

International Workshop on Watershed Management and Land Rehabilitation in NF Region

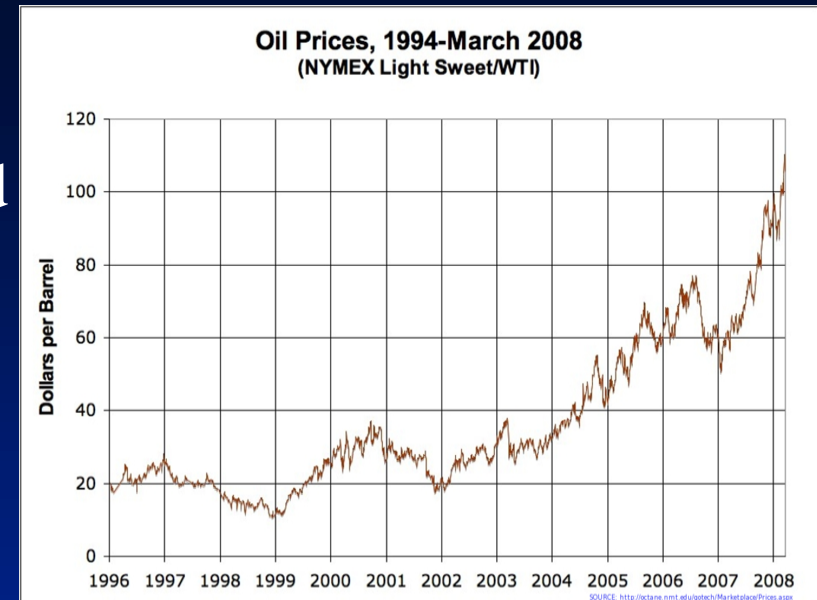
Dryland Farming Techniques Under Multiple Cropping Conditions

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What happened in recent years for grain Production ?

- Oil price changed violently
 - Agricultural chemical price increased
 - Grain price increased
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- Farm land for grain production decreased
 - Farmer's enthusiasm for grain production decreased
 - Water shortage for grain production



The millionaire and the poor



Eat Your Money ?!



Become Rich?!



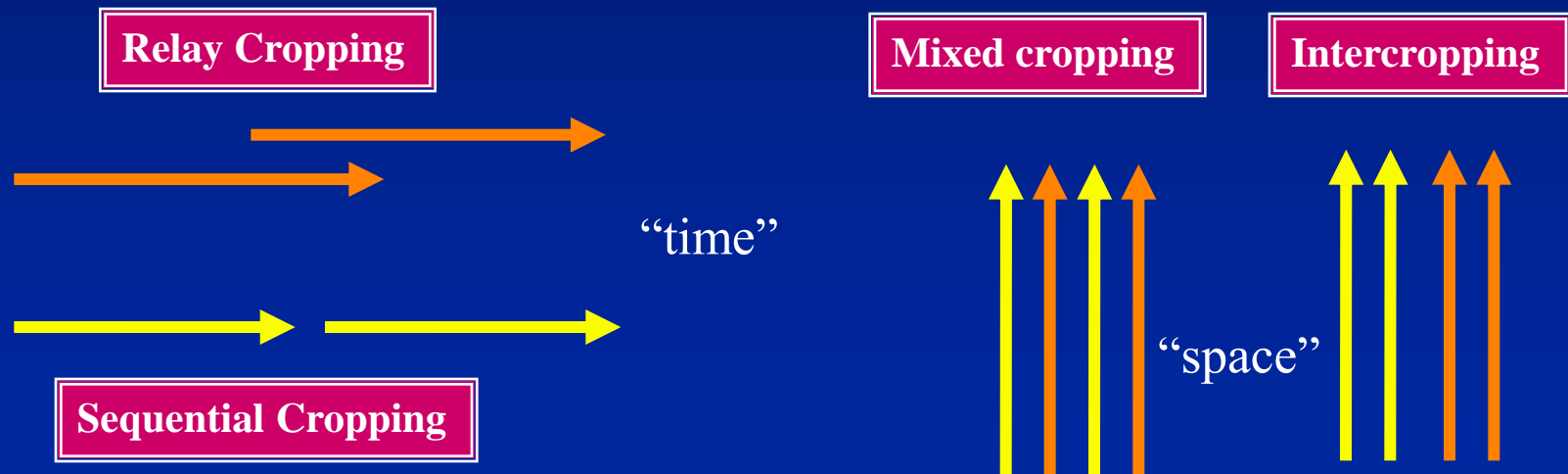
Gold or Food?

