**Unit- I - Introduction**

Meaning of Agricultural Economics:

Agricultural Economics, as its title implies is that branch of economics which deals with all aspects of problems related to agriculture. According to Snodgrass and Wallace, “Agricultural economics is an applied phase of the social science of economics in which attention is given to all aspects of problems related to agriculture.”

Prof. Gray treats agricultural economics as a branch of general subject of economics. It is only one of the many branches of applied economics. Such as Industrial Economics, Labour Economics, Monetary Economics, Transport Economics, Public Economics, International Economics, Household Economics, etc.

According to Prof. Heady, “Agricultural economics is an applied field of science wherein the principles of choice are applied to the use of capital, labour, land and management resources in the farming industries. As a study of resource efficiency, it is concerned with defining the condition under which the ends or objectives of farm manager form families and the nation’s consumers can be attained to the greatest degree.”

As we know, economic activities are divided into production, exchange, distribution and consumption, agricultural economics cover all of them-what to produce, how to produce, how much to produce, what to sell, where to sell and at what price to sell; what to distribute, among whom to distribute and on what basis to distribute; and what to consume and how much to consume.

Specifically, we can say agricultural economics includes the choice of farming as an occupation, the choice between cultivator and animal husbandry of machinery and labour; combination of various factors of production, intensity of cultivation irrigation, manuring, marketing, soil conservation, land revenues system, costs, prices, wages, profits, finance, credit, employment, etc. In all these cases the fundamental problem before the agricultural economist is to recommend the combination of factors of production in ideal proportion under given conditions in the economic interests of the agricultural community.

**Scope of Agricultural Economics:**

The foregoing definitions indicate the scope of agricultural economics. A common theme of scarcity of resources and choice of uses runs almost through all of these definitions. That way, agricultural economics is not different from the general economics.

All the tools of analysis used in general economics are employed in agricultural economics as well. We have the same branches of agricultural economics i.e. economics of production, consumption, distribution, marketing, financing and planning and policy making as in case of general economics. A study at the micro and macro level for the agricultural sector is also generally made. Static and dynamic analyses are also relevant for the agricultural sector of the economy.

To be more specific, these definitions point out that agricultural economics examines how a farmer chooses various enterprises e.g., production of crops or rising of cattle and how he chooses various activities in the same enterprise. E.g., which crop to grow and which crop to drop; how the costs are to be minimized; what combination of inputs for an activity are to be selected; but amount of each crop is to be produced but type of commercial relation the farmer have to have with people from whom they purchase their input or to whom they sail their product.

Agricultural economics does not study only the behavior of a farmer at the farm level. That is, in a way, the micro analysis. Agricultural problems have a macro aspect as well. Instability of agriculture and agricultural unemployment are the problems which have to be dealt with, mainly at the macro level.

And then, there are the general problems of agricultural growth and the problems like those concerning tenurial systems and tenurial arrangements, research and extension services which are again predominantly macro in character. Such problems their origin, their impact and their solutions are all the subject matter of agricultural economics.

Again, ‘agricultural economics’ as at present does not confine itself to the principles concerning ‘economising of resource in agriculture’ only whether at the micro or macro level or from the ‘static’ a ‘dynamic’ point of view.

The scope of agricultural economics is larger than ‘mere economizing of resources’. Agriculture is, as we know an important sector, of the overall economy. The mutual dependence of the various sectors of the economy on each other is well established. Growth of one sector is necessary for the growth of the other sector.

As such, in agricultural economics, we also study how development of agriculture helps the development of the other sectors of the economy; how can labour and capital flow into the non-agricultural sectors; how agricultural development initiates and sustains the development of other sectors of the economy.

What this implies is that agricultural economics not only develops concerning the use of scarce resources in agriculture proper but also examines the principles (a) regarding the out flow of scare resources to other sectors of the economy and (b) about the flow of these resources from other sectors into the agricultural sector itself.

Nature of Agricultural Economics:

Agricultural economics makes use of the principles of general economics. The first point to be noted with regard to the nature of agricultural economics is that, in general, it borrows most of its principle from its parent body of knowledge i.e., the general economics.

Even the main branches of agricultural economics are similar to those of general economics. But than a question arises. If the principles of general economics are not different from the principal of agricultural economics, why is there a need for separate study of agricultural economics?

The answer lies in the fact that agricultural economics does not merely imply a direct application of principles of economics to the field of agriculture. The principles of economics are too general in nature and the general theory of economics has been considered as an abstraction from reality.

Before this theory is applied to agriculture which includes, besides crop production, forestry and animal husbandry for the purpose of economic analysis, its principles have to be modified so that their postulates totally tally with the main features of the situation of obtaining in the agricultural sector.

A few examples will make it clear. We study in economic theory, price formation under various market structures e.g., monopoly, perfect competition and oligopoly. So far as agriculture is concerned, it is presumed that as the number of farms is very large and at the same time, their size is relatively small and the crops produced are undifferentiated (homogeneous), perfect competition is likely to prevail is the agricultural produce market.

In other words, we shall almost be completely ignoring the study of price formation of agricultural produce under condition of oligopoly or monopolistic competition or monopoly. Than, there is the system of tenancy or crop sharing in agriculture – a problem particular to agriculture only. Study of this problem will necessitate modification of the principle of resource allocation as propounded in general economics.

The modification of the economic principles, required to be made before being applied to agriculture are so large and varied that there is a complete justification for studying agricultural economics as a separate body of knowledge.

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Role of Agriculture in Economic Development

Agriculture plays a vital role in economic development of developing countries. The role of agriculture in economic development is crucial because a majority of the population of developing countries make their living from agriculture. We explain below the role of agriculture in detail and point out in what ways agriculture can contribute to economic growth of a country.

Agriculture’s contribution to economic development has been classified into six categories: 1. Product contribution 2. Factor contribution 3. Market contribution 4. Foreign exchange contribution 5. Agriculture and Poverty Alleviation 6. Contribution of Agriculture to Employment Generation.

1. Product Contribution:

Most of the developing countries depend on their own agriculture to provide food to be consumed by their population. However, there are few exceptions. Some countries such as Malaysia, South Saudi Arabia have large exports based on natural resources which enable them to earn enough foreign exchange to import their food requirements for their people. But most developing countries do not have necessary foreign exchange earnings to import food-grains to feed their people and therefore have to rely on their own agriculture to produce enough food to meet the consumption needs of their people.

