

Introduction to Agricultural Geography



NORTH AMERICA
Amérique du Nord - Nordamerika
Nordamerika

EUROPE
L'Europe - Europa

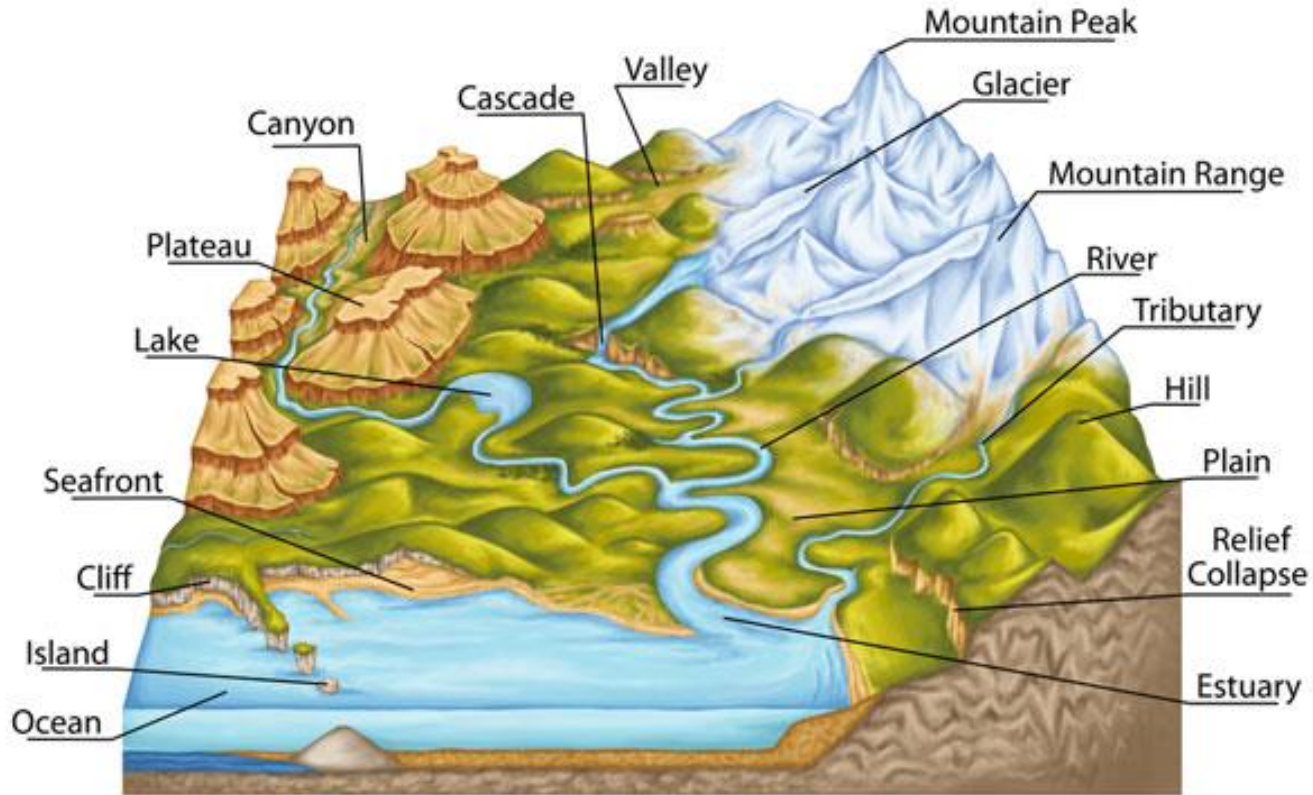
ASIA
Asien - Asien

ATLANTIC OCEAN
Océan Atlantique - Océano Atlántico
Atlantischer Ozean

PACIFIC OCEAN
Océan Pacifique - Océano Pacífico
Pazifischer Ozean

INDIAN OCEAN

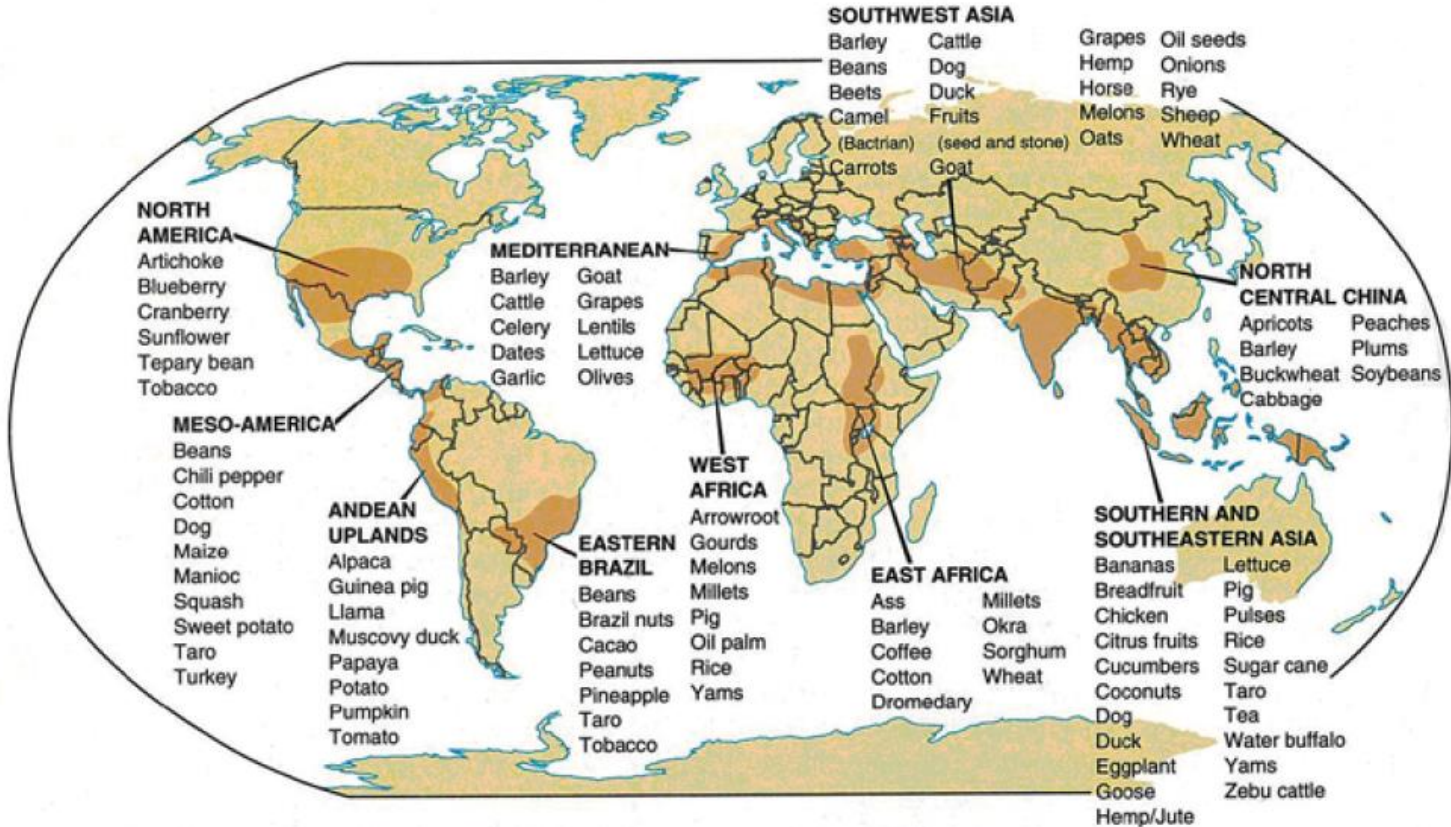
Why Geography?

