AGRICULTURAL ECONOMICS

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Preface

Agricultural economics is a multifaceted field that applies economic principles to analyze and understand the agricultural sector's functioning. It encompasses various aspects, including production, distribution, consumption, and policies related to agricultural goods and services. One of the primary focuses of agricultural economics is production economics, which examines the factors influencing agricultural productivity. This includes land, labour, capital, technology, and management practices. Understanding these factors helps farmers make decisions regarding crop selection, input use, and production techniques to optimize resource allocation and maximize profits.

Moreover, agricultural economics delves into agricultural markets and pricing mechanisms. It analyzes supply and demand dynamics, market structures, and price determination. Market behaviour and price movements are crucial for farmers, policymakers, and other stakeholders to make informed decisions, manage risk, and ensure market efficiency.

Additionally, agricultural economics explores the role of government policies and interventions in shaping agricultural outcomes. This includes subsidies, tariffs, price supports, trade policies, and environmental regulations. Government policies influence production decisions, market outcomes, and the overall economic viability of the agricultural sector. Furthermore, agricultural economics examines rural development and the socio-economic impacts of agriculture on rural communities. It addresses issues such as rural poverty, income inequality, rural-urban migration, and the provision of public goods and services in rural areas. Understanding these dynamics is essential for designing effective policies and strategies to promote rural development and address rural challenges.

Agricultural economics also plays a crucial role in ensuring food security and sustainability. It analyzes factors affecting food production, distribution, and consumption, and assesses strategies to enhance agricultural productivity, improve food access, and reduce food waste.

Moreover, agricultural economics contributes to international agricultural trade and development. It examines trade patterns, market access, and trade agreements' implications for agricultural producers and consumers worldwide. Understanding international trade dynamics helps countries formulate trade policies that promote economic growth, food security, and rural development.

Agricultural economics provides valuable insights into the economic, social, and environmental dimensions of agriculture. It helps policymakers, farmers, and other stakeholders make informed decisions to enhance agricultural sustainability, promote rural development, and ensure food security for present and future generations.

The book on Agricultural Economics provides a comprehensive analysis of the economic principles, policies, and practices shaping the agriculture sector, addressing issues of production, markets, policies, and rural development.

–Author

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Introduction

Agricultural economics originally applied the principles of economics to the production of crops and livestock — a discipline known as agronomics. Agronomics was a branch of economics that specifically dealt with land usage. It focused on maximizing the crop yield while maintaining a good soil ecosystem.

Throughout the 20th century the discipline expanded and the current scope of the discipline is much broader. Agricultural economics today includes a variety of applied areas, having considerable overlap with conventional economics.

ORIGINS

Economics is the study of resource allocation under scarcity. Agronomics, or the application of economic methods to optimizing the decisions made by agricultural producers, grew to prominence around the turn of the 20th century.

The field of agricultural economics can be traced out to works on land economics. Henry Charles Taylor was the greatest contributor with the establishment of the Department of Agricultural Economics at Wisconsin in 1909 Another contributor, Theodore Schultz was among the first to examine development economics as a problem related directly to agriculture.

Schultz was also instrumental in establishing econometrics as a tool for use in analyzing agricultural economics empirically; he noted in his landmark 1956 article that agricultural supply analysis is rooted in “shifting sand,” implying that it was and is simply not being done correctly.

DEVELOPMENT

One scholar summarizes the development of agricultural economics as follows:

- "Agricultural economics arose in the late 19th century, combined the theory of the firm with marketing and organization theory, and developed throughout the 20th century largely as an empirical branch of general economics. The discipline was closely linked to empirical applications of mathematical statistics and made early and significant contributions to econometric methods. In the 1960's and afterwards, as agricultural sectors in the OECD countries contracted, agricultural economists were drawn to the development problems of poor countries, to the trade and macroeconomic policy implications of agriculture in rich countries, and to a variety of production, consumption, and environmental and resource problems."

Agricultural economists have made many well-known contributions to the economics field with such models as the cobweb model, hedonic regression pricing models, new technology and diffusion models (Zvi Griliches), multifactor productivity and efficiency theory and measurement, and the random coefficients regression. The farm sector is frequently cited as a prime example of the perfect competition economic paradigm.

Since the 1970s, agricultural economics has primarily focused on seven main topics, according to a scholar in the field: agricultural environment and resources; risk and uncertainty; consumption and food supply chains; prices and incomes; market structures; trade and development; and technical change and human capital.

In terms of technical change, there have been increasingly rapid developments and innovations in the equipment designed for agricultural research. This equipment includes instruments for plant physiology research, and monitoring soil conditions and atmospheres.