Farmers in these developing countries have to produce food over and above their subsistence needs so as to provide necessary food to their urban population. If the industrial and services sectors have to grow, the food requirements of the workforce employed in them have to be met by the marketable surplus of the farmers. As the industrial and services sectors develop further, the agricultural productivity and production must also rise to sustain the industrial development by feeding the increasing industrial workforce.

If with industrial development, productivity of agriculture does not rise sufficiently and imports of food-grains are not possible due to non-availability of sufficient foreign exchange, the terms of trade will turn heavily against the industrial sector and as several models of growth point out the growth process will eventually stop because industrial production will become unprofitable.

As of result, the economy will reach a stationary state. Besides, according to Rostow’s model of economic growth, prior to take-off stage of economic development there must be agricultural revolution. As a matter of fact, why Britain was the first country to have industrial revolution is the fact that Britain had an agricultural revolution. Abolition of serfdom and enclosure movement led to the significant increase in agricultural productivity which enabled agriculture to provide enough food to feed its increasing industrial workforce.

It is here worth mentioning the concept of marketable surplus. The marketable surplus is the difference between the agricultural output and the subsistence needs of the farmers producing it. This marketable surplus must be extracted from the agricultural population to be used for the expansion of the industrial sector.

If agricultural productivity does not rise the marketable surplus for industrial growth has been obtained by some countries through coercion as was the case in Japan at the time of Meiji Restoration (1869) when through compulsory taxation marketable surplus was extracted from the farmers. More conspicuously, marketable surplus was forcefully collected from kulaks (small class of rich landowners) in 1920-21 during Stalin’s Collectivisation Scheme.

2. Factor Contribution:

Another contribution of agriculture to economic development is that it provides two important factors — labour and capital — for industrial growth. The size of agricultural sector in developing countries is quite large as around 60 per cent of their population is engaged in it and therefore it can release a significant amount of labour to be employed in the industrial and other non-farm sectors. However, agriculture can release labour for industrial development if its productivity rises.

In Lewis “Model of Development with Unlimited, Supplies of Labour,” mobilisation of surplus labour (i.e., disguisedly unemployed) in agriculture for expansion of modern industrial sector and capital accumulation has to be made for employment in expanding industries. The smaller the wages of labour, the lower will be the cost of industrial sector which will bring large profits to the industrialists which can be ploughed back for further industrial development and capital accumulation.

But as coercion is ruled out in democratic countries like India, the release of labour from agriculture for use in industrial sector can be achieved if there is rise in agricultural productively and therefore the increase in marketable surplus. Thus, it is through increase in agricultural productivity as a result of green revolution technology since the mid-sixties of the last century that has been used for generating agricultural marketable surplus for industrial growth by the developing countries of South-East Asia by using cheap labour from agriculture.

Source of Capital:

Agriculture can also be a major source of saving or capital for industrial growth of developing countries. Even, in poor developing countries, as income from agriculture is unequally distributed, rural people with high incomes can invest their savings for industrial development. In Britain at the time of industrial revolution rich landlords voluntarily invested some of their savings in growing industries. Besides, small farmers can deposit their small savings in banks operating in the rural areas and then these banks can provide loans to the industrialists for investment purposes.

The government can also extract savings from the farmers by taxing the agricultural sector. In Japan a tax on agriculture was levied to mobilise savings for capital accumulation. In India land revenue from agriculture has been a negligible source of State income. A committee headed by late Dr K.N. Raj recommended ‘Agricultural Holding Tax’ to mobilise savings from agriculture for economic development.Since taxing agriculture is a State subject, no State has levied agricultural holding tax or agricultural income tax because no party can turn farmers who are voters against it. Therefore, in India agriculture remains under taxed. However, with the expansion of branches of nationalised banks farmers are voluntarily depositing their savings in these banks, which the banks can lend for industrial growth of the country.

3. Market Contribution:

The market contribution of agriculture means the demand for industrial products. In the earlier stages of development when urban sector is very small and markets for exports have not yet been found, agricultural sector of developing countries is a major source of demand or market for industrial products. The farmers often produce cash crops such as sugar, jute, cotton and from their sales they obtain money incomes which they can spend on industrial goods. Besides, the farmers who have marketable surplus of food-grains (cereals and pulses) sell them in the market from which they get money incomes which also become a source of demand for industrial goods.

Unless the market or demand for industrial products expands, rate of industrial growth cannot be high. In India it has been found that whenever there is sluggish or negative agricultural growth, there is stagnation in the industrial sector due to lack of demand for the industrial products. The increase in agricultural productivity and production causes increase in the home market for manufactured goods and services and thereby speeds up rate of economic development. According to World Development Report of the year 1979, “a stagnant rural economy with low purchasing power holds back industrial growth in many developing countries.”

In fact, there is interrelationship between agriculture and industries. Not only is agriculture a source of demand for various industrial products but it also supplies food and raw materials (such as sugarcane, jute, cotton, oilseeds etc.) to industries. Besides, various agro-based industries such as rice-husking, sugar manufacturing, oil-crushing, handloom weaving also depends on agriculture for the raw material supplies. Therefore, if agricultural growth is sluggish, these agro-based industries would not get their required supplies of raw materials.

The household studies of the currently developed economies indicate that in the earlier stages of development industrial revolution took place in the countries that had already experienced substantial increase in agricultural production. On the other hand, developing countries which have neglected agriculture (as India in the Second and Third Five Year Plans) and allocated bulk of their investment resources to the industrial sector soon found themselves with problems of food shortage, inflation and balance of payments difficulties. Thus Jean Waelbroeck and Irma Adelman write – “In the absence of increase in agricultural productivity, countries quickly find themselves in the balance of payments problems as they find themselves compelled to import food in order to avoid upsurge in real wages that would jeopardise their industrial programme.”

It follows from above that rapidly growing agricultural sector is a precondition for rapid industrial growth. This has however implication for pricing of agricultural products relative to the industrial goods, that is, terms of trade between agriculture and industry. Lower agricultural prices are good for industry as it would get cheaper food and raw material, which would lower its cost of production and raise its profitability. On the other hand, low agricultural prices are bad for the farmers because they reduce their incomes and therefore their buying power to purchase industrial goods.

Besides, lower agricultural prices would serve as disincentive to raise agricultural productivity. Therefore, there is need to strike a balance in terms of trade between agriculture and industry so that agricultural prices are not too high so that they should not make industrial production unprofitable. The agricultural prices should also not be too low so as to provide incentives to the farmers to increase agricultural production.

In the early fifties some economists were of the view that fanners do not respond positively to higher agricultural prices as they aim at earning fixed incomes. With higher agricultural prices the farmers, according to this view, produce and supply less agricultural output. That is, according to this viewpoint, there was backward bending supply curve of agricultural output. Thus, according to this viewpoint for raising agricultural production, agricultural prices should be kept at low levels.