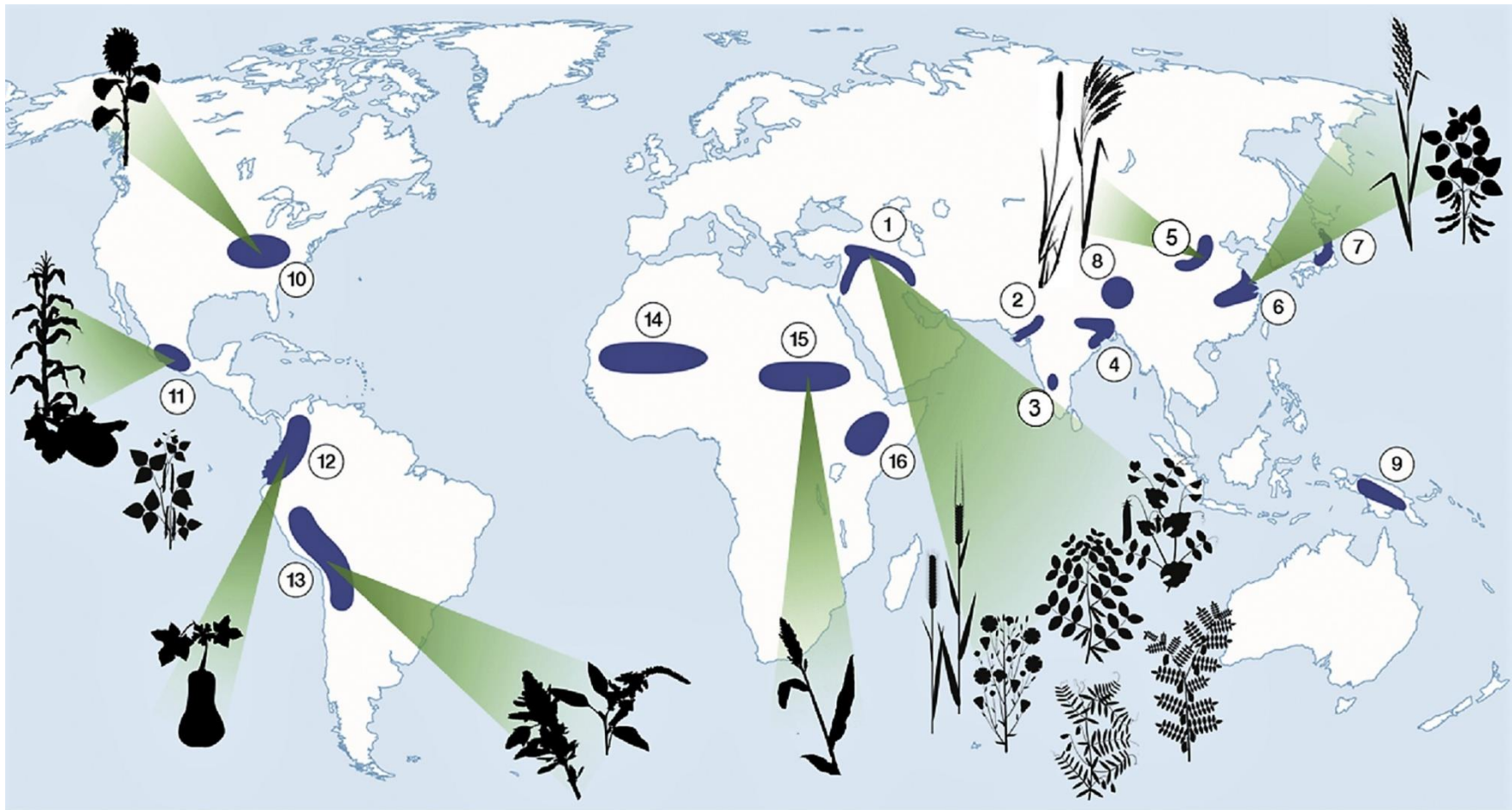




- **Agricultural geography** is a sub-discipline of human **geography** concerned with the spatial relationships found between **agriculture** and humans.
- That is, the study of the phenomena and effects that lead to the formation of the earth's top surface, in different regions.