AREAS OF CONCENTRATION

- Econometrics
- International development
- Community and rural development
- Food safety and nutrition
- International trade
- Natural resource and environmental economics
- Production economics
- Risk and uncertainty
- Consumer behaviour and household economics
- Health economics
- Labour economics
- Forestry economics

- Analysis of markets and competition
- Agribusiness
- Agricultural marketing
- Agricultural policy
- Industrial organization
- Marketing of agricultural products
- Rural economics
- Rural sociology

Agricultural economics tends to be more microeconomic oriented. Many undergraduate Agricultural Economics degrees given by US land-grant universities tend to be more like a traditional business degree rather than a traditional economics degree. At the graduate level, many agricultural economics programmes focus on a wide variety of applied microeconomic topics. Their demand is driven by their pragmatism, optimization and decision making skills, and their skills in statistical modelling. Graduates from Agricultural Economics departments across America find jobs in diversified sectors of the economy:

- Accounting
- Agriculture
- Breweries, distilleries, bottling plants
- Cigarette manufacturing
- Food processing - eg. flour mill
- Food manufacture - eg. cake factory
- Furniture manufacturing; production of linens, drapes, carpet
- Government & NGOs
- Information technology
- Leather tanning, footwear manufacturing, handbag production
- Logistics & supply chains
- Pulp and paper
- Sawmills, lumber mills, wood products
- Textiles processing and garment manufacturing

IMPACT OF ECONOMIC REFORMS ON AGRICULTURE IN INDIA

The serious foreign-exchange crisis in 1990 led to a number of well-publicized economic reforms in the early 1990s dealing with trade, industrial licensing, and privatization. The reforms had an impact on the agricultural sector through the central government's effort to withdraw the fertilizer subsidy and place greater emphasis on agricultural exports.

The cut in the fertilizer subsidy was a result of the government's commitment to reduce New Delhi's fiscal deficit by removing grants and subsidies from the budget. The government action led to a reduction in the use of chemical fertilizers and protests by farmers and opposition political parties. The government was forced to continue the subsidies but at a somewhat lower level.

New import and export policies aim at enhancing export capabilities of the agricultural sector by increasing productivity and promoting modernization and competitiveness. The measures to facilitate export growth include allowing the import of capital for the agricultural sector, reducing the list of agricultural products that cannot be exported, and removing the minimum export price from a number of products.

Agricultural exports increased by 30 percent in FY 1991 and 14 percent in FY 1992 in terms of rupee value, but declined by 8 percent from FY 1990 to FY 1992 in United States dollar terms because of the devaluation of the rupee in 1991.

In the mid-1990s, it was expected that agriculture would continue to be the most important sector of the economy for the rest of the decade in terms of the proportion of GDP.

However, even when it is not the sector providing the largest share of GDP, the importance of agriculture is not likely to diminish because of its critical role in providing food, wage goods, employment, and raw materials to industries.

Despite their preoccupation with industrial development, India's planners and policy makers have had to acknowledge the critical role of agriculture in the early 1990s by changing basic policy. The gains in agricultural production should not lead to complacency, however. Continuing increases in productivity, developing allied activities in rural areas, and building infrastructure in rural areas are essential if India is to continue to be self-reliant in food and agricultural products and provide a modest surplus for exports.

AGRICULTURE AND RURAL DEVELOPMENTS

From a nation dependent on food imports to feed its population, India today is not only self—sufficient in grain production, but also has a substantial reserve.

The progress made by agriculture in the last four decades has been one of the biggest success stories of free India. Agriculture and allied activities constitute the single largest contributor to the Gross Domestic Product, almost 33% of it. Agriculture is the means of livelihood of about two—thirds of the work force in the country.

This increase in agricultural production has been brought about by bringing additional area under cultivation, extension of irrigation facilities, the use of improved high yielding variety of seeds, better techniques evolved through agricultural research, water management, and plant protection through judicious use of fertilizers, pesticides and cropping practices.

Crops

The 1970s saw a multi-fold increase in wheat production that heralded the Green Revolution. In the next decade rice production rose significantly; in 1995-96, rice production was 79.6 million tons. Total grain production crossed 191 million tons in 1994-95, a big leap from 51 million tons in 1950-5 1. During the Seventh Plan, the average grain production was 155 million tons, 17 million

tons more than the Sixth Plan average. To carry improved technologies to farmers, a National Pulse Development Programme, covering 13 states, was launched in 1986. The Special Food Production Programme augmented efforts to boost pulse production further. In 1995-96, pulse production was 13.2 million tons. With some States offering more than the statutory minimum price, sugarcane production also received a boost, in 1995-96 a record 283.0 million tons was registered.

Irrigation

As efforts continued to increase the irrigation potential in the country, the last 40 years saw the gross irrigated area reach 8~ million hectares. Flood forecasting has become an important activity over the years. Over 500 hydrological stations collect and transmit data through 400 wireless stations for issuing forecasts for 157 sites. About 5000 forecasts are issued in a year with 94% accuracy.

The country also receives international support, with the World Bank as a primary source, for developing the water resources. International cooperation is also envisaged in setting up a National Centre for Information on Water and Power.

As there is a broad seismic belt in the country, particularly along the Himalayan, the Kutch region and ports of Maharashtra, a scheme is being evolved to collect all data on seismic activity at various dam sites.

Fertilizers

The fertilizer industry in India has grown tremendously in the last 30 years. The Government is keen to see that fertilizer reaches the farmers in the remote and hilly areas. It has been decided to decontrol the prices, distribution and movement of phosphatic and potassic fertilizers. Steps have been taken to ensure an increase in the supply of non-chemical fertilizers at reasonable prices. There are 53 fertilizer quality control laboratories in the country. Since bio—fertilizers are regarded as an effective, cheap and renewable supplement to chemical fertilizers, the Government is implementing a National Project on Development and Use of Bio-fertilizers. Under this scheme, one national and six regional centers for organizing training, demonstrating programmes and quality testing of bio-fertilizers has been taken up.