This view did tremendous harm to the agriculture as it was based on wrong premises and the implementation of this view by some developing countries stood in the way of achieving a higher growth of agricultural output. The empirical evidence now clearly shows that farmers respond positively to higher agricultural prices. Even in case of India recently (2012-13, 2013-14) when minimum support prices (MSP) of wheat and rice were raised by the Government, farmers responded positively and not only they increased production of wheat and rice but also exported them on a large scale in the years 2012-13 and 2013-14.

With this India became the world’s largest exporter of rice which no one even dreamed of. That the farmers respond positively to incentive prices is also shown by the fact that the farmers in India and other developing countries adopted the green revolution technology (i.e., use of HYV of seeds along with fertilizers and pesticides) when higher prices of food-grains were offered to them as incentives.

4. Foreign Exchange Contribution:

The exports of agricultural products can also be a source of foreign exchange earnings. In the initial stages of development when industrial sector has not yet developed much, agriculture is a source of foreign exchange earnings from its exports of primary goods.

The developing countries in the early stages of economic development often experience shortage of foreign exchange or what has been called ‘foreign exchange gap’ to meet the requirements of imports for industrial development. By contributing to foreign exchange earnings, it enables the developing countries to have access to imported goods needed for industrial growth which cannot be produced at home or can be produced at a higher opportunity cost.Thus agriculture can make significant contribution to economic development by earning foreign exchange required for importing industrial raw materials and capital goods required for expanding industries. The lack of foreign exchange acts as a great constraint on the growth process. Thus, in India as in the Second and Third Five Year Plans (period 1956-1966), agriculture was relatively neglected in allocation of investment resources, the growth process came to a halt as even food could be imported and also in the absence of availability of enough foreign exchange earnings, it experienced balance of payments problems and it became difficult to import even necessary inputs for industrial growth.

5. Agriculture and Poverty Alleviation:

A majority of poor people live in rural areas. Even after 60 years of independence around 40% of population in the rural areas of India lives below the poverty line and a majority of them consists of small and marginal farmers, landless agricultural labourers, Scheduled Casts and Tribes. It has been shown, among others, by Montek Singh Ahluwalia, the former Deputy Chairman of Indian Planning Commission that poverty declines with agricultural growth.In any strategy of eradication of poverty agricultural growth plays an important role. Agricultural growth raises the productivities and incomes of small and marginal farmers, and raises and employment and wages of agricultural workers. With this, it helps to reduce poverty and disguised unemployment. Besides, increase in agricultural productivity leads to lower food prices and keeps inflation under control which also contribute to lowering of poverty.

6. Contribution of Agriculture to Employment Generation:

In major growth models for labour-surplus developing countries, prominent among them are ‘Lewis’ model of growth with unlimited supply of labour,’ Mahalanobis’ growth model of assigning higher priority to basic and heavy industries visualised withdrawal of surplus labour from agriculture to be employed in the expanding industrial sector. However, the empirical evidence shows that far from withdrawing surplus labour from agriculture, the modern industrial sector being highly capital-intensive generates very little employment opportunities which are not enough even to employ all the openly unemployed persons in the urban areas.

It has been found that agricultural growth has a good employment potential provided a proper strategy of agricultural growth is pursued. The new agricultural technology represented by the use of HYV seeds, fertilizers, pesticides along with use of optimum quantity of irrigation water leads to the expansion in agricultural employment. The use of these inputs of high-yielding technology enables the farmers to adopt multiple cropping which has a large employment potential.

What is needed is the increase in capital investment for expansion of irrigation facilities and other infrastructure for agriculture so that farmers throughout India can draw benefits from the new high-yielding technology. The widespread diffusion of new high-yielding technology in the rural economy of India will raise agricultural productivity as well as employment. However, to realise the full employment potential of agricultural growth, reckless mechanisation of agriculture should be avoided. Besides, to increase employment in agriculture, lands reforms such as tenancy reforms and distribution of land through imposition of ceilings on landholdings should be effectively implemented as small farmers employ more labour, have larger cropping intensity and higher productivity.

Irma Adelman and Jean Waelbroeck” have put forward a strategy called ‘Agricultural Development- Led Industrialisation Strategy’ simply called ADLI Strategy in which they have argued for allocating a greater share of investments to the agricultural sector to improve agricultural productivity and achieve a more rapid growth. To quote them, “With current initial conditions and in the present low-growth world environment, an “Agricultural Development-Led Industrialisation (ADLI) Strategy” leads to higher rates of economic growth, better income distribution, more rapid industrialisation and a stronger balance of payments than continuation of purely export-led growth strategy.

The main reasons for the favourable result of ADLI strategy are that:

(1) The strong domestic linkages of agriculture with manufacturing, through both the demand and the input sides, lead to high domestic demand multipliers for agricultural output;

(2) Investment in agriculture is less import- intensive and more labour-intensive than investment in industry and so is agricultural production;

(3) The rate of return to investment in agriculture is high, equal or be exceeding that of investment in industry.

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**Inter Dependence of Agriculture and Industry**

The most important aspect of this inter dependence is that the products of one serve as important inputs for the other. Growth of one sector, thus means ample supply of inputs for the other. The situation is such that a greater flow of products from one sector to other simultaneously ensures a greater return flow of inputs itself, though with some time lag. Help others to help you in brief, sums up, development.

Limits of Interdependence:

The account of the contribution of each sector to the other should not lead one to conclude that this interdependence is competing. This is not the case. Each sector uses some inputs which are not supplied by the other sector. For instance industrial sector does not depend upon the agricultural sector for supply of minerals and salts as raw materials. Much of its capital is now supplied from its own sources.It itself supplies machinery to it. Similarly agricultural sector will continue to depend upon nature for certain inputs like water supply even after industrial sector has provided it with canals and modern irrigation facilities. As use of machinery is limited in agriculture, human and animal power will continue to be important inputs for the sector. For these inputs, the agricultural sector will again depend upon itself.

Further, there are some problems which are specific to a particular sector and the development of the other sector will leave these problems untouched. What all this implies for the policy-makers is that development of one sector say, the industrial sector, will surely remove some hindrances in the way of further development of the agricultural sector.

But at the same time, it should not be overlooked that there are other hindrances too which emanate from within the agricultural sector itself. These too have to be attended to. Same is the case with the industrial sector. Development of agricultural sector will not remove all the hindrances inhibiting the development of the industrial sector.