Something need to think about

- Can we become rich by grain production?
- Can we become rich without grain production?
- Grain—**only for food?**
- How to meet the needs of grain—**self supply or depend on the market?**
- Grain production—**need government support or regulated by market price?**
- Challenge for developing countries—**development and survival**
- How to face the grain-shortage crisis world widely?

Multiple Cropping

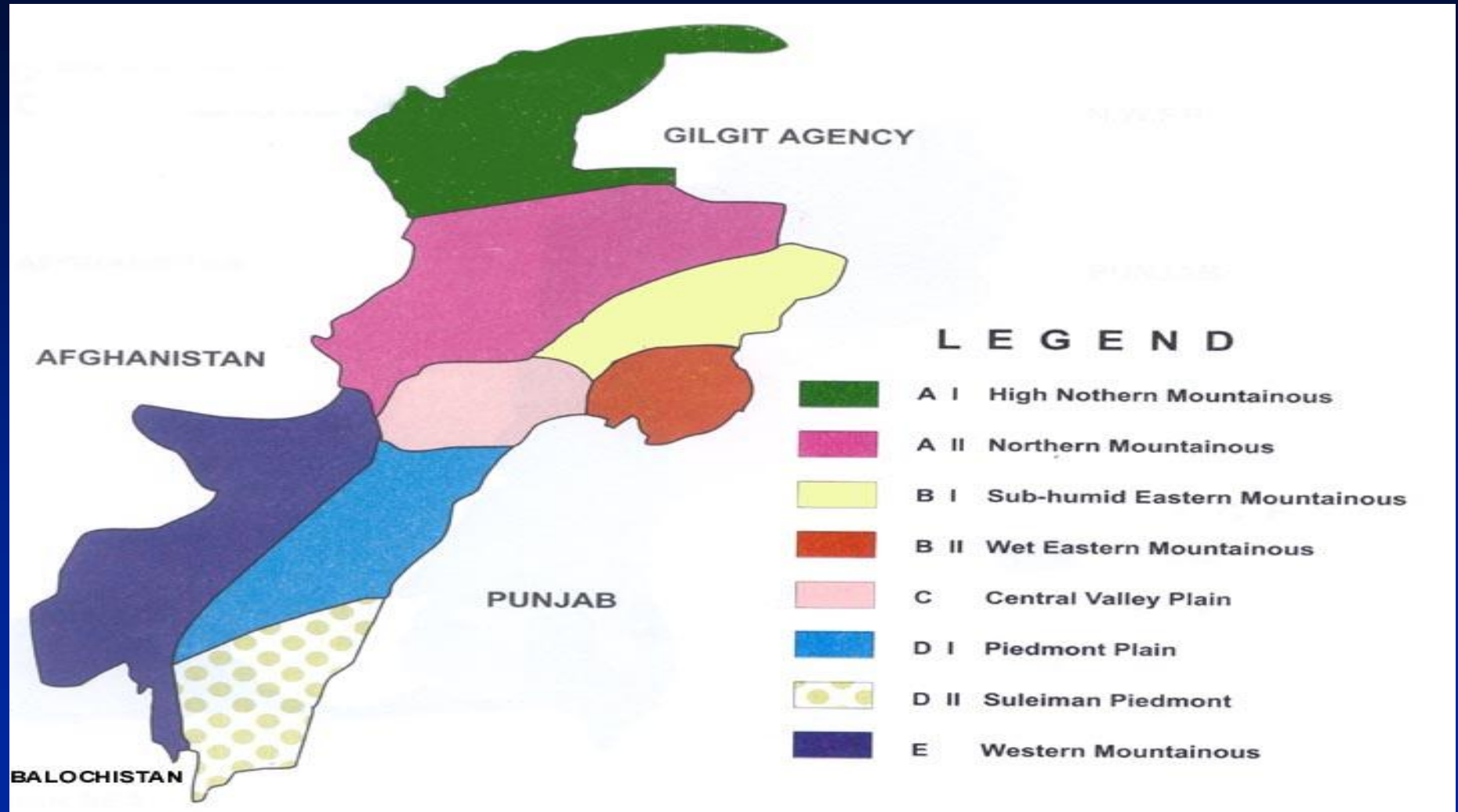
- **Multiple cropping** : the practice of planting two or more different crops synchronously or successively on the same plot of land within a year
- Multiple cropping encompasses both “time” and “space”.