It was a challenging decision of the Government to take Bombay High gas through a 1,700-km pipeline to feed fertilizer plants located in the consumption centers of North India.

However, the major policy which has ensured the growth of the fertilizer industry is the thrust on accelerating fertilizer consumption by fixing, on the one hand, low and uniform price for fertilizers, and on the other hand providing the manufacturers adequate compensation through the retention price and subsidy scheme. As expected, fertilizer nutrient demand has gone up from 0.29 million tons in 1960-61 to 13.9 million tons at the end of 1995-96, compared to 12.15MT during 1992-93.

Fisheries

Fish production achieved an all-time high of 4.9 million tons at the end of 1995-96. Programmes that have helped boost production include the National Programme of Developing Fish Seeds, Fish Farmers' Development Agencies and Brackish Water Fish Farmers' Development Agencies. The Central Institute of Fisheries Nautical and Engineering Training trains the necessary manpower. To diversify fishing methods and introduce processed fish products on a semi-commercial scale, an Integrated Fisheries Project has been launched. A National Fisheries Advisory Board has also been established.

Food Processing

A Ministry of Food Processing Industries was established in July 1988 to ensure better utilization of farmers' output by inducting modem technology into the processing of food products, thus augmenting the income of farmers and generating employment opportunities in rural areas. A new seeds policy has been adopted to provide access to high quality seeds and plant material for vegetables, fruit, flowers, oil-seeds and pulses, without in any way compromising quarantine conditions. Initiatives have been taken to encourage private sector investment in the food processing industry.

Agricultural Research

The apex body for education, research and extension education in the field of agriculture is the Indian Council of Agricultural Research (ICAR), established in 1929. India's transformation from a food deficit to a food surplus country is largely due to ICAR's smooth and rapid transfer of farm technology from the laboratory to the land. ICAR discharges its responsibilities through 43 research institutes, four national research bureaus, 20 national research centers, nine project directorates, 70 all-India coordinated research projects, and 109 Krishi Vigyan Kendras (farm science centers). Besides, the programme of Agricultural Education is coordinated by ICAR with the curricula and other normative guidance given to the 26 Agricultural Universities and four National Research Institutes.

Oilseeds Production

A Technology Mission on Oilseeds was launched in 1986 to increase production of oilseeds in the country and attain self-sufficiency. Pulses were brought under the Technology Mission in 1990. Before the Mission was launched in 1985-86, oilseed production was 10.83 million tons; during 1995-96, it was estimated at 22.42 million tons, which is a record. Soybean, rapeseed and mustard largely contributed the increase in production. Production of pulses has seen many ups and downs, which is expected to be checked under the Mission. The country grows mainly nine oilseeds, with groundnut, rapeseed and mustard accounting for 62% of total production. Lately, soybean and sunflower have shown major growth potential.

Drinking Water

A Technology Mission on Drinking Water and Related Water Management has been constituted to cover the residual problem villages and provide potable water at 40 liter per capita per day, and 70 liters per capita per day in desert areas inclusive of 30 liters for cattle. The Mission is tackling the problem through 55 mini-missions in project districts and countrywide problem oriented sub-missions. A Village Level Operation and Maintenance (VLOM) pump called India Mark-11 has been developed and is being exported to 40 countries. By March 31, 1993, over 79% of the rural and about 85% of the urban population was provided drinking water facilities.

ECONOMIC DEVELOPMENT AS AN OBJECTIVE OF POLICY

MOTIVES FOR DEVELOPMENT

The field of development economics is concerned with the causes of underdevelopment and with policies that may accelerate the rate of growth of per capita income. While these two concerns are related to each other, it is possible to devise policies that are likely to accelerate growth (through, for example, an analysis of the experiences of other developing countries) without fully understanding the causes of underdevelopment.

Studies of both the causes of underdevelopment and of policies and actions that may accelerate development are undertaken for a variety of reasons. There are those who are concerned with the developing countries on humanitarian grounds; that is, with the problem of helping the people of these countries to attain certain minimum material standards of living in terms of such factors as food, clothing, shelter, and nutrition. For them, low per capita income is the measure of the problem of poverty in a material sense. The aim of economic development is to improve the material standards of living by raising the absolute level of per capita incomes. Raising per capita incomes is also a stated objective of policy of the governments of all developing countries. For policy-makers and economists attempting to achieve their governments' objectives, therefore, an understanding of economic development, especially in its policy dimensions, is important. Finally, there are those who are concerned with economic development either because they believe it is what people in developing countries want or because they believe that political stability can be assured only with satisfactory rates of economic growth. These motives are not mutually exclusive. Since, World War II many industrial countries have extended foreign aid to developing countries for a combination of humanitarian and political reasons.