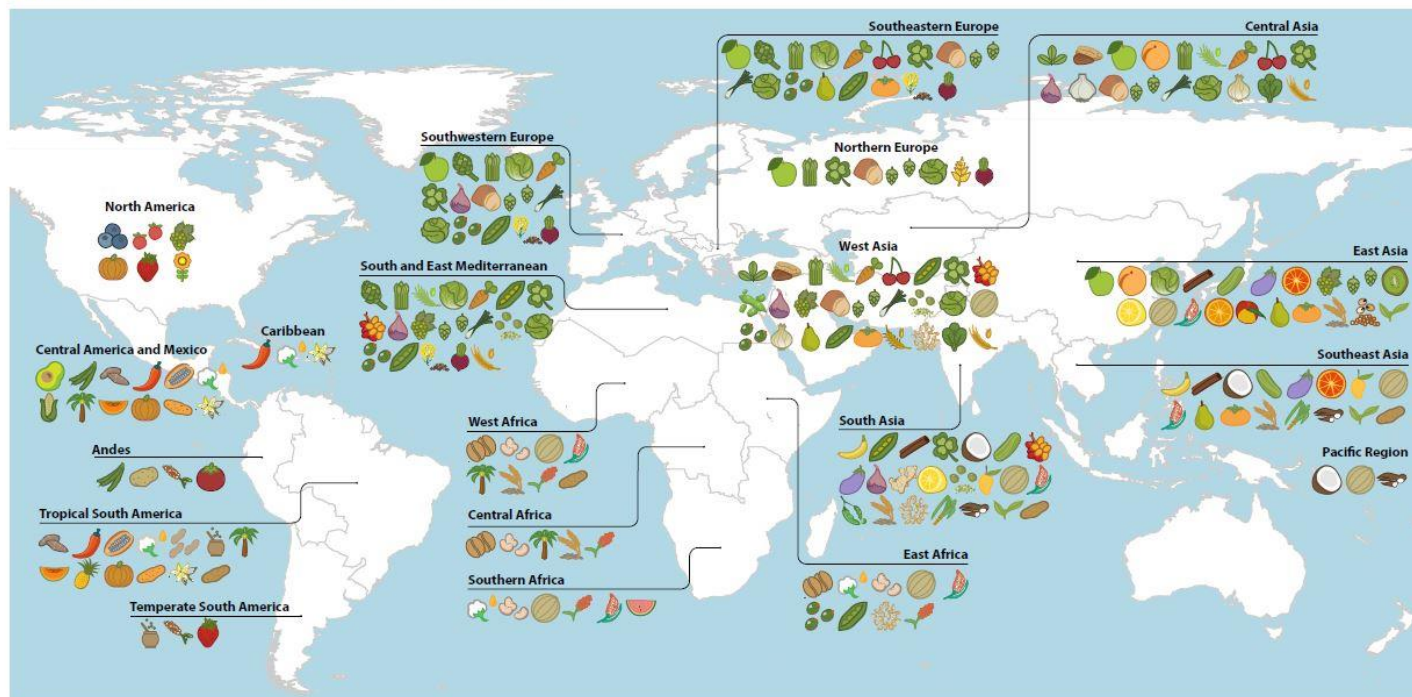
Origin and Dispersal of Agriculture





ORIGINS AND PRIMARY REGIONS OF DIVERSITY OF AGRICULTURAL CROPS

Khoury CK, Achicanoy HA, Bjorkman AD, Navarro-Racines C, Guarino L, Flores-Palacios X, Engels JMM, Wiersema JH, Dempewolf H, Sotelo S, Ramirez-Villegas J, Castañeda-Álvarez NP, Fowler C, Jarvis A, Rieseberg LH, and Struik PC (2016). Origins of food crops connect countries worldwide. Proc. R. Soc. B 283: 20160792. DOI: 10.1098/rspb.2016.0792.



- | | | | | | | | | |
|---------------------|--------------------|----------------|------------|----------------|----------------------|------------|--------------|----------------|
| Alfalfa | Beans | Clover | Eggplants | Hops | Melons | Pears | Rice | Sunflower |
| Almonds | Blueberries | Cocoa beans | Faba beans | Kiwi | Millets | Peas | Rye | Sweet potatoes |
| Apples | Cabbages | Coconuts | Figs | Leeks | Oats | Pigeonpeas | Sesame | Taro |
| Apricots | Carrots | Coffee | Garlic | Lemons & limes | Olives | Pineapples | Sorghum | Tea |
| Artichokes | Cassava | Cottonseed oil | Ginger | Lentils | Onions | Plums | Soybean | Tomatoes |
| Asparagus | Cherries | Cowpeas | Grapefruit | Lettuce | Oranges | Potatoes | Spinach | Vanilla |
| Avocados | Chickpeas | Cranberries | Grapes | Maize | Papayas | Pumpkins | Strawberries | Watermelons |
| Bananas & plantains | Chillies & peppers | Cucumbers | Groundnut | Mangoes | Rape & mustard seed | Quinoa | Sugar beet | Wheat |
| Barley | Cinnamon | Dates | Hazelnuts | Mate | Peaches & nectarines | Sugarcane | Vanilla | Yams |

Importance of Agricultural Geography

There are six main objectives of agricultural geography:

1. To examine the spatial distribution of crops, livestock and other agricultural activities. The cropping patterns and crop and livestock combinations vary in space and time. For example, the crop associations of Chattagram is different from those of Dinajpur. The causes of such variations and their systematic explanation are one of the primary objectives of agricultural geographers.

2. To ascertain the spatial concentration of agricultural phenomena. There are certain crops which have very high concentration in one area and low or insignificant concentration in other areas. The reasons for such spatial densities are examined by agricultural geographers.