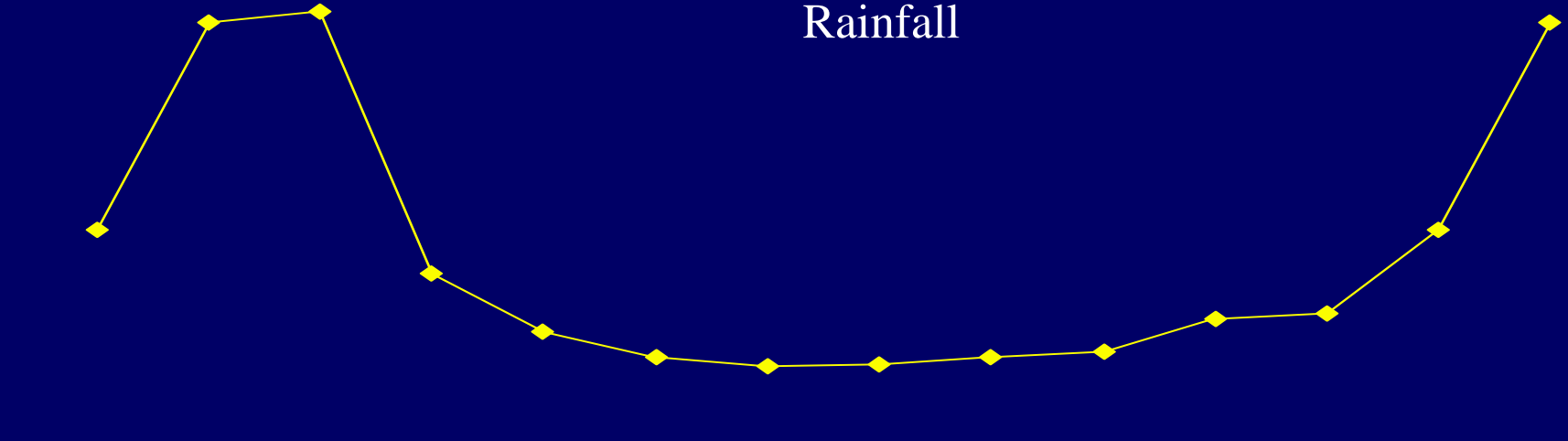
District map of Khyber Pakhtunkhwa and FATA