Those who are concerned with political stability tend to see the low per capita incomes of the developing countries in relative terms; that is, in relation to the high per capita incomes of the developed countries. For them, even if a developing country is able to improve its material standards of living through a

rise in the level of its per capita income, it may still be faced with the more intractable subjective problem of the discontent created by the widening gap in the relative levels between itself and the richer countries. (This effect arises simply from the operation of the arithmetic of growth on the large initial gap between the income levels of the developed and the underdeveloped countries. As an example, an underdeveloped country with a per capita income of $100 and a developed country with a per capita income of $1,000 may be considered. The initial gap in their incomes is $900. Let the incomes in both countries grow at 5 percent. After one year, the income of the underdeveloped country is $105, and the income of the developed country is $1,050. The gap has widened to $945. The income of the underdeveloped country would have to grow by 50 percent to maintain the same absolute gap of $900.) Although there was once in development economics a debate as to whether raising living standards or reducing the relative gap in living standards was the true desideratum of policy, experience during the 1960–80 period convinced most observers that developing countries could, with appropriate policies, achieve sufficiently high rates of growth both to raise their living standards fairly rapidly and to begin closing the gap.

IDENTIFYING PROJECT COSTS AND BENEFITS

We undertake economic analyses of agricultural projects to compare costs with benefits and determine which among alternative projects have an acceptable return. The costs and benefits of a proposed project therefore must be identified. Furthermore, once costs and benefits are known, they must be priced, and their economic values determined. All of this is obvious enough, but frequently it is tricky business.

Objectives, Costs, and Benefits

In project analysis, the objectives of the analysis provide the standard against which costs and benefits are defined. Simply put, a cost is anything that reduces an objective, and a benefit is anything that contributes to an objective.

The problem with such simplicity, however, is that each participant in a project has many objectives. For a farmer, a major objective of participating is to maximize the amount his family has to live on. But this is only one of the farmer's interests. He may also want his children to be educated; as a result, they may not be available to work full time in the fields. He may also value his time away from the fields: a farmer will not adopt a cropping pattern, however remunerative, that requires him to work ten hours a day 365 days a year. Taste preference may lead a farmer to continue to grow a traditional variety of rice for home consumption even though a new, high-yielding variety might increase his family income more. A farmer may wish to avoid risk, and so may plan his cropping pattern to limit the risk of crop failure to an acceptable level or to reduce the risk of his depending solely on the market for the food grains his family will consume. As a result, although he may be able to increase his income

over time if he grows cotton instead of wheat or maize, he would rather continue growing food grains to forestall the possibility that in any one year the cotton crop might fail or that food grains might be available for purchase in the market only at a very high price. All these considerations affect a farmer's choice of cropping pattern and thus the income-generating capacity of the project. Yet all are sensible decisions in the farmer's view. In the analytical system presented here, we will try to identify the cropping pattern that we think the farmer will most probably select, and then we will judge the effects of that pattern on his incremental income and, thus, on the new income generated by the project.

For private business firms or government corporations, a major objective is to maximize net income, yet both have significant objectives other than simply making the highest profit possible. Both will want to diversify their activities to reduce risk. The private store owner may have a preference for leisure, which leads him to hire a manager to help operate his store, especially during late hours. This reduces the income-since, the manager must be paid a salary-but it is a sensible choice. For policy reasons, a public bus corporation may decide to maintain services even in less densely populated areas or at off-peak hours and thereby reduce its net income. In the analytical system here, we first identify the operating pattern that the firms in the project will most likely follow and then build the accounts to assess the effects of that pattern on the income-generating capacity of the project.

A society as a whole will have as a major objective increased national income, but it clearly will have many significant, additional objectives. One of the most important of these is income distribution. Another is simply to increase the number of productive job opportunities so that unemployment may be reduced-which may be different from the objective of income distribution itself. Yet another objective may be to increase the proportion of savings in any given period so there will be more to Invest, faster growth, and, hence, more income in the future. Or, there may be issues to address broader than narrow economic considerations-such as the desire to increase regional integration, to upgrade the general level of education, to improve rural health, or to safeguard national security. Any of these objectives might lead to the choice of a project (or a form of a project) that is not the alternative that would contribute most to national income narrowly defined.

No formal analytical system for project analysis could possibly take into account all the various objectives of every participant in a project. Some selection will have to be made. In the analytical system here, we will take as formal criteria very straightforward objectives of income maximization and accommodate other objectives at other points in the process of project selection. The justification for this is that in most developing countries increased income is probably the single most important objective of individual economic effort, and increased national income is probably the most important objective of national economic policy. For farms, we will take as the objective maximizing the incremental net benefit-the increased amount the farm family has to live on as a result of participating in

the project. For a private business firm or corporation in the public sector, we will take as the objective maximizing the incremental net income. And for the economic analysis conducted from the standpoint of the society as a whole, we will take as the objective maximizing the contribution the project makes to the national income-the value of all final goods and services produced during a particular period, generally a year. This is virtually the same objective, except for minor formal variations in definition, as maximizing gross domestic product (GDP). It is important to emphasize that taking the income a project will contribute to a society as the formal analytical criterion in economic, analysis does not downgrade other objectives or preclude our considering them. Rather, we will simply treat consideration of other objectives as separate decisions. Using our analytical system, we can judge which among alternative projects or alternative forms of a particular project will make an acceptable contribution to national income. This will enable us to recommend to those who must make the Investment decision a project that has a high income-generating potential and also will make a significant contribution to other social objectives. For example, from among those projects that make generally the same contribution to increased income, we can choose the one that has the most favourable effects on income distribution, or the one that creates the most jobs, or the one that is the most attractive among those in a disadvantaged region.