3. Crop associations and crop-livestock combinations change in space and time. What was the crop combination in the, pre-Green Revolution period has changed in the post- Green Revolution period.

This association is not going to last as many of the farmers and scientists are rightly challenging its sustainability. There is a strong possibility of the farmers to adopt a new combination in the coming decades. The farmers always try to optimize their agricultural returns and adopt new innovations. The temporal change in cropping patterns deserves investigation and explanation.

4. The performance of various crops in a country or region is not uniform. There are inter-regional, intra-regional, intra-village and intra-farm variations in the production and productivity of different crops. In other words, some areas perform better than others agriculturally. The reasons why certain areas are lagging behind in agricultural productivity is also a fascinating ground of agricultural geographers.

5. Apart from the given objectives, the agricultural geographers have to diagnose at the micro level (household and field level) the causes of existing agricultural backwardness, and then to suggest suitable strategies to enhance productivity. This may go a long way in alleviating the marginal and small farmers above the poverty line in a given region.

In the developed countries and in some pockets of developing countries, agriculture has achieved the status of 'agribusiness'. In agribusiness agriculture has been considered as an industry in which the 'law of increasing return' applies. The geographers should make attempt to identify the impediments which are coming in the way of making this occupation as an agribusiness.

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Climate and Agriculture

- Humid tropical monsoon type with three distinct meteorological seasons – **summer, monsoon and winter.**
- The **rainfall** ranges from **1500** mm in the northwest to **5000** mm in the northeast.
- The rainfall along with depth and duration of flooding is the main critical factor for agriculture in Bangladesh.
- The critical aspects of rainfall in relation to the use of land for agriculture is related to the uncertainty of the onset and departure of the monsoon as well as occurrence of droughts.
- Based on the **climate, physiography and soil**, Bangladesh has been divided into **30 Agro Ecological Zones (AEZ)**

Bangladesh Agriculture

Introduction

- **Agriculture is one of the prime sectors of Bangladesh's economy.**
- **About 80 percent of the total population lives in rural areas, with 70 percent of them employed in agriculture.**
- **Agriculture contributes about 18 percent to the country's GDP, about 14 percent of which is contributed by the crop sector alone.**
- **Food security, employment creation and poverty alleviation are closely related with the development of agriculture.**
- **Bangladesh has already achieved self-sufficiency in cereal food production.**
- **In Bangladesh, it is possible to reduce rural poverty and raise the living standard of common people by establishing agriculture as a profitable sector.**

Characteristics of Bangladesh Agriculture

- Cropping intensity 179%
- Irrigated land 56%
- Surface water: 21%, groundwater: 79%
- Land-man ratio: .06 ha
- Mainly subsistence farming
- Inadequate agro-processing
- Non-mechanized farming
- Fragmented land/plots
- Dependence largely on nature

Importance of agriculture

- **21% GDP**
- **48% labor force**
- **Source of raw materials as backward and forward linkage for agro based industries**
- **Agriculture determines people's lives and livelihood of this region**
- **People living in rural areas 77%**
- **Export value 12%**

Some challenges

- Rapid shrinkage of agricultural land @1% p.a.
- Population growth @1.48% p.a.
- Climate change and variations
- Rapid urbanization growth @12% p.a.
- Agricultural research and education (manpower shortage, updating course curriculum)
- Technology generation (needs expertise, time and money)
- Technology dissemination (needs expertise, time, logistics support)
- Alternate livelihoods/rehabilitation program
- Inadequate value addition /food processing

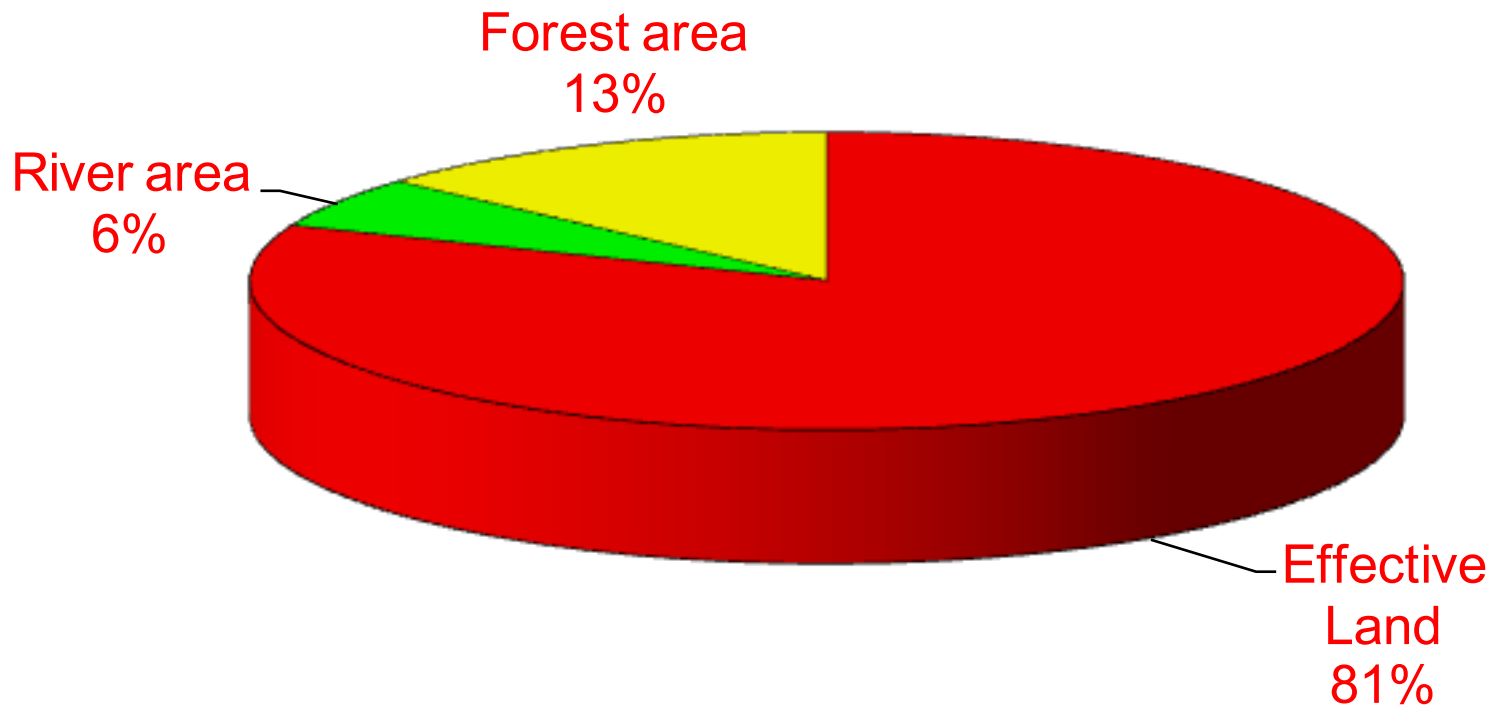
Challenges continued...