Contributions of Agriculture to Industries:

(i) Supply of raw materials to industries:

Many industries look to the agricultural sector for supply of raw material.

(ii) Supply of wage goods:

The market arrivals of food grains can be taken to represent what agriculture can spare for the non-agricultural sector as wage goods provided the market arrivals do not contain any distress sale on the part of the agriculturists. With this provision in view, we give below the market arrivals in the state of Punjab for the last 30 years or so.

Punjab agriculture has developed at a much rapid pace as compared with that in the other states of the country and its rate of growth of population is one of the lowest in the country. So, there is a reason to believe that whatever is sold in the market is a genuine surplus spared by the agricultural sector.

(iii) Agriculture and foreign trade:

Though India has been importing food grains for quite sometimes after independence, it has also been exporting the products of Argo-based industries , thereby , helping the country , not only to pay for the food imports but also for other imports which includes capital goods also. It is important to note here that the major traditional exports of India are the cotton textiles, Jute textiles and tea.

(iv) Provision of market for the industrial sector:

The increasing income of the farm sector leads to an expanded demand for the consumer’s goods produced in the industrial sector. Though no enquiry directly pertaining to this issue has been conducted in India, the data collected by the National Sample Survey organization does indicate that the goods produced in the industrial sector are finding their way into the consumption schedule of the rural people.

(v) Provision of capital and labour to the non-agricultural sector:

No data are available about the supply of these to inputs by the agricultural sector to the industrial sector. Since it is the agriculture which is the custodian of capital and labour in the initial stages of economic development, it can be positively asserted that, these factors have moved to the industrial sector, mainly from the agricultural sector, in initial stages of economic development in most of the countries.

The contribution of the agriculturists in setting up of various industries in England, of textile industry in India and of some important industries in Japan is quite known. The statement about Indian labour that it was migratory in character and that this was because of its nexus with agriculture shows that it was agricultural sector which provided labour to the industrial sector in the initial stages of the development of the latter.

Contributions of the Industrial Sector to the Agricultural Sector:

(i) Provision of modern inputs to the agricultural sector:

One of the major contributions of the industrial sector is to provide modern input to agriculture. The inputs are in the form of fertilizers, pesticides, machinery etc.

(ii) Reduction of population pressure on land:

Data regarding transfer of population from agricultural to non agricultural sector in India does not yield an encouraging picture. Dependence of population on agriculture during the last 50 years or so has not declined to any significant extent.

Growing population and a slow progress of the industrial sector are responsible for this static situation. However, the population data concerning some developed countries of Europe & that of the U.S.A., are quite illuminating in this regard.

(iii) Provision of infrastructure:

No doubt, many of the items included infrastructure serve the agricultural sector as well as the industrial sector but these are provided mainly by the industrial sector. Transport, electricity, financial institutions, health services, educational and research institutions, all owe their existence mainly to the facilities provided by the industrial sector.

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**Recent Trends in Agricultural Growth in India**

1. Raising the Production of Food grains:

India has been experiencing the increase in the production of food grains particularly after the introduction of new agricultural strategy (i.e., Green Revolution) in agricultural practices. Annual growth rate of 2.08 per cent was recorded during 1970s. Annual growth rate of 3.5 per cent in food grains in 1980s is the hallmark of the green revolution that enabled India to become self sufficient in food grains and even a marginal exporter.

The decade of 1990s could not maintain this pace and annual growth rate has fallen to 1.7 per cent which is just about equal to annual population growth. Total production of food grains has increased from 176.39 million tonnes in 1990-91 to 233.9 million tonnes in 2008-09. With the increase in size of population and increase in income, the demand for food grains is likely to rise in near future.

As per the latest estimate it is found that by 2010, the demand for food grains is likely to rise at the rate of 2.6 per cent. If the country can maintain 4 per cent growth rate in agricultural production then after meeting its domestic demand, the country can export the surplus amount of food grains to the foreign countries in which it has favourable position.

2. Diversification of Agriculture:

Agriculture is not only meeting the demand for food grains but also other needs of development. In recent years, agricultural sector has been diversified to produce commercial crops and horticultural crops viz., fruits, vegetables, spices, cashew, areca nut, coconut and floricultural products like flowers, orchids etc.. dairy and other animal husbandry products. The demand for these products has also been increasing. Liberalisation of the economy has created ample scope for the development of agricultural sector both in terms of increased production and trade.

3. Increasing Trend in Horticultural Output:

The diversity of physiographic, climate and soil characteristics enables India to grow a large variety of horticultural crops which includes fruits, vegetables, spices, cashew-nut, coconut, cocoa, areca-nut, root and tuber crops, medicinal and aromatic plants etc. India is the largest producer of fruits, and second largest producer of vegetables.

Total production of fruits has increased from 29.0 million tonnes in 1990-91 to 63.5 million tonnes in 2007- 08. Total production of vegetables has increased from 67.29 million tonnes in 1994-95 to 125.9 million tonnes in 2007-08. India is the largest producer of cashew. Total production of cashew has increased from 3.7 lakh tonnes in 1991-92 to 6.0 lakh tonnes in 2003-04.With the increase in the production of fruits, vegetables and other horticultural products, the value of exports of these products is also increasing. Total value of exports of fruits, vegetables and pulses has increased from Rs. 216 crore in 1990-91 to Rs. 5,650 crore in 2008-09. Thus horticultural exports of the country contribute nearly 25 per cent of the total agricultural exports.

4. Increase in Floricultural Output:

Presently about 31,000 hectares of land spread over Karnataka, Tamil Nadu, Andhra Pradesh and West Bengal are under flower production. Since the inception of liberalisation, commercial farming of floricultural activities has been increasing gradually. The demand for Indian cut flower is increasing continuously in the international market.

Total value of exports of cut flowers has increased from Rs. 28.7 crore in 1994-95 to Rs. 96.6 crore in 1998-99. Under the liberalized regime, India is having a wide prospect of export of floricultural products in near future, which is expected to exceed Rs. 200 crore mark by the year 2010. The total production of flowers during 2007-08 was 0.87 million tonnes of loose flowers and 803.5 million tonnes of cut flowers.

5. Free Trade:

Liberalisation has removed all restrictions on the movement of agricultural produce within the country. This has facilitated expansion of trade in agricultural products, especially of food grains.

6. Agricultural Exports:

Another important emerging trend of agriculture under liberalisation is the increasing volume of agricultural exports and its increasing prospects in near future under the WTO regime. India is favourably placed in respect of agricultural exports as the agricultural sector is subjected to low import content, low cost of labour, favourable climatic conditions, and low unit cost of inputs.

