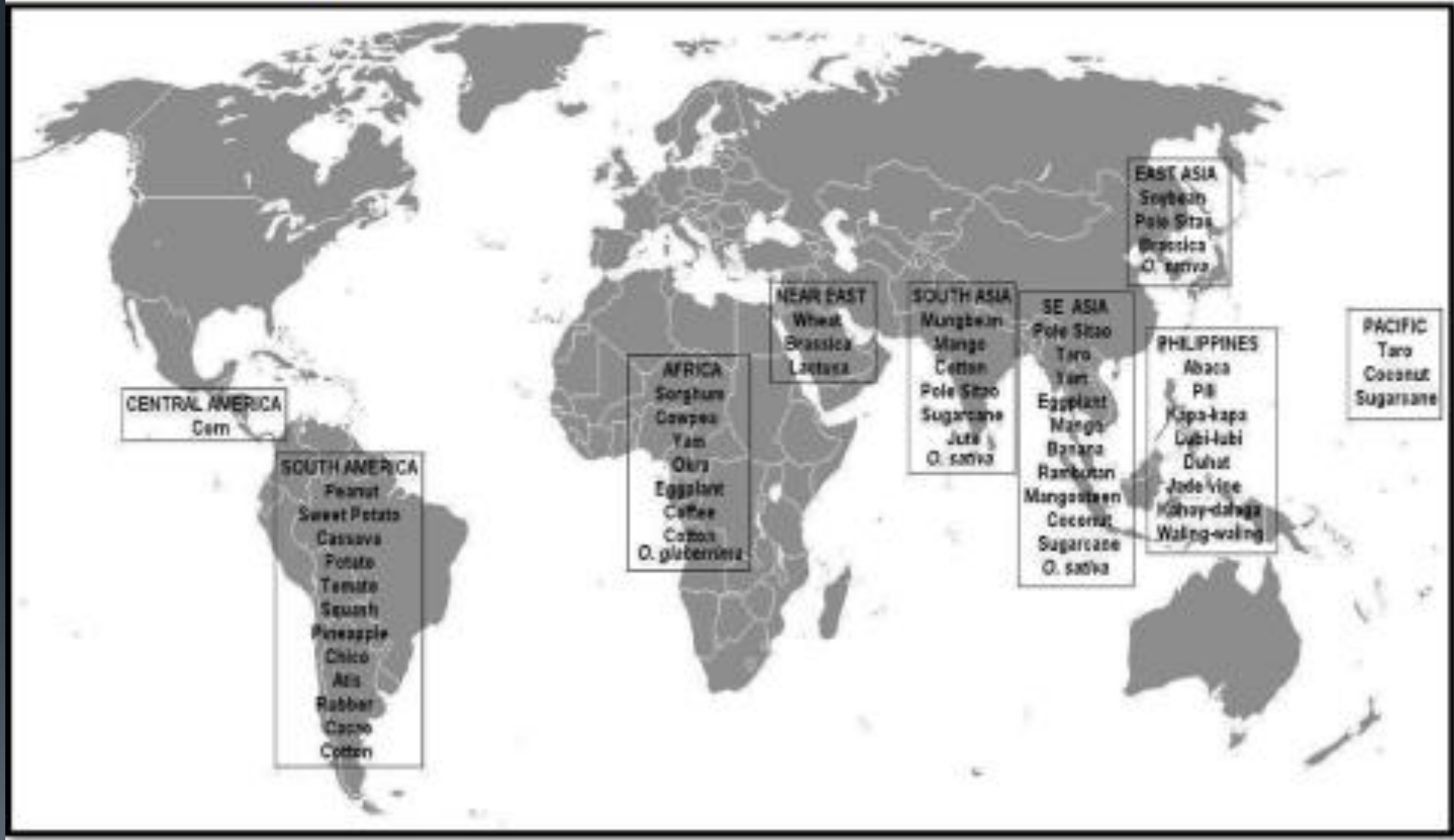
LABORATORY EXERCISE 1

I. Introduction about the crop (classification, origin, domestication, etc.)
II. Importance of the crop(refer to importance i.e uses, GDP etc.)
III. Present scenario (with statistics)
IV. Issues and challenges of the industry
V. Future/ Trends of the Industry
VI. References