- Climate change adaptation & mitigation
- Developing stress tolerant varieties
- Transferring updated information and technologies to the field
- Attaining irrigation efficiency
- Regaining soil fertility and natural ingredients
- Research-extension-farmer-market linkage
- Shortage of Agril labour at peak seasons

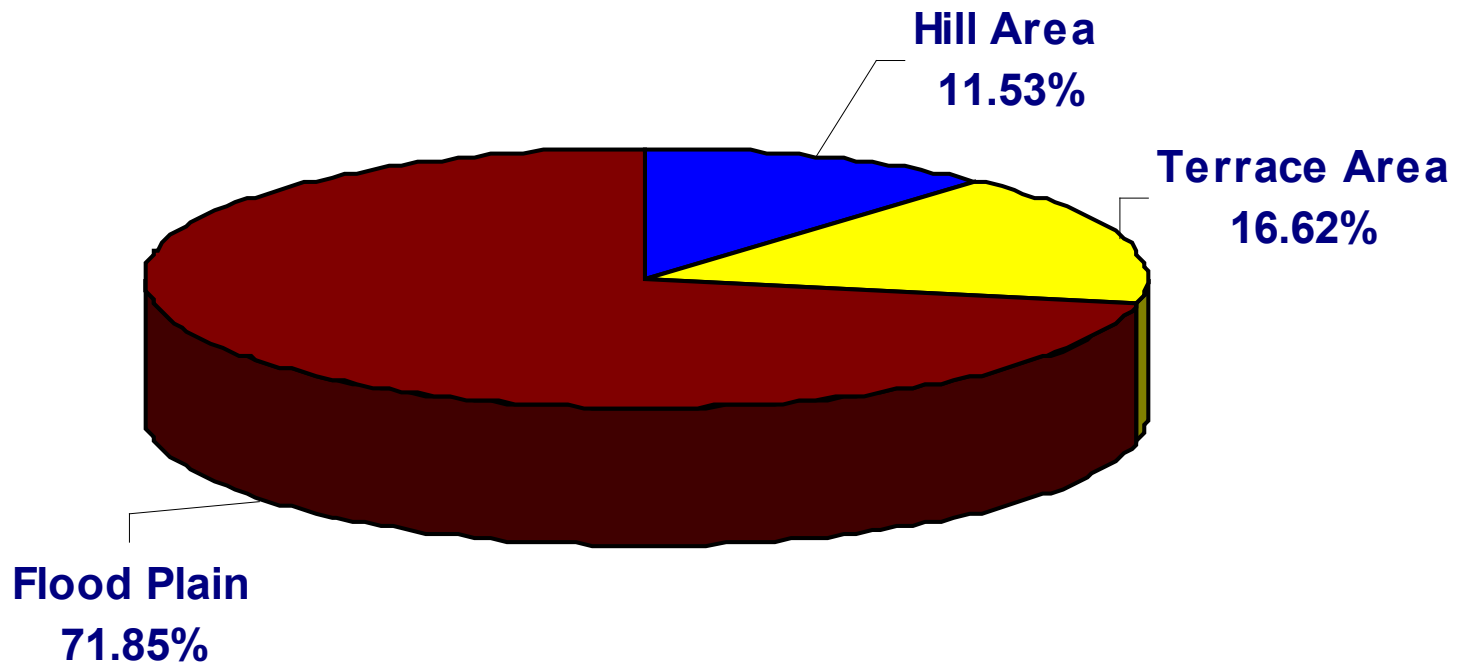
Prospects of Agriculture:

- Modern technological know-how is available for dissemination
- Scope for expanding hybrid technology exists(10%)
- Prospects for adoption of advanced technology in agriculture are bright
- Potentials for proper utilization of hilly/coastal areas including agro-ecologically disadvantaged regions exist
- Export potentials exist for high-value crops
- Scope for crop diversification, intensification and value addition to agricultural produces
- Agriculture sector has capacity to absorb labor force and to generate income
- Scope for reducing yield gaps exists

Land use of Bangladesh



Land area of Bangladesh



Cropping Seasons

1. Kharif-I (Mid-March to Mid-July)
2. Kharif-II (Mid-July to Mid-November)
3. Rabi or Winter (Mid-November to Mid-March)

