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- the importance of agriculture in developing countries:
if one is concerned with poverty, then agriculture in LDCs is important to consider because people in rural areas tend to be poorer than people in urban areas, and LDCs have a large proportion of people living in rural areas (70% in some cases)

agricultural development is critical for improving the living standards of poor people, feeding the urban population at low prices, and as a source of labor for the higher productivity services and industrial sectors; also, for many countries, agricultural exports are a major source of foreign currency

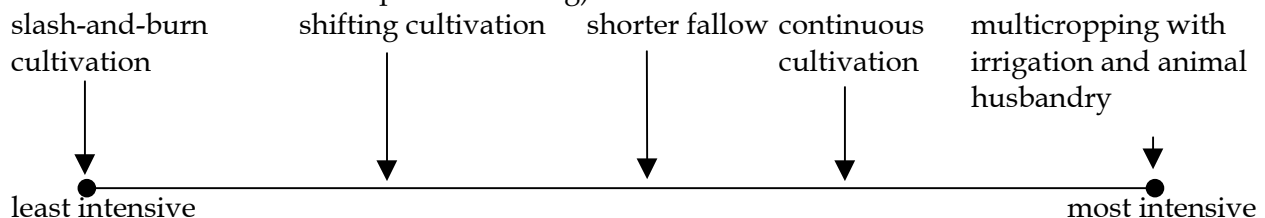
agricultural surplus is potentially a source of funds for investment; socialist countries (including China, North Korea, and Vietnam) used agriculture as a primary source of capital accumulation; these countries forced farmers to sell crops at below market prices to the government, which kept prices low for the urban population; because of the low prices for agricultural goods, state-owned industries were able to pay low wages; the high profits earned by state industries (because they were able to pay low wages) were used for capital formation - thus, agriculture indirectly subsidized investment by allowing state industries to pay low wages and earn high profits

in some cases, the lack of funding to agriculture led to unbalanced investment and harmed the economy

- agriculture versus industry:
in developing countries agriculture and industry differ institutionally and technologically:
 - 1) institutionally - farmers tend to be self-employed or farms are run by a family, but industry is run by for-profit firms
 - 2) technologically - agricultural technology must be adapted to local conditions, but industrial technology is mostly independent of local conditions (although it could adapt to local labor and capital costs)

because the method of cultivation and the variety of crops that can be grown must be adapted to local conditions (climate, soil, etc.), intervention by government in agriculture might not be as successful as intervention by government in industry because government does not have the information about local conditions necessary to produce efficiently; the variability of local conditions could also explain why extension services are not very useful in developing countries that lack local research capabilities

- history of agriculture:
 - agricultural methods lie along a continuum ranging from least to most intensive (intensive refers to the amount of labor applied to the land, the frequency of land use, and the amount of inputs to farming):



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slash-and-burn cultivation - land is cleared by slashing tall vegetation and burning the rest, then seeds are planted in the ground; because the fertilizer is the debris from the burning and existing soil nutrients, this method can only be used for about 2 years on a given plot of land; this technique is used where population densities are low and people can move from one plot of land to another

shifting cultivation - this is similar to slash-and-burn cultivation

shorter fallow - the fallow periods decrease (down from the 30 year fallow periods with slash-and-burn cultivation)

continuous cultivation - rotations with one year fallow and two years cultivation

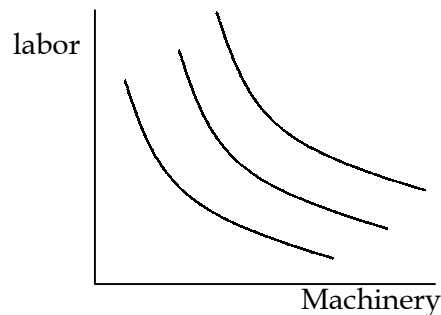
multicropping with irrigation and animal husbandry: the same land is used for 2-3 crops in a year; irrigation is used, animals supply fertilizer, and a large amount of labor is necessary; the yield per unit land is high; this method is used where population densities are high

- technological change in agriculture began long before modern agriculture, which employs machines and chemical fertilizers; for example, plows were improved over time, better harnesses for animals were developed, and biological adaptations were made (through selective breeding, for instance)

following colonial expansion in the 16th century, crops spread among Oceania, the New World, and the Old World helped agriculture develop (for example, corn [maize] was introduced to Africa from the New World; coffee came to Brazil and Columbia from Africa)

- the two modern packages of technology:
two different technological packages account for increased agricultural productivity over the past 50 years - the mechanical package and the biological package:

- 1) the mechanical package - in the mechanical package, there is high substitutability between labor and machinery:

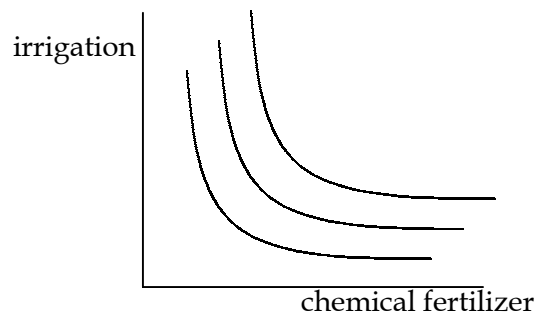


because labor is a good substitute for machinery, mechanized agriculture is not necessarily a sign of agricultural progress, especially if labor is relatively abundant; for instance, in Bangladesh, India, and China, there is surplus agricultural labor

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available - mechanization will increase the yield per worker, but not yield per unit land; increased mechanization will increase unemployment and misallocate scarce capital; some countries have made the policy mistake of encouraging mechanization because a) they believe that if industrialized countries use it, then it must be good for development and b) people selling the machinery convince government officials with bribes to support the purchase of machinery

- 2) the biological package - in the biological package, increased fertilization and agriculture lead to higher yields:



the elasticity of the isoquants in the biological package is lower than in the mechanical package because fertilizer and irrigation must be added in the proper proportion

- contractual arrangements in agriculture:

there are several ways to organize agriculture when the owner of land and the farm laborer are not the same entity:

contractual arrangements

- 1) fixed-rent tenancy - the land is rented out to the farm worker at a fixed amount of rent
- 2) sharecropping - the tenant gives a proportion of the harvest or the value of the harvest to the owner of the land (often 50%)
- 3) wage-labor - the landowner hires farm workers on a wage (based on time) or a piece-rate (based on productivity)

incentives to work

- 1) fixed-rent tenancy - the incentive to work is highest in fixed-rent tenancy because with the amount going to the landowner fixed in advance, the farmer earns 100% of the value of his marginal product; thus, the farmer has a strong incentive to be more productive because he will earn all of the value of the additional time and effort he puts in
- 2) sharecropping - the incentive to work is intermediate in sharecropping because the worker will receive a certain proportion of the value of the marginal product of his time and effort (50% if the shares to landlord and tenant are 50/50)
- 3) wage-labor - the incentive to work is lowest in wage-labor because the worker will not get paid more if he works harder; a piece-rate could be used but this could result in a trade-off between quantity and quality because workers could sacrifice quality for quantity in order to earn a higher income

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risk-bearing

- 1) fixed-rent tenancy - because the landowner will receive the rent regardless of how much the farmer earns, the farmer bears all the risk
- 2) sharecropping - the risk-bearing is intermediate because both the farmer and landowner share the risk; this could be desirable and could be why sharecropping is common in Latin America, Asia, and parts of Africa
- 3) wage-labor - because the worker will get paid regardless of the yield or prices, he bears very little or no risk

thus, the risk runs in the opposite direction to incentives (highest risk to the worker, but greatest work incentive to the worker, with fixed-rent tenancy; lowest risk to the worker, but lowest work incentives with wage-labor)

- land reform:

from an economic standpoint, the redistribution of land ownership from large landowners to small landowners and landless farmers will increase both equality and efficiency

if land were unevenly distributed, then there would be an abundance of workers in the labor market and wages would be low; redistribution of land would increase the income of the poorest farmers; however, if poor farmers compensate landowners for the full value of the land the poor farmers receive, then they will probably not be better off; in practice, poor farmers have typically paid for the land purchased over time and end up paying less than the real value of the land because of inflation; thus, land redistribution can improve equality

on large farms, hired workers are less effective because they have less incentive to work and also require supervision, whereas on family-owned farms the incentives of family members to work are high and supervision is unnecessary - thus, the amount of labor provided per dollar is less on large farms than on small farms; studies show that small, intensively cultivated farms are more productive than larger, less-intensively cultivated farms - labor per unit of land and yield per unit of land are higher on small farms than on large farms; thus, land redistribution can also increase efficiency by bringing more land under labor-intensive, high yielding cultivation

the success of economic development in East Asia is attributed to widespread access to education and low inequality; these countries also underwent land reform after World War II

land reform in China was followed by collectivization; however, after collectivization ended farm sizes were fairly equal and were correlated with low malnutrition and greater access to education

in other countries, land reform has been instituted by law, but people have found ways to avoid it; for example, if there is a limit on the amount of land that can be owned by an individual, people will put their land under the names of family members, and land will not be redistributed

- mobilizing labor for public works:

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labor in developing countries is seasonally underutilized during parts of the agricultural cycle (for instance, between crops); a country could increase its output and capital formation at a low opportunity cost of resources by using this temporarily unemployed rural labor to create agricultural infrastructure, such as roads, canals, irrigation systems, etc.