Thus, in the system of economic analysis, anything that reduces national income is a cost and anything that increases national income is a benefit. Since, our objective is to increase the sum of all final goods and services, anything that directly reduces the total final goods and services is obviously a cost, and anything that directly increases them is clearly a benefit. But recall, also, the intricate workings of the economic system. When the project analyzed uses some intermediate good or service-something that is used to produce something else - by a chain of events it eventually reduces the total final goods and services available elsewhere in the economy. On the one hand, if we divert an orange that can be used for direct consumption-and thus is a final good-to the production of orange juice, also a final good, we are reducing the total available final goods and services, or national income, by the value of the orange and increasing it by the value of the orange juice. On the other hand, if we use cement to line an irrigation canal, we are not directly reducing the final goods and services available; instead, we are simply reducing the availability of an intermediate good. But the consequence of using the cement in the irrigation project is to shift the cement away from some other use in the economy. This, in turn, reduces production of some other good, and so on through the chain of events until, finally, the production of final goods and services, the national income, is reduced. Thus, using cement in the project is a cost to the economy. How much the national income will be reduced by using the cement for the project is part of what we must estimate when we turn, to deriving economic values. On the benefit side, we have a similar pattern. Lining a canal increases available water that, in turn, may increase wheat production, and so on through a chain of

events until in the end the total amount of bread is increased. By this mechanism, the project leads to an increase in the total amount of final goods and services, which is to say it increases the national income. Again, part of the analyst's task in the economic analysis is to estimate the amount of this increase in national income available to the society; that is, to determine whether, and by how much, the benefits exceed the costs in terms of national income. If this rather simple definition of economic costs and benefits is kept in mind, possible confusion will be avoided when shadow prices are used to value resource flows.

Note that, by defining our objective for economic analysis in terms of change in national income, we are defining it in real terms. (Real terms, as opposed to money terms, refer to the physical, tangible characteristics of goods and services.) To an important degree, economic analysis, in contrast to financial analysis, consists in tracing the real resource flows induced by an Investment rather than the Investment's monetary effects.

With these objectives defined, we may then say that in financial analysis our numeraire-the common measurement used as the unit of account-is a unit of currency, generally domestic currency, whereas in economic analysis our numeraire is a unit of national income, generally also expressed in domestic currency.

In the economic analysis we will assume that all financing for a project comes from domestic sources and that all returns from the Project Go to domestic residents. [This is one reason why we identify our social objective with the gross domestic product (GDP) instead of the more familiar gross national product (GNP).] This convention-almost universally accepted by project analysts-separates the decision of how good a project is in its income-generating potential from the decision of how to finance it. The actual terms of financing available for a particular project will not influence the evaluation. Instead, we will assume that the proposed project is the best Investment possible and that financing will then be sought for it at the best terms obtainable. This convention serves well whenever financing can be used for a range of projects or even versions of roughly the same project. The only case in which it does not hold well is the rather extreme case in which foreign financing is very narrowly tied to a particular project and will be lost if the project is not implemented. Then the analyst may be faced with the decision of implementing a lower-yielding project with foreign financing or choosing a higher-yielding alternative but losing the foreign loan.

"With" and "Without" Comparisons

Project analysis tries to identify and value the costs and benefits that will arise with the proposed project and to compare them with the situation as it would be without the project. The difference is the incremental net benefit arising from the project investment. This approach is not the same as comparing the situation "before" and "after" the project. The before-and-after comparison fails to account for changes in production that would occur without the project and thus leads to an erroneous statement of the benefit attributable to the project investment.

A change in output without the project can take place in two kinds of situations. The most common is when production in the area is already growing, if only slowly, and will probably continue to grow during the life of the project. The objective of the project is to increase growth by intensifying production. In Syria at the time the First Livestock Development Project was appraised, for example, production in the national sheep flock was projected to grow at about 1 percent a year without the project. The project was to increase and stabilize sheep production and the incomes of seminomadic flock owners and sheep fatteners by stabilising the availability of feed and improving veterinary services. With the project, national flock production was projected to grow at the rate of 3 percent a year. In this case, if the project analyst had simply compared the output before and after the project, he would have erroneously attributed the total increase in sheep production to the project investment. Actually, what can be attributed to the project investment is only the 2 percent incremental increase in production in excess of the 1 percent that would have occurred anyway.

A change in output can also occur without the project if production would actually fall in the absence of new Investment. In Guyana, on the north coast of South America, rice and sugarcane are produced on a strip of clay and silt soil edging the sea. The coast was subject to erosion from wave action. Under the Sea Defence Project, the government of Guyana has built seawalls to prevent the erosion. The benefit from this project, then, is not increased production but avoiding the loss of agricultural output and sites for housing. A simple before-and-after comparison would fail to identify this benefit.

In some cases, an Investment to avoid a loss might also lead to an increase in production, so that the total benefit would arise partly from the loss avoided and partly from increased production. In Pakistan, many areas are subject to progressive salinization as a result of heavy irrigation and the waterlogging that is in part attributable to seepage from irrigation canals. Capillary action brings the water to the surface where evaporation occurs, leaving the salt on the soil. If nothing is done to halt the process, crop production will fall. A project is proposed to line some of the canals, thus to reduce the seepage and permit better drainage between irrigations. The proposed project is expected to arrest salinization, to save for profitable use the irrigation water otherwise lost to seepage, and to help farmers increase their use of modern inputs. The combination of measures would not only avoid a loss but also lead to an increase in production. Again, a simple before-and-after comparison would fail to identify the benefit realized by avoiding the loss.