Agricultural exports are playing an important role in expanding the activities of agricultural sector along with generating increasing number of employment opportunities and also in diversifying agricultural operations. The Export Import Policy (Exim) 1992-97 has provided ample opportunities for increasing the volume of agricultural exports.

The policy has permitted exports of agricultural goods like oilseeds, edible oil, sugarcane, pulses, coconut, etc. which were prohibited earlier. Accordingly, the total value of agricultural and allied exports of India has increased from Rs. 6,295.2 crore in 1991- 92 to Rs. 77,783 crore in 2008-09 which was nearly 9.2 per cent of country’s total exports as compared to that of only 10.59 per cent in 1992-93.

Trade policy reforms have provided an opportunity to Indian exporters to export agricultural products to overseas market. India has the potential to export at least 2 million tonnes of rice annually which of course includes nearly 5 lakh tonnes of high value long grain basmati rice.

In 1998 over 2 million tonnes of rice had already been exported till November 1998. In order to tap the future potential, Indian exporters are required to improve their processing and packaging facilities to meet international quality standard.

India’s share in the world trade in agricultural commodities is less than 1 per cent. For over four decades industry remained highly protective and agriculture served as a source of cheap raw materials for the domestic industry, a very large segment of which was inefficient and globally non-competitive. This had a dampening effect on the agricultural exports and investment in agriculture.

The new economic policy since 1991-92 has attempted to correct this imbalance and agriculture has now begun to see some gains through competitive exports. A number of policy changes have been introduced to make agricultural exports more viable. Lowering of import duties on capital goods particularly for green house equipment and plant and machinery necessary for food processing industries as well as easier availability of credit for export has helped agricultural exports.

Most of the restrictions on agricultural exports have been removed. Only two items in the category of agricultural and food export are in the negative list, i.e. beef and tallow. The items on the restricted list have been drastically pruned and only a few items now remain subject to either licensing or quantitative ceiling. Rice and wheat are emerging as major export products.

Fruits, vegetables and flowers have emerged as products with immense export potential. A number of Export Oriented Units (EOUs) in the floriculture sector has already been set up. To facilitate export of perishable products, subsidy on air freight is being provided for specified items.

7. Food Processing:

Economic liberalisation has made ample scope for the development and expansion of food processing industry in India. Fruits and vegetables being perishable in nature are facing a huge loss worth Rs. 3,000 crore every year. In order to prevent such loss, the National Horticulture Board is making necessary steps for providing infrastructure and for the packaging, storage and transportation of horticultural products.

The production of processed fruits and vegetables are providing huge number of employment and improving agricultural productivity by raising the prospects of agricultural exports. The Government is also offering necessary incentives by exempting the industry from excise duty.

In order to invite foreign capital into this industry the Government has permitted 51 per cent foreign equity partnership and also offered prompt approval of foreign technology transfer to the food processing industry of the country.

Production of processed fruits and vegetables grew by about 13 per cent in 1997 but the same has declined by about 5.2 per cent in 1997-98. However, the exports of processed fruits and vegetables are estimated to increase to Rs. 889 crore in 1998-99 as compared to Rs. 745 crore in 1997-98.

Production of different variety of milk products is estimated to have increased to 306 thousand tonnes in 1998 from 290 thousand tonnes in 1997. Exports of animal products (including milk products) is expected to increase to over Rs. 1.100 crore in 1998-99 from Rs. 910 crore in 1997-98. Marine fish harvest experienced a 2.8 per cent growth in production in 1997-98 and export of marine products is expected to increase to over Rs. 5,500 crore in 1998-99 from Rs. 4,643 crore in 1997-98.

Food processing industry has received a considerable interest for development in recent times. Out of total investment proposals worth Rs. 72.154 crore approved in this industry, the amount of foreign investment is Rs. 8,940 crore.

Till September 1998, 837 projects have gone into commercial production and total foreign investment inflow in the sector till March, 1998 is around Rs. 1,800 crore. As on 1st January, 1999, the estimated total installed capacity of fruits and vegetables processing units in India stands at 20.8 lakh tonnes.

8. Rising Productivity of Agricultural Resources:

One of the important aims of liberalisation is to attain higher productivity of resources utilized for agriculture. Improvement in the productivity of resources is being done through better allocation of resources between different areas and also with the application of latest technology.

In the present regime of liberalisation, there is an emerging trend to emphasize on export oriented policies, applying new improved technologies in food processing and marketing and giving stress on planting crops as per geographical suitability.

9. Developing Agriculture in Backward Areas:

In the post-Green Revolution period, application of new agricultural strategy, research and technology was very much restricted in the production of food grains, i.e. only wheat and rice. But under the liberalisation wave, with the growing demand for agricultural exports, many new areas of agricultural operations have become favourable and lucrative.

In the agriculturally backward areas, having no irrigation system, dry land farming has been initiated. The other activities like horticulture, floriculture, animal husbandry, fishery etc. have been encouraged. Application of modern improved techniques in these areas has resulted in the development of many backward areas which were previously subjected to wide spread poverty.

10. Developing New Biological Techniques:

During the period of green revolution, increasing application of chemical fertilizers and pesticides were encouraged extensively in order to meet the growing demand for food required to feed the rising population. Rising population, ever-increasing demand for food and unlimited exploitation, of natural resources have created a grave threat to the environment as well as to the agricultural sector.

In order to save and protect the environment as well as the agricultural sector from any further damage, increasing use of biological technology for agricultural operation has been emphasised and more emphasis is being given to develop new biological technology.

11. Growing Trend of Unemployment in Agricultural Sector and Its Solution:

Green revolution and increasing mechanization of agriculture have resulted fall in employment opportunities, resulting in a serious problem in the rural areas. Although many special employment programmes have been introduced to serve as a security net but increasing potentiality of the agricultural sector as emerged from the liberalisation wave should be exploited properly.

The growing trend in agricultural exports, increasing demand for horticultural and animal products in the export market has created ample opportunities and scope for employment of huge number of population. This allied sector being labour intensive can provide a lasting solution to the rural unemployment problem of the country.

12. Growing Volume of Subsidies:

In India, the volume of subsidies granted to agriculture, in respect of fertilizer, irrigation and electricity charges etc. has been increasing. Aggregate subsidies provided by the Central Government are estimated at Rs. 22,025 crore in 1998-99 as compared with Rs. 19,664 crore in 1997-98.

Out of this total amount about 75 per cent is allotted in the area of fertilizer and food grains. Under the present era of liberalisation, although there is a move to reduce the volume of subsidies in the budget but political compulsions have prevented the government to undertake that move.