Part 4

Introduction to Crop Science

ORIGIN and DOMESTICATION of some important CROPS



Philippines is also home to many plant species…

- According to International Union for the Conservation of Nature (IUCN), the Philippines ranks fifth in the world in terms of species diversity and endemism.
- A total of 39,100 species of flora and fauna have been identified in the country, of which a high 67% are endemic.

Plants found only in the Philippines…

ABACA *(Musa textilis)*

Plants found only in the Philippines…

PILI *(Canarium ovatum)*

Plants found only in the Philippines…

Kapa-kapa *(Medinilla magnifica)*

Plants found only in the Philippines…

Lubi-lubi *(Niyog- niyugan)*

Plants found only in the Philippines…

DUHAT *(Syzygium cumini)*

Plants found only in the Philippines…

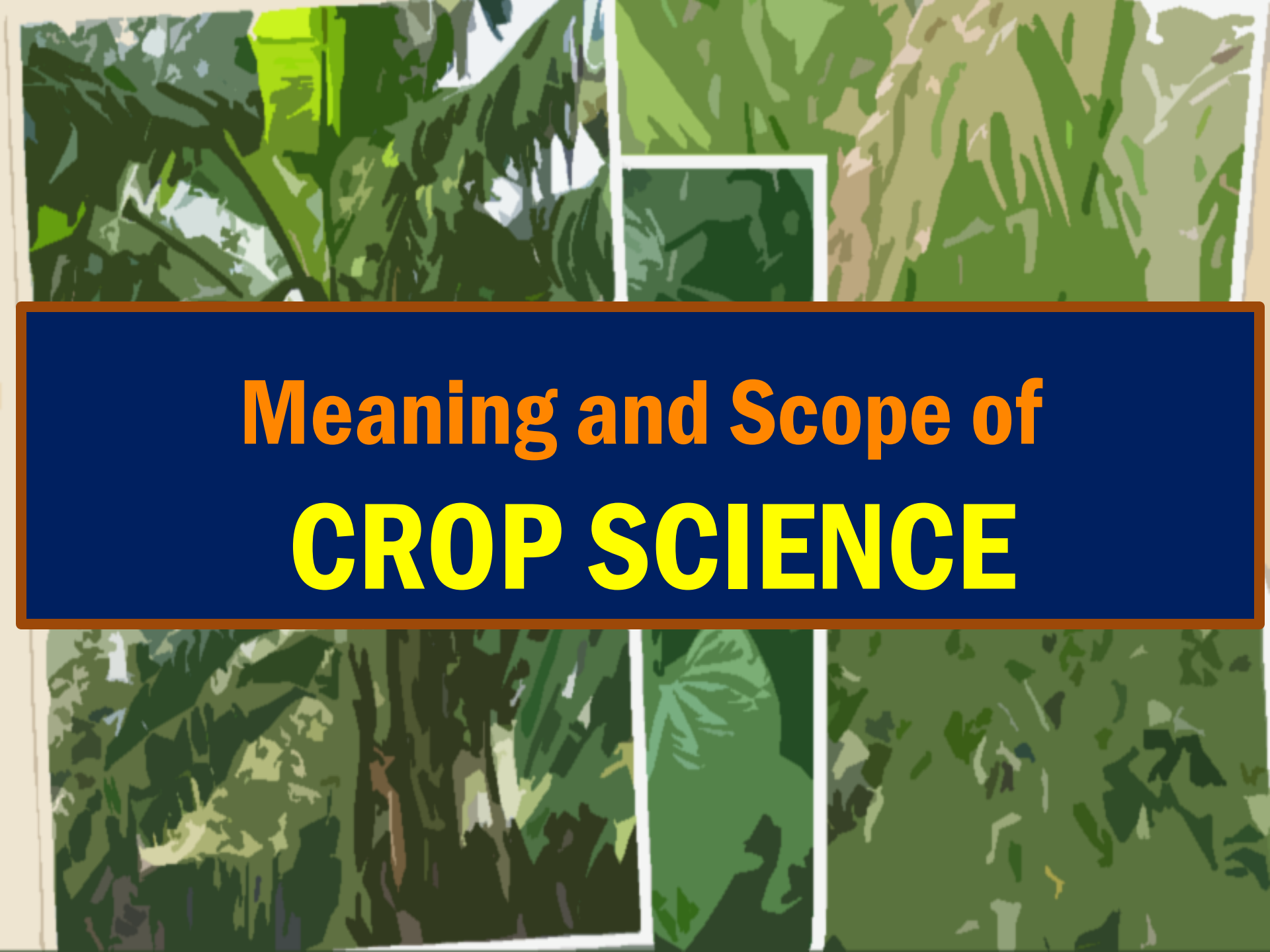
JADE VINE *(Strongylodon macrobotrys)*

Plants found only in the Philippines…

KAHOY-DALAGA *(Mussaenda philippica var 'aurorae')*

Plants found only in the Philippines…

WALING-WALING *(Vanda sanderiana)*



Meaning and Scope of
CROP SCIENCE

DEFINITION

- **SCIENCE:** Systematically **accumulated and tested knowledge.** It refers to the ordered knowledge of natural phenomena and the rational study of the relationship between the concepts in which these phenomena are expressed.
- **PLANT:** Any **organism** belonging to the **kingdom Plantae**, typically lacking of active locomotion or obvious nervous system or sensory organs and has photosynthetic ability.

DEFINITION

- **CROP:**

  Domesticated/cultivated **plants grown for profit.** It usually connotes a group or population of cultivated plants.

What is CROP SCIENCE?

It is concerned with the observation and classification of knowledge concerning economically cultivated crops and the establishment of verifiable principles regarding their growth and development for the purpose of deriving the optimum benefit from them.