Of course, if no change in output is expected in the project area without the project, then the distinction between the before-and-after comparison and the with-and-without comparison is less crucial. In some projects the prospects for increasing production without new INVESTMENT are minimal. In the Kemubu Irrigation Project in northeastern Malaysia, a pump irrigation scheme was built that permitted farmers to produce a second rice crop during the dry season. Without the project, most of the area was used for grazing, and with the help of

residual moisture or small pumps some was used to produce tobacco and other cash crops. Production was not likely to increase because of the limited amount of water available. With the project now in operation, rice is grown in the dry season. Of course, the value of the second rice crop could not be taken as the total benefit from the project. From this value must be deducted the value forgone from the grazing and the production of cash crops. Only the incremental value could be attributed to the new INVESTMENT in pumps and canals.

Another instance where there may be no change in output without the project is the obvious one found in some settlement projects. Without the project there may be no economic use of the area at all. In the Alto Turi Land Settlement Project in northeastern Brazil, settlers established their holdings by clearing the forest, planting upland rice, and then establishing pasture for production of beef cattle. At the time the settlers took up their holdings the forest had not been economically exploited-nor was it likely to be, at least for many years, in the absence of the project. In this case, the output without the project would be the same as the output before the project.

Direct Transfer Payments

Some entries in financial accounts really represent shifts in claims to goods and services from one entity in the society to another and do not reflect changes in national income. These are the so-called direct transfer payments, which are much easier to identify if our definition of costs and benefits is kept in mind. In agricultural project analysis four kinds of direct transfer payments are common: taxes, subsidies, loans, and debt service (the payment of interest and repayment of principal).

Take taxes, for example. In financial analysis a tax payment is clearly a cost. When a farmer pays a tax, his net benefit is reduced. But the farmer's payment of tax does not reduce the national income. Rather, it transfers income from the farmer to the government so that this income can be used for social purposes presumed to be more important to the society than the increased individual consumption (or investment) had the farmer retained the amount of the tax. Because payment of tax does not reduce national income, it is not a cost from the standpoint of the society as a whole. Thus, in economic analysis we would not treat the payment of taxes as a cost in project accounts. Taxes remain a part of the overall benefit stream of the project that contributes to the increase in national income.

Of course, no matter what form a tax takes, it is still a transfer payment-whether a direct tax on income or an indirect tax such as a sales tax, an excise tax, or a tariff or duty on an imported input for production. But some caution is advisable here. Taxes that are treated as a direct transfer payment are those representing a diversion of net benefit to the society. Quite often, however, government charges for goods supplied or services rendered may be called taxes. Water rates, for example, may be considered a tax by the farmer, but from the standpoint of the society as a whole they are a payment by the farmer

to the irrigation authority in exchange for water supplied. Since, building the irrigation system reduces national income, the farmer's payment for the water is part of the cost of producing the crop, the same as any other payment for a production input. Other payments called taxes may also be payments for goods and services rendered rather than transfers to the government. A stevedoring charge at the port is not a tax but a payment for services and so would not be treated as a duty would be. Whether a tax should be treated as a transfer payment or as a payment for goods and services depends on whether the payment is a compensation for goods and services needed to carry out the project or merely a transfer, to be used for general social purposes, of some part of the benefit from the project to the society as a whole.

Subsidies are simply direct transfer payments that flow in the opposite direction from taxes. If a farmer is able to purchase fertilizer at a subsidized price, that will reduce his costs and thereby increase his net benefit, but the cost of the fertilizer in the use of the society's real resources remains the same. The resources needed to produce the fertilizer (or import it from abroad) reduce the national income available to the society. Hence, for economic analysis of a project we must enter the full cost of the fertilizer.

Again, it makes no difference what form the subsidy takes. One form is that which lowers the selling price of inputs below what otherwise would be their market price.

But a subsidy can also operate to increase the amount the farmer receives for what he sells in the market, as in the case of a direct subsidy paid by the government that is added to what the farmer receives in the market. A more common means to achieve the same result does not involve direct subsidy. The market price may be maintained at a level higher than it otherwise would be by, say, levying an import duty on competing imports or forbidding competing imports altogether.

Although it is not a direct subsidy, the difference between the higher controlled price set by such measures and the lower price for competing imports that would prevail without such measures does represent an indirect transfer from the consumer to the farmer.

Credit transactions are the other major form of direct transfer payment in agricultural projects. From the standpoint of the farmer, receipt of a loan increases the production resources he has available; payment of interest and repayment of principal reduce them. But from the stand-point of the economy, things look different.

Does the loan reduce the national income available? No, it merely transfers the control over resources from the lender to the borrower. Perhaps one farmer makes the loan to his neighbour. The lending farmer cannot use the money he lends to buy fertilizer, but the borrowing farmer can. The use of the fertilizer, of course, is a cost to the society because it uses up resources and thus reduces the national income. But the loan transaction does not itself reduce the national income; it is, rather, a direct transfer payment. In reverse, the same thing

happens when the farmer repays his loan. The farmer who borrowed cannot buy fertilizer with the money he uses to repay the loan his neighbour made, but his neighbour can. Thus, the repayment is also a direct transfer payment.