13. Growing Trend of Investment in Agriculture:

Agricultural sector is experiencing a growing trend in the volume of its investment during the post-liberalisation period. But the volume of public sector investment in the agricultural sector is declining.

reveals that total volume of investment made in agricultural sector of the country at 1980-81 prices has declined from Rs. 4,636 crore in 1980-81 to Rs. 4,594 crore in 1990-91 and then subsequently increased to Rs. 6,999 crore in 1996-97. During this period the share of public sector investment which was 38.7 per cent in 1980-81 gradually declined to 25.1 per cent in 1990-91 and then subsequently to 16.2 per cent in 1996-97, i.e. from Rs. 1,796 crore in 1980-81 to Rs. 1,154 crore in 1990-91 and then to Rs. 1,132 crore in 1996-97.

The main reason behind the downward trend in public sector investment was the withdrawal of investment resources in favour of investment in terms of current expenditure incurred through subsidies. Such a decelerating trend is a matter of concern. However, the private sector investment has grown substantially in the 1990s. Total volume of private investment in agriculture which was Rs. 2.840 crore in 1980-81 gradually increased to Rs. 3,440 crore in 1990-91 and then considerably increased to Rs. 5,867 crore in 1996-97.

Gross Capital Formation in Agriculture

However, the volume of total investment in agriculture at 1993-94 prices has increased from Rs. 13,523 crore in 1993-94 to Rs. 20,510 crore in 2003-04. The share of public sector investment has declined from 33.0 per cent (Rs. 4,467 crore) in 1993-94 to 25.6 per cent (Rs. 5,249 crore) in 2003- 04.

On the other hand, the share of private sector investment in agriculture has increased considerably from 67.0 per cent (Rs. 9,056 crore) in 1993-94 to 74.4 per cent (Rs. 15,261 crore) in 2003-04. The main factors responsible behind such increase in private investment are the incentives and encouragement being provided to the development of agricultural sector and the favourable changes being made in trade policies under the post-liberalisation period and also due to favourable prospects of agricultural exports in India under the path of globalisation.

Moreover, investment in agriculture declined from 1.6 per cent of GDP in 1993-94 to 1.3 per cent both in 1997-98 and also in 2001-02. This decline was due to fall in public investment in agriculture in recent years. Again the volume of total investment in agriculture at 2004-05 prices increased from Rs. 78,848 crore in 2004-05 to Rs. 1,38,597 crore in 2008-09 (Q). The share of public sector investment has decreased from 20.5 per cent (Rs. 16,189 crore) to 27.6 per cent (Rs. 24,452 crore) in 2008-09.

On the other hand, the share of private sector investment in agriculture has increased relatively from 79.5 per cent (Rs. 62,665 crore) in 2004-05 to 82.4 per cent (Rs. 1,14,145 crore) in 2008-09. The main reasons behind such decrease in private investment are the increasing How of institutional credit, especially from public sector banks, to agricultural sector and the relative slump in the prices of agricultural products.

Moreover, investment in agriculture declined from 2.2 per cent of GDP in 1999-2000 to 1.9 per cent in 2005-06. Such decline in the share of the agricultural sector’s capital formation in GDP is a matter of concern. This declining share was mainly clue to the stagnation or fall in public investment in irrigation, particularly since mid-1990s.

However, there is indication of a reversal of this trend with public sector investment in agriculture reaching the highest level of Rs. 12,591 crore in 2004-05 since the early 1990s. This is no doubt an encouraging trend.

14. Institutionalization of Agricultural Credit:

Under the present wave of liberalisation there is growing trend of institutionalization of agricultural credit. In the initial stage of post-independence period Indian farmers were depending too much on unorganized sources of agricultural credit, i.e., on village money lenders, landlords, traders etc. But such non-institutional credit is very much damaging farmers’ interest as they charge exorbitantly higher rate of interest.

But with the passage of time, there is growing trend to institutionalize the How of agricultural credit mainly through commercial banks cooperative and regional rural banks. Agricultural credit provided by various agencies rose from Rs. 16,494 crore in 1993-94 to Rs. 1,80,486 crore in 2005-06.

In 2006-07, it is likely to rise to Rs. 1,75,000 crore. Thus under the present era of liberalisation, the farmers are showing much interest to collect loan from institutional sources and the recovery of agricultural advances has also increased from 56 per cent in 1993-94 to 63 per cent in 2000-01.

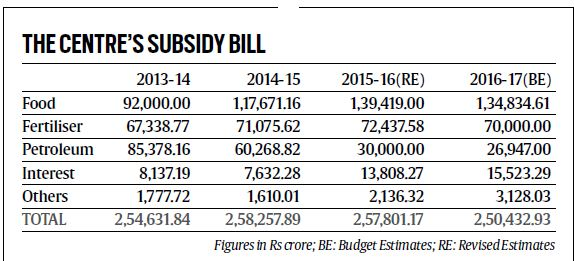
Thus it is observed that liberalisation has created several favourable impacts on the agricultural sector of the country. The emerging trends in agriculture which are very much prominent in the post- liberalisation period include the rising productivity, growing investment, diversification of the sector, application of modern techniques, development of horticulture and floriculture, growing volume of exports and development of food processing industry.

India with its rising population is in an advantageous position to develop its agricultural and allied sectors which arc mostly labour intensive. Liberalisation has provided ample scope for the modernization and development of the agricultural sector and also to reap the maximum benefit from the increasing scope of agricultural exports arising out of the path of globalisation adopted by the economy.

**Different Types of Agricultural Subsidies Given to Farmers in India**

**Government gives different types of subsidies to farmers like, fertilizer, irrigation, equipment, credit subsidy, seed subsidy, export subsidy etc. Current subsidy**[**bill**](https://myphotohunter.com/s/?q=bill)**of the government stands at 2.57 lac cr. in 2015-16 which was 2.58 lac cr. in 2014-15.**

Introduction of the High Yielding Varieties (HYV) seeds programme in the 1960s demanded a high priority to supplying irrigation [water](https://myphotohunter.com/s/?q=water) and fertilisers to the farmers, the government tried to ensure that they were accessible and affordable. Subsidy on fertilisers is provided by the Central government whereas subsidy on [water](https://myphotohunter.com/s/?q=water) is provided by the State governments. Government gives different types of subsidies to farmers like, fertilizer, irrigation, equipment, credit subsidy, seed subsidy, export subsidy etc. Current subsidy [bill](https://myphotohunter.com/s/?q=bill) of the government stands at 2, 60, 128 cr. in 2013-14 which was 2, 39,551 cr. in 2012-13.