Major crops

Cereal crops

Rice

Wheat

Maize

Pulses

Grasspea

Lentil

Chickpea

Fieldpea

Mungmean

Blackgram

Cowpea

Oil crops

Mustard

Sesame

Flax

Soybean

Fibre crops

Jute

Cotton

Sugarcane

Tea

Vegetables

Potato

Fruits

Spices

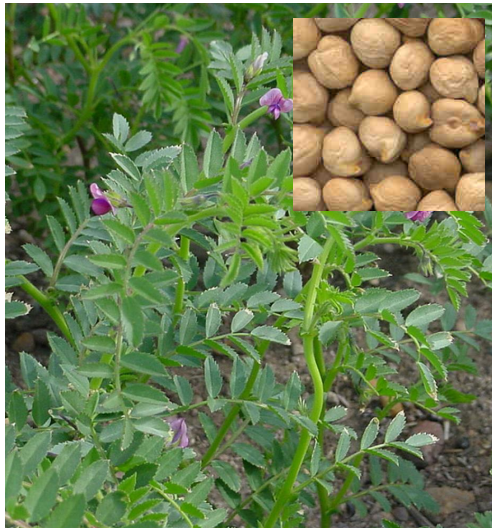
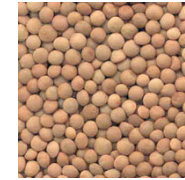
Pulse Crops



Grasspea



Lentil



Chickpea



Field pea



Cowpea

Pulse Crop



Mungbean



Black gram

Oil Crops



Rapeseed or mustard



Sesame



Flax



Groundnut

Jute

The 'Golden fibre of Bangladesh'



Once upon a time Jute was the largest foreign currency earning products. Jute is used for making different fabrics. However, with the course of time due to invention of synthetic products Jute has lost its importance. But still it is the most exporting crops to abroad

Sugar crop



Sugarcane

Tea

Tea is the only beverage crop in Bangladesh. Bangladesh produce a high quality which are exported to many foreign countries. There are 159 tea gardens in Bangladesh.



Tea garden

Vegetables

Nearly 100 different types of vegetables both of local and exotic are cultivated in Bangladesh. Day by day vegetables growing areas of Bangladesh is increasing. Bangladesh produces quality vegetables which is now exported to abroad. In 2004-05 Bangladesh earned 2665.38 million Tk by exporting 29100 metric tonnes of vegetables.



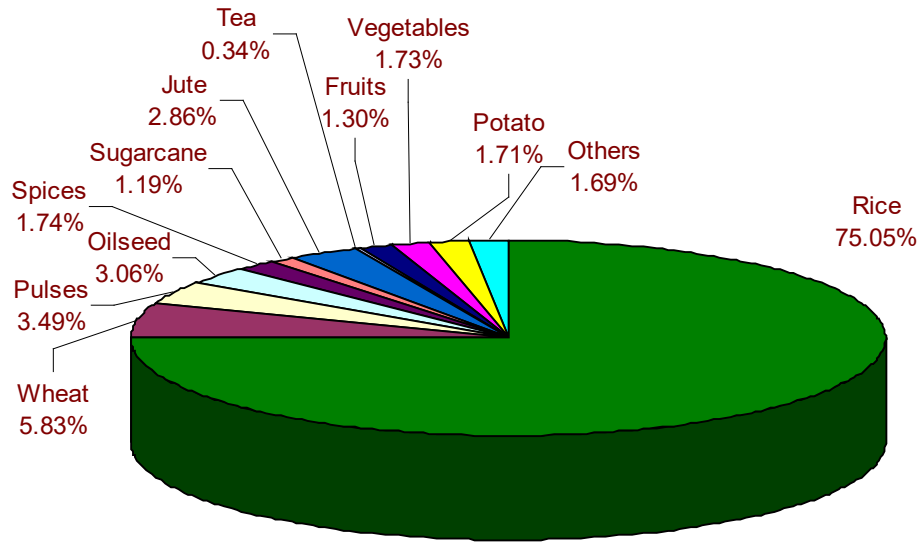
Fruits of Bangladesh





Jackfruit- The national fruit of Bangladesh

Area occupied by different crops



Agricultural Policy

- Education
- Research
- Extension

Education

Degree and certificate offering universities and institutes in Bangladesh *Universities General Fields of degrees*

- Sher-e-Bangla Agricultural University (SAU), Dhaka
- Bangladesh Agricultural University (BAU), Mymensingh
- Bangabandhu Sheikh Mujibur Rahman Agricultural University (BSMRAU), Gazipur
- Sylhet Agricultural University, Sylhet
- Haji Md. Danesh Science and Technology University (HMDUST)
- Patuakhali University of Science and Technology (PUST), Patuakhali
- Rajshahi University
- Khulna University
- Veterinary University, Sylhet
- Chittagong Veterinary University, Chittagong
- Agricultural Training Institute (ATI) of DAE
- Veterinary Training Institute (VTI) of Department of Livestock Service (DLS)

Sher-e-Bangla Agricultural University (SAU)



Bangladesh Agricultural University (BAU)



Bangabandhu Sheikh Mujibur Rahman Agricultural University (BSMRAU)



Agricultural Research System

The National Agricultural Research System (NARS) of Bangladesh consists of ten research institutes under the umbrella of Bangladesh Agricultural Research Council (BARC).

- **Bangladesh Rice Research Institute (BRRI)**
- **Bangladesh Agricultural Research Institute (BARI)**
- **Bangladesh Jute Research Institute (BJRI)**
- **Bangladesh Institute of Nuclear Agriculture (BINA)**
- **Bangladesh Livestock Research Institute (BLRI)**
- **Bangladesh Fisheries Research Institute (BFRI)**
- **Bangladesh Sugarcane Research Institute (BSRI)**
- **Bangladesh Tea Research Institute (BTRI)**
- **Bangladesh Forest Research Institute (BFRI)**
- **Soil Resources Development Institute (SRDI)**

The Bangladesh Agricultural Research Council (BARC) is the apex body of the NARS.

Strategies:

- **Self-sufficiency in food: 2012**
 - **Ensuring food security: 2017(a+a+n)**
 - **Middle Income Country: 2022**
-
- ***(a+a+n=Availability, accessibility and nutrition)**

AGROECOLOGICAL ZONES (AEZs)

Agroecological zones

An agroecological zone (AEZ) is a zone or region which has unique combination of physiographic, soil, hydrological and agroclimatic characteristics.