Some people find the concept of transfer payments easier to understand if it is stated in terms of real resource flows. Taking this approach in economic analysis, we see that a tax does not represent a real resource flow; it represents only the transfer of a claim to real resource flows. The same holds true for a direct subsidy that represents the transfer of a claim to real resources from, say, an urban consumer to a farmer. This line of reasoning also applies to credit transactions.

A loan represents the transfer of a claim to real resources from the lender to the borrower. When the borrower pays interest or repays the principal, he is transferring the claim to the real resources back to the lender-but neither the loan nor the repayment represents, in itself, use of the resources.

Costs of Agricultural Projects

In almost all project analyses, costs are easier to identify (and value) than benefits. In every instance of examining costs, we will be asking ourselves if the item reduces the net benefit of a farm or the net income of a firm (our objectives in financial analysis), or the national income (our objective in economic analysis).

Physical Goods

Rarely will physical goods used in an agricultural project be difficult to identify. For such goods as concrete for irrigation canals, fertilizer and pesticides for increasing production, or materials for the construction of homes in land settlement projects, it is not the identification that is difficult but the technical problems in planning and design associated with finding out how much will be needed and when.

Labour

Neither will the labour component of agricultural projects be difficult to identify. From the highly skilled project manager to the farmer maintaining his orchard while it is coming into production, the labour inputs raise less a question of what than of how much and when. Labour may, however, raise special valuation problems that call for the use of a shadow price. Confusion may also arise on occasion in valuing family labour.

Land

By the same reasoning, the land to be used for an agricultural project will not be difficult to identify. It generally is not difficult to determine where the land necessary for the project will be located and how much will be used. Yet problems may arise in valuing land because of the very special kind of market conditions that exist when land is transferred from one owner to another.

Contingency Allowances

In projects that involve a significant initial INVESTMENT in civil works, the construction costs are generally estimated on the initial assumption that there will be no modifications in design that would necessitate changes in the physical work; no exceptional conditions such as unanticipated geological formations; and no adverse phenomena such as floods, landslides, or unusually bad weather. In general, project cost estimates also assume that there will be no relative changes in domestic or international prices and no inflation during the investment period. It would clearly be unrealistic to rest project cost estimates only on these assumptions of perfect knowledge and complete price stability. Sound project planning requires that provision be made in advance for possible adverse changes in physical conditions or prices that would add to the baseline costs. Contingency allowances are thus included as a regular part of the project cost estimates.

Contingency allowances may be divided into those that provide for physical contingencies and those for price contingencies. In turn, price contingency allowances comprise two categories, those for relative changes in price and those for general inflation. Physical contingencies and price contingencies that provide for increases in relative costs underlie our expectation that physical changes and relative price changes are likely to occur, even though we cannot forecast with confidence just how their influence will be felt. The increase in the use of real goods and services represented by the physical contingency allowance is a real cost and will reduce the final goods and services available for other purposes; that is, it will reduce the national income and, hence, is a cost to the society. Similarly, a rise in the relative cost of an item implies that its productivity elsewhere in the society has increased; that is, its potential contribution to national income has risen. A greater value is forgone by using the item for our project; hence, there is a larger reduction in national income. Physical contingency allowances and price contingency allowances for relative changes in price, then, are expected-if unallocated-project costs, and they properly form part of the cost base when measures of project worth are calculated.

General inflation, however, poses a different problem. The future prices, in project analysis the most common means of dealing with inflation is to work in constant prices, on the assumption that all prices will be affected equally by any rise in the general price level. This permits valid comparisons among alternative projects. If inflation is expected to be significant, however, provision for its effects on project costs needs to be made in the project financing plan so that an adequate budget is obtained. Contingency allowances for inflation would not, however, be included among the costs in project accounts other than the financing plan.

Taxes

Recall that the payment of taxes, including duties and tariffs, is customarily treated as a cost in financial analysis but as a transfer payment in economic

analysis (since, such payment does not reduce the national income). The amount that would be deducted for taxes in the financial accounts remains in the economic accounts as part of the incremental net benefit and, thus, part of the new income generated by the project.

Debt Service

The same approach applies to debt service-the payment of interest and the repayment of capital. Both are treated as an outflow in financial analysis. In economic analysis, however, they are considered transfer payments and are omitted from the economic accounts.

Treatment of interest during construction can give rise to confusion. Lending institutions sometimes add the value of interest during construction to the principal of the loan and do not require any interest payment until the project begins to operate and its revenues are flowing. This process is known as "capitalising" interest. The amount added to the principal as a result of capitalising interest during construction is similar to an additional loan. Capitalising interest defers interest cost, but when the interest payments are actually due, they will, of course, be larger because the amount of the loan has been increased. From the standpoint of economic analysis, the treatment of interest during construction is clear. It is a direct transfer payment the same as any other interest payment, and it should be omitted from the economic accounts. Often interest during construction is simply added to the capital cost of the project. To obtain the economic value of the capital cost, the amount of the interest during construction must be subtracted from the capital cost and omitted from the economic account.

In economic analysis, debt service is treated as a transfer within the economy even if the project will actually be financed by a foreign loan and debt service will be paid abroad. This is because of the convention of assuming that all financing for a project will come from domestic sources and all returns from the project will go to domestic residents. This convention, as noted earlier, separates the decision of how good a project is from the decision of how to finance it. Hence, even if it were expected that a project would be financed, say, by a World Bank loan, the debt service on that loan would not appear as a cost in the economic accounts of the project analysis.