**Types of Agricultural Subsidy in India**

* Fertilizer subsidy
* Power subsidy
* Agricultural Equipment subsidy
* Irrigation subsidy
* Seed subsidy
* Export subsidy
* Credit subsidy
* Agricultural infrastructure subsidy

All these subsidies are discussed below:

**Fertilizer Subsidy:**Disbursement of cheap chemical or non-chemical fertilisers among the farmers. It amounts to the difference between price paid to manufacturer of fertilizer (domestic or foreign) and price, received from farmers, rest of the burden is [bear](https://myphotohunter.com/s/?q=bear) by the government. This subsidy ensures:

(i) Cheap inputs to farmers,

(ii) Reasonable returns to manufacturer,

(iii) Stability in fertilizer prices, and

(iv) Availability of fertilisers to farmers in adequate quantity at the requirement.

In some cases this kind of subsidies are granted through lifting the tariff on the import of fertilisers, which otherwise would have been imposed.

**Power Subsidy:**The electricity subsidies imply that the government charges low rates for the electricity supplied to the farmers. Power is primarily used by the farmers for irrigation objectives. It is the difference between the cost of generating and distributing electricity to farmers and price received from farmers. The State Electricity Boards (SEBs) either generate the power themselves or purchase it from other producers such as NTPC and NHPC. Power subsidy “acts as an incentive to farmers to invest in pumping sets, bore-wells, tube wells etc. **Irrigations subsidy: under this umbrella government provides irrigation facilities at the cheaper rates as compare to the markets rates**. It is the difference between operating and maintenance cost of irrigation infrastructure in the state and irrigation charges recovered from farmers. This may work through provisions of public goods such as canals, dams, tube wells etc. which the government constructs and charges low prices or no prices at all (in special cases)for their use from the farmers. It may also be through cheap private irrigation equipment such as pumping sets.

**Seed Subsidy:**High yielding seeds can be provided by the government at low prices, and at the future payment options. The research and development activities needed to produce such productive seeds are also undertaken by the government, the expenditure on these is a sort of subsidy granted to the farmers.

**Export Subsidy:**This subsidy is given to the farmers to face the international completion. When a [farmer](https://myphotohunter.com/s/?q=farmer) or exporter sells agricultural products in foreign market, he earns money for himself, as well as foreign exchange for the country. Therefore, agricultural exports are generally encouraged as long as these do not harm the domestic economy. Subsides provided to encourage exports are referred as export subsidies.

**Credit Subsidy:**It is the difference between interest charged from farmers, and actual cost of providing credit, plus other costs such as write-offs bad loans. Availability of credit is a major problem for poor farmers. They do not have sufficient cash to purchase agricultural equipments and cannot approach the credit market because they do not have the collateral needed for loans. To carry out production activities they approach the local money lenders. Taking advantage of the helplessness of the poor farmers the lenders charge very high rates of interest. Many times even the farmers who have some collateral cannot avail loans because banking institutions are mainly urban based and many a times they do not indulge in agricultural credit operations, which is considered to be risky. **To tackle these problems the government have provided following provisions:**

(1) More banking operations in rural areas-which will advance agricultural loans, and

(2) The interest rates can be maintained low through subsidization schemes, and

(3) The terms of credit (such as collateral requirements) can be relaxed for the poor.

**Agriculture Infrastructure subsidy:**Private efforts in many areas do not prove to be sufficient to improve agricultural production. Good roads, storage facilities, power, information about the market, transportation to the ports, etc. are vital for production and sale operations. These facilities are in the domain of public goods, the costs of which are huge and whose benefits accrue to all the cultivators in an area. No individual [farmer](https://myphotohunter.com/s/?q=farmer) will come forward to provide these facilities because of their bulkiness and inherent problems related to revenue collections (no one can be excluded from its benefit on the ground of non-payment). Therefore the government takes the responsibility of providing these and given the condition of Indian farmers a lower price can be charged from the poorer farmers.

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Introduction

The large part of Indian agriculture is still predominantly subsistence in nature facing enormous challenges of technical inefficiencies, high input price, limited infrastructure like irrigation, and weak extension services. The challenge of limited land and water availability is further exacerbated by degradation of natural resources; climate changes; shifting demand and consumption patterns, moving toward high-value agriculture; increasing population pressure; and liberalization of trade putting pressure on the food production system of underdeveloped and developing country (Lele et al., 2010). The technical challenges can be mitigated through adoption of the technical knowledge, skill, and innovations predominantly generated by research and development organizations working for the purposes. But the actual development is largely dependent on efficiency and effectiveness of extension agencies in supporting such development and up scaling of best practices. In India, the importance of extension agencies in agriculture is widely recognized since inception of planned economic development policies. Specific attention has been given to establish and strengthen extension services by various agencies of the Government of India (GoI) for several decades. This has resulted in spurt of extension agencies in India with a wide range of focus and objectives within the broader framework of development of agriculture and allied sectors. Among them most important players are the extension system of state governments at different levels called line departments, extension units of research institutes under Indian Council of Agricultural Research (ICAR), extension services/directorates of the state agricultural universities (SAU), Krishi Vigyan Kendra (KVK) (the farm science centers) of ICAR, Business Incubation Centers of ICAR-Research Institutes, Agricultural Technology Management Agency (ATMA), NGOs, farmer producer organizations, input dealers, private sector, etc. Significantly, international donor-driven short- and long-term service providers are also key players in this space.

The 20th century witnessed radical developments in Science and Technology. These developments had an impact on the social and economic changes that took place in the world. Such changes gradually influence day-to-day life of people at the grassroots levels (NAAS, 2005). In agriculture, larger development has been witnessed due to robust technologies and extension with lab-to-land programs as an example. Despite a wide range of reform initiatives in agricultural extension in India, coverage of, access to, and quality of information provided to marginalized and poor farmers is uneven (Glendenning et al., 2010). In many developing countries, wider adoption of research results by farmers at large scale remains as challenge (FAO, 1985). Ideally, flow of information from farmers to researchers and from researchers to farmers is modulated by agricultural extension services. Role of extension agencies in performing such role efficiently and effectively has been questioned by several researchers.