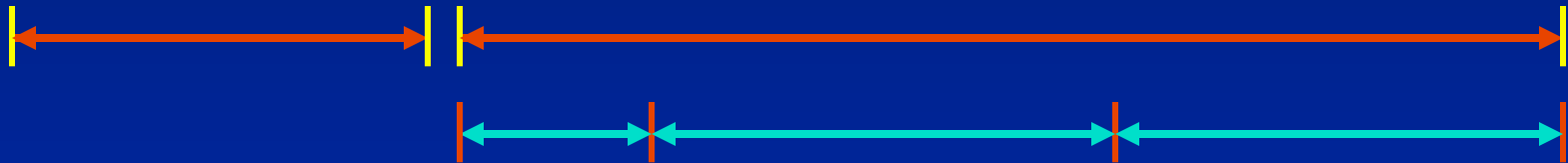
AGRO-ECOLOGICAL ZONES OF KPK



Rainfall



Jun Jul Aug Sep Oct Nov Dec Jan Feb Mar Apr May Jun Jul



Over Wintering

Summer Maize

Winter Wheat

LAND UTILIZATION STATISTICS IN KPK FOR 2007-08 (HECTARES)

REPORTED AREA	CULTIVATED AREA	CROPPED AREA	UN-CULTIVATED AREA	CULTURABLE WASTE	FOREST	NOT AVAILABLE FOR CULTIVATION
5619653	1690152	1625938	3929501	1036598	1283955	1608948



Dryland farming techniques

- Limited water resources in the North West Frontier of Pakistan restricted in intensive crop production
- Water saving approaches must be adopted in order to keep sustainable crop production



Conditions needed for dryland farming

- Rainfall must be greater than 250 mm per year
- Wind and heat must not cause excessive evaporation at critical stages of plant growth
- Soil should be deep (preferably 3 meters) with no clay, sand, or gravel seams to interfere with capillary movement of water
- The minimum feasible soil depth is 18 inches (450 mm) but water storage capability and drought resistance increases with increasing soil depth

Strategies for dryland farming

- Farm practices must conserve and utilize the available rainfall to the full extent
- To obtain maximum storage of moisture under any rainfall condition, the soil must absorb as much water as possible when it rains
- Soil water losses by evaporation or transpiration must be kept to the minimum
- Quick maturing, drought resistant crops must be grown in order to make an efficient use of soil water by crop plants

Dryland farming techniques

- The following techniques are commonly used for water saving in dryland farming
- Using proper tillage methods to store rainwater in the soil and to reduce water losses from soil
- Changing your planting patterns to reduce water losses from soil evaporation and to make an efficient use of soil water
- Selecting crops and/or cultivars of drought tolerance for efficient use of soil water
- Choosing proper methods of irrigation and irrigating your crops with minimum water

- Choosing proper methods of sowing and sowing your crops in appropriate date
- Mulching fields with crop residues or plastic film for reducing water losses from soil
- Collecting water from rainfall for irrigation
- Using chemical products to increase water use efficiency of crops

DEEP TILLAGE



PLASTIC MULCHING



PLANTS RESIDUE MULCH



Summary

- Multiple cropping is one of the best ways of using solar radiation, rainwater and farmland efficiently to produce more crops under limited season
- Selection of cropping patterns, appropriate crops, and crop combinations depends mainly on the local climate, soil conditions, and water availability
- Winter wheat-summer maize double cropping system is the major cropping pattern in The North West Frontier of Pakistan
- Success of dryland farming is dependent upon the rainfall patterns
- The basic idea for dryland farming is to store more rainwater in the soil, to reduce water losses from the soil, and to make an efficiently use of soil water by crop plants



WE WANT PEACE IN THE WORLD

Thank you









Smash corn plants



Straw-smashed field



Sowing winter wheat



Wheat-over wintering

Drought in Early Spring 2009 in some parts of the World



Major Planting Patterns

- Winter wheat-summer maize
- Intercropping of maize –soybean after winter wheat
- Intercropping of maize –peanut after winter wheat
- Intercropping of maize –vegetables after winter wheat
- Relay cropping of winter wheat-cotton