to encourage participation in these public works projects, the government could pay people; for example, people would have to work on a project to receive payment from a fund for famine relief; in communes in China, people worked in small groups for production, but all workers worked on irrigation projects and were paid with work points (similar to how they were paid for production), giving them an incentive to participate - the results of this were mixed, although irrigation improved, the engineering was in some cases poor

- rural small-scale credit:

small-scale credit can help farmers by allowing them to borrow at the beginning of the farming season and repaying the loan at the end of the harvest; loans can help farmers adopt modern technology by enabling them to purchase hybrid seeds and chemical fertilizers; see the notes and chapter on financial intermediation for a more complete discussion

- agricultural extension services:

agricultural extension services are publicly funded in most countries; in the United States, extension services have helped agricultural development

other countries have implemented agricultural extension services, but often the advice they offer to farmers is not useful because the extension agents are not familiar with local conditions and the economic state of farmers; the extension services might not be useful if the services' workers are male, but females are responsible for food production and cannot meet for cultural reasons, and if extension agents are less interested in helping farmers than in escaping to a government salary instead of having to be farmers themselves

thus, extension services can be a waste of government spending unless they are designed carefully

- rural infrastructure:

transportation costs can be prohibitively high in developing countries; for example, in sub-Saharan Africa, it can be impossible to get crops to the market because roads are washed out

middle-men who transport crops often earn much of the revenue from selling crops, while the farmers receive a small proportion

thus, it would be useful to improve transportation infrastructure in developing countries, perhaps by helping rural people organize to maintain the roads that give them access to markets

- agricultural price policy:

governments extracting revenue from farmers has been a major problem in developing countries, especially in sub-Saharan Africa

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to earn tax revenue, governments use:

- 1) export taxes, which hurt farmers because they must continue to charge the same world price but must pay a portion of their revenue as tax
- 2) government monopolies, which are the only entities allowed to buy from farmers; these monopolies purchase from farmers at low prices and resell the crops to earn a profit; however, in practice these government monopolies often have not earned profits because they waste money on unnecessary goods, corruption occurs, etc.; these inefficient monopolies have been a major reason why in some countries (especially those in sub-Saharan Africa) the export of crops has decreased and food production has not kept pace with population growth (food prices to the farmer may also be kept low by overvalued exchange rates which make food imports cheap)

although some might believe that farmers are unresponsive to prices and, thus, can be taxed with little effect on total production, empirically the opposite is true; even the poorest farmers will make economically rational decisions, for example, shifting out of certain crops when they become less profitable; when they have harmed the incentives to produce, governments have sometimes forced farmers to continue growing

- agricultural pricing:

page 614, figure 15-6 illustrates the relationship between the output of an agricultural product, the price of the product, and the cost of a key input (fertilizer); please understand this figure (but we have to move in with the class due to time constraints at this point in the semester)

- world food production:

there is concern about whether world food output will increase at the same rate as world food needs; overall food production has grown faster than world population growth in the past; over the past 50 years, the amount of arable land might have decreased because land was needed for housing, factories, etc., but yields have improved because of developments in hybrid seeds, irrigation, chemical fertilizers

world food productive capacity exceeds current consumption levels; for instance, the United States, Canada, and Australia could produce more food, but do not because of the demand for food is not high enough (notice that demand means paying demand in the marketplace; there are needs in the world that aren't backed by purchasing power and won't be met until those with the needs obtain the purchasing power or until a government, charity, etc. purchases food for them)

China's grain production has increased with its population growth, partially because of improved incentives and a domestic "green revolution"; China's per capita food production increased after 1978 when agricultural and economic reforms were implemented; rather than farming in teams and sharing the revenue on a workpoint basis, farming was now carried out at the family level, with improved incentives from direct residual claims (like a self-employed farmer or fixed-rent tenant); also, instead of attempting to be self-sufficient, areas specialized according to their comparative advantages, and both nongrain and grain production increased; additionally, rising agricultural productivity could be attributed to improved farming techniques that were already in use in some advanced counties but continued spreading to other ones

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- self-sufficiency in food production:

it might appear that severe poverty (as an example) in Central America exists because the best land is allocated to the production of bananas for export to rich countries, which does not leave enough food for farmers; however, this is confusing the question of which crop is best to grow with the problem of inequality

if income were equally distributed, people might well be better off economically if they continued to export bananas and import food than if they grew their own food because the returns to growing bananas and selling them may be higher than that of growing food, if bananas are your comparative advantage

self-sufficiency in food production can be a political goal, but will not necessarily make people better off; in this case, the problem facing farmers is their economic power and their small share of the profits from food export, not that they are growing the “wrong” crop