AGRONOMY

It came from the Greek word “agros” meaning field and “nomos” meaning to manage. Thus agronomy deals with the principles and practices of managing field crops and soils.

HORTICULTURE

- It came from the Latin words "hortus", which means a "garden", (a term derived from the Anglo-saxon word "gyrdan", which means "to enclose") and "colere", which means 'to cultivate".
- The concept of gardens and plants within an enclosure is distinct from the culture of field crops- A MEDIEVAL CONCEPT.
- It includes pomology (fruits), ornamentals (floriculture), vegetables (olericulture), nursery management, and landscape gardening.

CROP PRODUCTION as a Science, Art and Business

As a science, it is derived from the adoption or application of basic sciences of chemistry, mathematics, physics and from various applied sciences like physiology, meteorology, anatomy, plant breeding, etc.

As an art, it requires skills to produce crops with little or no scientific training.

As a business, plants are not grown simply to satisfy human needs but to realize at some profit in the process of production.

Trivia and Current Events in Crop Science

Some chemical compounds found in crops

- **Calcium oxalate** – chemical substance that causes itchiness in gabi
- **Sulfuric acid** – chemical present in onion
- **Capsaicin** – white crystalline compound that causes hotness in some pepper varieties

Some chemical compounds found in crops

- **Solanine** – glykoalkaloid chemical present in potato tuber which causes greening when exposed to sunlight
- **Momordicin** – substance that causes bitter taste of ampalaya
- **Allicin** – substance found in garlic; can heal common cold; can reduce/improve blood pressure and cholesterol, can be used to heal an-an and warts

THANK YOU FOR LISTENING!!!