Re-growth in spring



Grain filling



Wheat harvesting



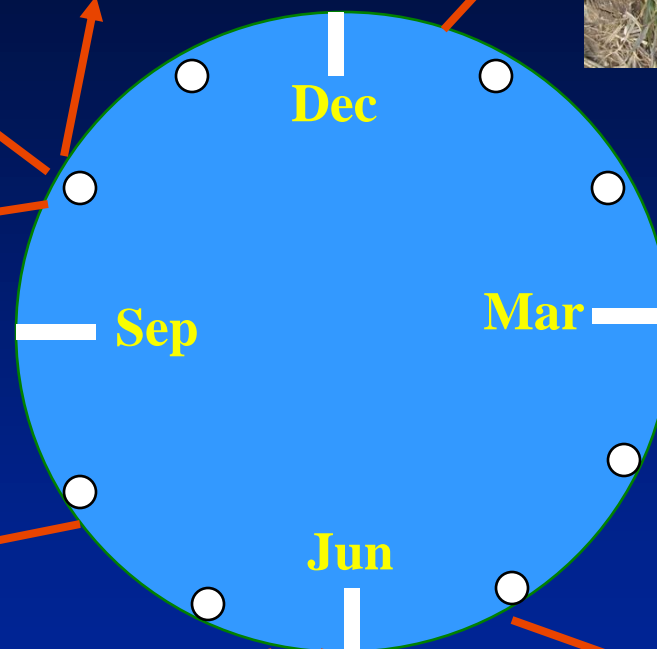
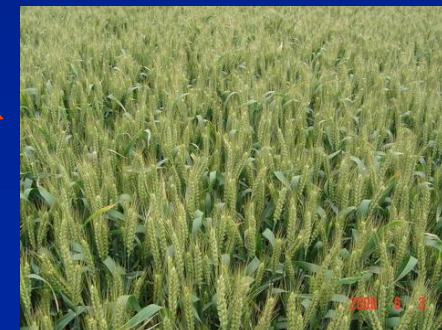
Sowing summer maize