Extension system needs to play an increasingly important intermediation and facilitation role to support application of new knowledge, especially in the context of multiple and diverse organizations involved in extension and advisory services (Sulaiman, 2012). To do this, it should also reform its strategies and program delivery architecture to meet the needs of its large number of clients representing varied resource base and risk-bearing capacity in a better way. The lack of qualified local manpower, delivery mechanisms, technical and financial support, and a clear framework for partnerships are some of the constraints responsible for weak links between ATMA, ICAR, SAUs, and KVKs (Kapoor, 2010). The linkage between KVKs and State Department of Agriculture (DoA) is less than satisfactory and the DoA continues to ignore other organizations that have entered the extension arena in selected regions and enterprises that could complement or supplement its efforts (Holt and Sulaiman, 2002). At the national level, it still carries some of the deficiencies of the public-sector extension system, which has reduced its efficacy due to limited staff, poor capacity, and weak links to the research system (especially the KVKs), as well as limited reach to farmers (Singh et al., 2013).

It is time for agencies to work on innovative extension approaches in the light of declining public funding to extension. Innovative extension approaches for technology transfer in community development is a process of extending benefits to larger communities by adopting unique extension methods. The effective reach of KVKs can be increased through adequate linkages with other development agencies. Staff shortage, limited operational funding, and a narrow mandate have also led to suboptimal utilization of KVKs. KVKs can do better if its technical expertise is linked to the facilitation support and reach of the DoA/ATMA (Sulaiman, 2012). Though agricultural extension in India has undergone several changes since independence still, a large number of smallholder farmers and other vulnerable groups remain unreached by the public extension system (Babu et al., 2013). The challenges are that India has 119 million farmers with in average 1.23 ha land area and the pluralistic Rural Advisory Services (RAS) system that includes public RAS (in average one extensionist/1200 farmers), a multitude of private extension schemes, 230 million members of agricultural cooperatives, and 1 million NGOs. It is interesting to note that public RAS reaches 6% of the more than 119 million Indian farmers (Ghimire et al., 2014). In 2005, only 40% of farmers accessed agricultural information from any source, whereas progressive farmers and input suppliers are the major information source for small-scale farmers (Adhiguru et al., 2009).

Among these players in the space of extension services in India, the KVK or Farm Science Center which is a multidisciplinary institution located at the district level, with funding and technical supervision from ICAR, is important in providing technical services in agriculture operating at every district in the country. The KVKs have contributed significantly in the field trials, demonstration, and technology transfer since its inception. But the performance of KVKs is often criticized for working in isolation from other actors in the extension system like the private and other public sector (Glendenning et al., 2010). With increasing technological need and demand, partnerships with diverse range of extension agencies is necessary to deliver the technical services to the farmers in more effective and efficient manner. Hence, the convergence among the related agencies is the need of the hour to deliver extension services in the form and amount demanded by the end users. The convergence with other development programs helps in supplementation of funds for holistic treatment as well as better coordination and complementing efforts of each other (Chandrappagari et al., 2012).

As per the constitution of India, the state government has the responsibilities for providing extension services to the farmers; the central government provides necessary support to the state government in strengthening their effort. The KVK is an institution operating at the district level supported by GoI but managed and operated by diverse range of host organizations like ICAR-Research Institutes, state agriculture universities, nongovernment organizations, etc. Despite diversity in the management structure, KVK has a unique identity and agenda as formulated by GoI. Typically, KVK plays important link between research institute and other extension agencies as well as advanced farmers in technology evaluation, refinement, and adaptations. In whole of India, 650 KVKs administered by ICAR through 8 zonal project directorates renamed as Agricultural Technology Application Research Institute (ATARI) since 2015. For example, Zone VII comprising 100 KVKs, there was 220,147 footfalls (207,940 farmers, 10,734 officials, and 1473 dignitaries, political leaders, bureaucrats, etc. during 2015–16) (ATARI, 2016). There is a huge demand from farmers seeking advices from KVKs in the last several decades and also a critical vector of the central government to implement development projects. Taking the case of KVK Khordha under this study during 2014–15 catered services to more than 12,000 with its mandatory activities. The demand for the extension service is much larger than what is being provided by KVK at present; hence, the synergetic and convergence with other agencies operating at the district or state level is a way forward toward effective and efficient extension services to the farmers.

In this context, the KVK, Khordha undertook an initiative during 2012–16, to collaborate with the other extension agencies in the district in a convergence mode. This chapter deals with this initiative and developed a framework for greater convergence of such agencies for effective transfer of technology to the larger farming communities.

Transfer Pricing and Income Shifting

Higher marginal tax rates in one sector than elsewhere motivates shifting of income away from the sector. By transfer pricing this can be done by higher input prices or lower output prices. Companies paying taxes in many sectors, themselves or through subsidiaries or otherwise related companies, can thus reduce their overall tax burden. In effect, the company sells to itself at artificial prices. Income shifting may also involve real transfers. Tax differences may motivate, for example, testing equipment or training personnel in a high-tax sector. The effect may even be that more of this activity is undertaken, compared with a situation with equal tax rates.

More specifically, let *τy* be the marginal tax rate on (gross) income in the resource sector, that is, the increased tax payment following a one unit increase in a company's gross income. For instance, if an income tax of 41% and a royalty rate of 8% are applied, and royalties are deductible in the income tax base, then *τy* = 0.08 + 0.41(1−0.08). If taxes over several periods are affected, use PDVs. Let *τc* be the marginal tax rate on cost reductions (0.41 in the example), and let *τy* and *τc* be similarly defined rates in another sector. A company with operations in both sectors will have incentives to move gross income away from the resource sector if *τy* > *τy* and to move costs into the sector if *τc* > *τc*. A different problem called gold-plating incentives occurs if *τc* > 1. The traditional distortive effect of royalties occurs if *τy* > *τc*.

OECD has transfer pricing guidelines. Prices for international sales should be as if parties were at arm's length, that is, nonrelated. If prices are found to deviate significantly, there can be legal means to enforce arm's length prices as basis for taxation. This could clearly be extended to sales between sectors with different tax systems within one country. In general, the principle is more easily applied for output prices than for input prices because input factors are numerous and different. Often, there exist no markets for identical items. Financing costs, however, may be compared with other financing of similar riskiness.

Much of the theory of neutral taxation neglects income shifting, and leads naturally to a recommendation of tax rates at about 99%. Potential income shifting may be the most important limiting factor when tax rates are determined. Some economists have recommended compromise solutions. If the problem is most serious on the input factor side, there is a trade-off between neutrality and cost consciousness. The optimal solution may require *τy* > *τc*.

Models of asymmetric information have been applied to resource taxation when cost monitoring is a serious problem. While companies are assumed to know the required minimum costs for any level of extraction, authorities do not know. The models typically assume that authorities can formulate a probability distribution of the costs, and that they cannot base tax deductions on costs reported by the companies.