Thirty agroecological regions and 88 subregions have been identified by adding successive layers of information on the physical environment which are relevant for land use and for assessing agricultural potential. These layers are:

- ✍ Physiography (Land forms and soil parent materials)
- ✍ Soils
- ✍ Depth and duration of seasonal flooding
- ✍ Length of rainfed kharif and rabi growing periods
- ✍ Length of the pre-kharif period of unreliable rainfall
- ✍ Length of cool winter period
- ✍ Frequency of occurrence of extremely high (>40° C) summer temperatures.

Agroecological regions and subregions are very broad units. The fertility status of those regions varies considerably. Individual farmers have fragmented the land into small pieces causing wide variation in the management of each and every piece of land by the farmers of different economic groups. This led to the large variation in the fertility levels even between adjacent plots.

Lists of Agroecological zones

1. Old Himalayan Piedmont Plain
2. Active Tista Floodplain
3. Tista Meander Floodplain
4. Karatoya-Bangali Floodplain
5. Lower Atrai Basin
6. Lower Punarbhaba Floodplain
7. Active Brahmaputra-Jamuna Floodplain
8. Young Brahmaputra and Jamuna Floodplain
9. Old Brahmaputra Floodplain
10. Active Ganges Floodplain
11. High Ganges River Floodplain
12. Lower Ganges River Floodplain
13. Ganges Tidal Floodplain
14. Gopalganj-Khulna Beels
15. Arial Beel
16. Middle Meghna River Floodplain
17. Lower Meghna River Floodplain
18. Young Meghna Estuarine Floodplain
19. Old Meghna Estuarine Floodplain
20. Eastern Surma-Kushiyara Floodplain
21. Sylhet Basin
22. Northern and Eastern Piedmont Plain
23. Chittagong Coastal Plain
24. St. Martin's Coral Island
25. Level Barind Tract
26. High Barind Tract
27. North-eastern Barind Tract
28. Madhupur Tract
29. Northern and Eastern Hills
30. Akhaura Terrace

Characteristics of different agroecological zones

Name of the AEZs	Location	Extent	Land type	Organic matter content	Fertility level	Suitable crops
1. Old Himalayan Piedmont Plain	Most of Panchagarh and Thakurgaon districts and north-western parts of Dinajpur districts	4008 km ²	High: 58% Medium high: 34% Others: 8%	Low	Low to medium	Kharif: B. Aus, T. Aman, Jute, Summer vegetables, Summer pulse, Sesame Rabi: Pulses, Potato, Vegetables, Wheat, Mustard
2. Active Tista Floodplain	Narrow belts within and adjoining the channels rivers in Nilphamari, Rangpur, Lalmonirhat, Kurigram and Gaibandha district	830 km ²	Medium high: 72% Others: 28%	Low	Medium	Kharif: B. Aus, B. Aman, T. Aman, Jute, Kaon, GM Rabi: Tobacco, Mustard, Boro rice, Wheat, Grasspea, Chilli
3. Tista Meander Floodplain	Most of greater Rangpur, eastern part of Panchagarh and Dinajpur; northern Bogra and part of Jaipurhat, Noagaon and Rajshahi districts.	9468 km ²	High: 35% Medium high: 51% Others: 14%	Medium	Medium	Kharif: B. Aus, T. Aus, Jute, T. Aman, GM, Kaon Rabi: Wheat, Sugarcane, Potato, Mustard, Blackgram, Tobacco
4. Karatoya-Bangali Floodplain	Eastern half of Bogra district and most of Sirajganj district.	2572 km ²	High: 23% Medium high: 44% Medium low: 14% Others: 19%	Medium to high	Medium	Kharif: Jute, B. Aus, T. Aman, Kaon, GM Rabi: Wheat, Vegetables, Pulses, Mustard, Potato, Boro
5. Lower Atrai Basin	Most of this region lies in Noagaon and Narore districts. Small areas extend into Rajshahi, Bogra and Sirajganj districts.	851 km ²	Medium high: 21% Low: 65% Others: 14%	Medium	Low to medium	Kharif: B. Aman, B. Aus Rabi: Grasspea, Boro
6. Lower Punarbhaba Floodplain	Extreme western part of Noagaon districts and the extreme northern part of Nawabganj district	129 km ²	Low: 60% Others: 40%	Medium to high	Medium	Kharif: B. Aman Rabi: Boro rice
7. Active Brahmaputra-Jamuna Floodplain	Eastern part of Kurigram, Gaibandha, Bogra, Sirajganj and Pabna districts. Minor areas also occur in Dhaka, Munshiganj, Narayanganj and Chandpur districts.	3190 km ²	Medium high: 37% Medium low: 20% Others: 43%	Low	Low to medium	Kharif: Jute, B. Aus, B. Aman, T. Aman, Kaon Rabi: Wheat, Mustard, Sweet Potato, Groundnut, Cheena