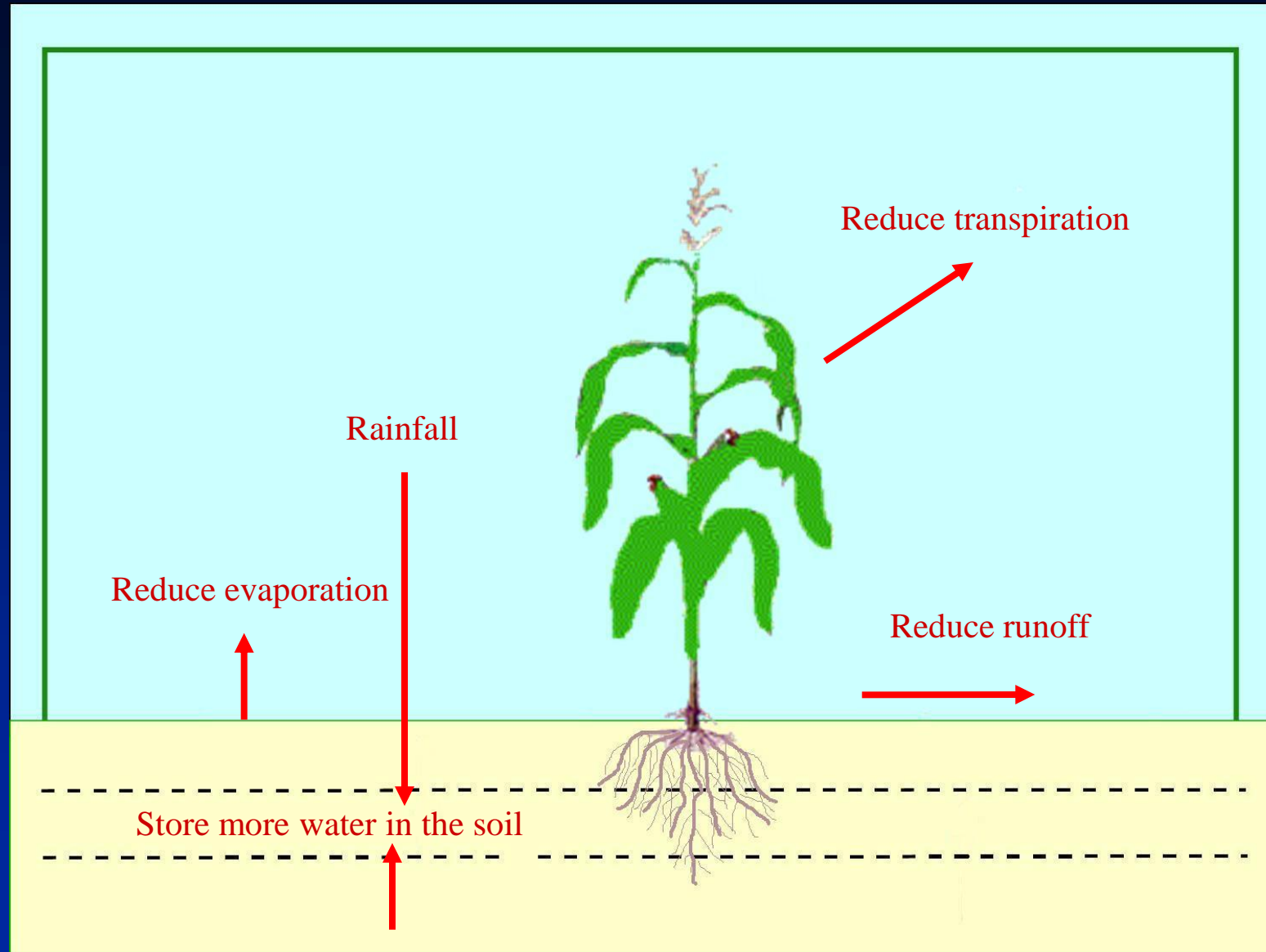


Maize growth during summer



Ready for pick up in autumn





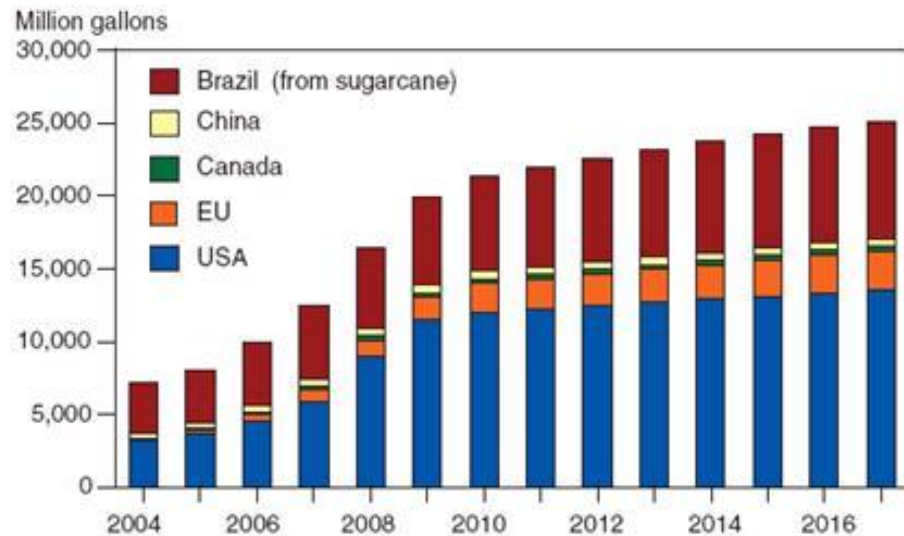
Multiple Cropping In The North West Frontier of Pakistan

Mad grain-----Is grain-shortage crisis coming ?

- Grain producing countries decreased grain export
- More than 40 countries involved in political troubles because of grain shortage

- More grains were used for producing bio-energy
- Grain price increased rapidly

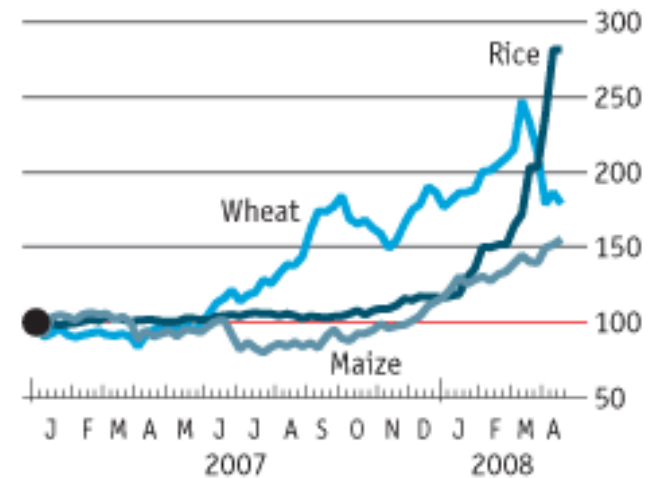
图 1: 全球主要燃料乙醇生产国燃料乙醇生产走势



(资料来源: USDA Agricultural Projections to 2017)

Shooting up

Grain prices, \$ terms, January 2nd 2007=100



Sources: Chicago Board of Trade; Jacksons

Artificial Rainfall



- The production of crops is usually spread over a longer period of the year, allowing for better vegetative cover to protect the soil
- Multiple cropping reduced the risk of total loss from drought, pests and diseases. Usually at least some of the crops can escape disaster and produce a yield



- The family has a more diverse supply of food and more than one source of income
- Systems with more than one crop frequently make better use of total sunlight, water, and available nutrients than is possible with a single crop



- It optimizes production from small plots, so can help farmers cope with land shortages
- Including legumes in the cropping pattern helps maintain soil fertility by fixing nitrogen in the soil



- It suppresses weeds. As the planting density is high, weeds cannot compete with the crops.
- Different types of crops can be planted to take advantage of environmental factors in different seasons.
- For example, crops that require a lot of water can be grown in the wet season, intercropped with drought-resistant crops that can be harvested in the following dry season.



Disadvantages

- The presence of crops in the field throughout the year allows crop pests to survive more easily.
- Some pests can shift from one crop to another: for example, aphids can move to cotton plants during the dry season.
- The large number of different crops in the field makes it difficult to weed especially for the mixed cropping.
- It may be difficult to introduce new techniques such as row planting, modern weeding tools, and improved varieties.
- The harvest of crops is usually spreading throughout the year.

Major Patterns of Multiple Cropping in The North West Frontier of Pakistan

- The appropriate crops, crop combinations, planting times and planting patterns vary from place to place
- It depends on the local climate, soils, topography, water availability, pests and diseases, socio-economic conditions, and other factors.



Maize-potato



Tobacco-Peanut



Maize-Soybean

- **Sequential cropping** can be regarded as multiple crops in “time”, i.e. two or three crops were planted sequentially with no overlap in growth cycle e.g, Winter wheat-summer maize double cropping system.



- **Intercropping** : multiple crops in “space”, two or more crops are planted in strips at the same time with their significant parts of growth cycles overlapped



Wheat-cotton



maize-flax

- **Mixed cropping:** multiple crops in “space”, two or more crops are planted in mixture at the same time with their significant parts of growth cycles overlapped
- Mixed cropping of maize, sorghum, millet, and cowpea



- **Relay cropping:** planting second crop before the harvest of the first crop
- Multiple cropping is suitable for small scale farms or fields
- Multiple cropping has been applied in crop production for more than 1000 years in KPK





Maize-Maize

Why multiple cropping ?

Advantages

- More crops can be planted in a small space
- Intercropping and relay cropping can allow a farmer to plant two or more crops in the field at the same time







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