Name of the AEZs	Location	Extent	Land type	Organic matter content	Fertility level	Suitable crops
8. Young Brahmaputra and Jamuna Floodplain	Western parts of Sherpur, Jamalpur and Tangail districts, parts of Manikganj, Dhaka, Munshiganj and Gazipur districts and a belt of adjoining and old Brahmaputra channel through Mymensingh, Kishoreganj and Narsingdi districts.	5924 km ²	High: 18% Medium high: 42% Medium low: 19% Others: 9%	Low to medium	Low	Kharif: B. Aus, T. Aman, T. Aus, Jute, GM, Kaon Rabi: Wheat, Potato, Tobacco, Mustard, Boro
9. Old Brahmaputra Floodplain	Large areas in Sherpur, Jamalpur, Tangail, Mymensingh, Netrokona, Kishoreganj, Narsingdi and Narayanganj districts. Small areas in the east of Dhaka and Gazipur districts.	7230 km ²	High: 28% Medium high: 35% Medium low: 18% Others: 17%	Low to Medium	Low	Kharif: B. Aus, T. Aman, T. Aus, Jute, GM Rabi: Mustard, Wheat, Pulses, Onion, Potato, Grasspea
10. Active Ganges Floodplain	The region extends along the Ganges and lower Meghna river Channels from the Indian border Nowabganj and Rajshahi District to the mouth of Meghna estuary in Lakshmipur and Barisal district.	3334 km ²	High: 12% Medium high: 33% Medium low: 18% Others: 37%	Low	Medium	Kharif: B. Aus, B. Aman, T. Aman, Jute Rabi: Boro, Wheat, Onion, Blackgram, Mustard
11. High Ganges River Floodplain	Nowabganj, Rajshahi, southern Pabna, Kushtia, Meherpur, Chuadanga, Jhenaida, Magura, Jessore, Satkhira and Khulna district together with minor areas in Noagaon and Narail district.	13205 km ²	High: 43% Medium high: 32% Medium low: 12% Others: 13%	Low	Low	Kharif: B. Aus, T. Aman, T. Aus, Mungbean, Jute, Cotton Rabi: Wheat, Mustard, Chickpea, Lentil, Boro rice
12. Lower Ganges River Floodplain	Nature, Pabna, Goalanda, Faridpur, madaripur, Gopalganj and Sariatpur, eastern parts of Kushtia, Magura and Narial, north-eastern parts of Khulna and Bagerhat, northern Barisal, and south-western parts of Manikganj, Dhaka and Munshiganj districts.	7968 km ²	High: 13% Medium high: 29% Medium low: 31% Others: 27%	Medium to high	Medium	Kharif: B. Aus, B. Aman, T. Aman, Jute, Kaon, GM Rabi: Pulses, Wheat, Mustard, Linseed, Boro rice
13. Ganges Tidal Floodplain	All or most of Barisal, Jhalkati, Pirojpur, Patuakhali, Bagerhat, Barhuna, Khulna and Satkhira districts. It includes the Khulna and Bagerhat Sundarbans Reserve Forests.	17066 km ²	Medium high: 78% Others: 22%	Medium to high	High	Kharif: B. Aus, T. Aman, Chilli, GM Rabi: Wheat, Mungbean, Grasspea, Cowpea, Boro rice

Name of the AEZs	Location	Extent	Land type	Organic matter content	Fertility level	Suitable crops
14. Gopalganj-Khulna Beels	A number of seperate basin areas in Madaripur, Gopalganj, Narial, Jessore, Bagerhat and Khulna districts.	2247 km ²	<i>Medium high</i> : 13% <i>Medium low</i> : 41% <i>Low</i> : 28% <i>Others</i> : 18%	Medium to high	Medium	Kharif : T. Aman, Jute, T. Aus, Sesame, B. Aman Rabi : Boro rice, Bean, Wheat, Grasspea,
15. Arial Beel	Munshiganj and Dhaka district.	144 km ²	<i>Medium high</i> : 13% <i>Low</i> : 73% <i>Others</i> : 14%	Medium	Medium to high	Kharif : Aus rice, Jute Rabi : Pulses, Mustard, Potato, Boro rice

Source:

1. FAO/UNDP, Land Resources Appraisal of Bangladesh for Agricultural Development Report 2: Agroecological Regions of Bangladesh, FAO/UNDP, 1988
2. BARC (Bangladesh Agricultural Research Council). 1997. Fertilizer Recommendation Guide. Bangladesh Agricultural Research Council, Dhaka.
৩. বি, এ, আর, সি (১৯৯৭)। মৃত্তিকা ও সার ব্যবহার সুপারিশমালা। বাংলাদেশ কৃষি গবেষণা কাউন্সিল, ফার্মগেট, ঢাকা।

Cropping Seasons

Concept

- The season of the year when a particular crop is normally grown is the season of that crop.
- It indicates the distribution of crops in a year on the basis of climatic requirement as different seasons are characterized by different climatic characters that normally affects crop germination, growth, flowering and finally yield.

Types of cropping season

- Kharif-I
- Kharif-II
- Rabi

Kharif-1

Mid March to mid July.

Major crops: Jute, Aus rice, summer vegetables, Cotton, Sesame, Pigeonpea etc.

Kharif-2

Mid July to mid November.

Major crops: T. aman, B. aman, Soybean,
Groundnut, Late summer vegetables etc.

Rabi

Mid November to mid March.

Major crops: Wheat, potato, mustard, boro rice, winter vegetables, lentil, tobacco, soybean, etc.

All seasons: Groundnut, BR 3, Maize, Sesame
etc.

Characteristics of Kharif-I

- Initially attacked by drought
- Disease, insect and weed incidence high due to high temperature and humidity
- Photosynthetic activity low due to cloudy sky
- Respiration rate is high compared to photosynthesis that enhance growth process life span becomes faster
- Latter stage affected by natural disaster e.g. flood, storms etc.
- Life span of the crop is short compared to other season
- Lodging effect due to storm.

Characteristics of Kharif-II

- Temperature comparatively low than Kharif-I
- Respiration rate is lower than Kharif-I
- Photosynthetic rate higher than Kharif-I
- Disease, insects and weed attack is less
- Less cloudy sky than Kharif-I
- Life span of the crop is higher than Kharif-I

Characteristics of Rabi

- Net photosynthesis is higher than other seasons due to low temperature & shiny sky
- Respiration rate is lower than others due to low temperature
- Less weed infestation
- No lodging effect

Influence of cropping season on crop yield

- As different cropping seasons are characteristically different from each other so they significantly influence crops yield, although same crop variety grown.
- For example – If BR 3 rice variety grown in different seasons, yield trend will be Rabi > Kharif-II > Kharif-I.