Sunk Costs

Sunk costs are those costs incurred in the past upon which a proposed new investment will be based. Such costs cannot be avoided, however poorly advised they may have been. When we analyze a proposed investment, we consider only future returns to future costs; expenditures in the past, or sunk costs, do not appear in our accounts.

In practice, if a considerable amount has already been spent on a project, the future returns to the future costs of completing the project would probably be quite attractive even if it is clear in retrospect that the project should never have

been begun. The ridiculous extreme is when only one dollar is needed to complete a project, even a rather poor one, and when no benefit can be realized until the project is completed. The "return" to that last dollar may well be extremely high, and it would be clearly worthwhile to spend it. But the argument that because much has already been spent on a project it therefore must be continued is not a valid criterion for decision. There are cases in which it would be preferable simply to stop a project midway or to draw it to an early conclusion so that future resources might be freed for higher-yielding alternatives.

For evaluating past Investment decisions, it is often desirable to do an economic and financial analysis of a completed project. Here, of course, the analyst would compare the return from all expenditures over the past life of the project with all returns. But this kind of analysis is useful only for determining the yield of past projects in the hope that judgements about future projects may be better informed. It does not help us decide what to do in the present. Money spent in the past is already gone; we do not have as one of our alternatives not to implement a completed project.

AGRICULTURAL ENGINEERING

Agricultural engineering is the engineering discipline that applies engineering science and technology to agricultural production and processing. Agricultural engineering combines the disciplines of animal biology, plant biology, and mechanical, civil, electrical and chemical engineering principles with a knowledge of agricultural principles. It utilizes the knowledge of engineering for making agricultural machinery.

SUBFIELDS

Some of the specialties of agricultural engineers include:

- The design of agricultural machinery, equipment, and agricultural structures
- Crop production, including seeding, tillage, irrigation and the conservation of soil and water
- Animal production, including the care and processing of poultry and fish and dairy management
- The processing of food and other agricultural and biorenewable products,and food engineering.
- Bioresource engineering, which uses machines on the molecular level to help the environment.

HISTORY

The first curriculum in Agricultural Engineering was established at Iowa State University by J. B. Davidson in 1905. The American Society of Agricultural Engineers, now known as the American Society of Agricultural and Biological Engineers, was founded in 1907.

AGRICULTURAL ENGINEERS

Agricultural Engineers may perform tasks as planning, supervising and managing the building of dairy effluent schemes, irrigation, drainage, flood and water control systems, perform environmental impact assessments, agricultural product processing and interpret research results and implement relevant practices. A large percentage of agricultural engineers work in academia or for government agencies such as the United States Department of Agriculture or state agricultural extension services. Some are consultants, employed by private engineering firms, while others work in industry, for manufacturers of agricultural machinery, equipment, processing technology, and structures for housing livestock and storing crops. Agricultural engineers work in production, sales, management, research and development, or applied science.

ECONOMIC DEVELOPMENT

Economic development, the process whereby simple, low-income national economies are transformed into modern industrial economies. Although the term is sometimes used as a synonym for economic growth, generally it is employed to describe a change in a country's economy involving qualitative as well as quantitative improvements.

The theory of economic development—how primitive and poor economies can evolve into sophisticated and relatively prosperous ones—is of critical importance to underdeveloped countries, and it is usually in this context that the issues of economic development are discussed.

Economic development first became a major concern after World War II. As the era of European colonialism ended, many former colonies and other countries with low living standards came to be termed underdeveloped countries, to contrast their economies with those of the developed countries, which were understood to be Canada, the United States, those of western Europe, most eastern European countries, the then Soviet Union, Japan, South Africa, Australia, and New Zealand. As living standards in most poor countries began to rise in subsequent decades, they were renamed the developing countries.

There is no universally accepted definition of what a developing country is; neither is there one of what constitutes the process of economic development. Developing countries are usually categorized by a per capita income criterion, and economic development is usually thought to occur as per capita incomes rise. A country's per capita income (which is almost synonymous with per capita output) is the best available measure of the value of the goods and services available, per person, to the society per year. Although there are a number of problems of measurement of both the level of per capita income and its rate of growth, these two indicators are the best available to provide estimates of the level of economic well-being within a country and of its economic growth.

It is well to consider some of the statistical and conceptual difficulties of using the conventional criterion of underdevelopment before analysing the causes

of underdevelopment. The statistical difficulties are well known. To begin with, there are the awkward borderline cases. Even if analysis is confined to the underdeveloped and developing countries in Asia, Africa, and Latin America, there are rich oil countries that have per capita incomes well above the rest but that are otherwise underdeveloped in their general economic characteristics. Second, there are a number of technical difficulties that make the per capita incomes of many underdeveloped countries (expressed in terms of an international currency, such as the U.S., dollar) a very crude measure of their per capita real income. These difficulties include the defectiveness of the basic national income and population statistics, the inappropriateness of the official exchange rates at which the national incomes in terms of the respective domestic currencies are converted into the common denominator of the U.S., dollar, and the problems of estimating the value of the non-cash components of real incomes in the underdeveloped countries. Finally, there are conceptual problems in interpreting the meaning of the international differences in the per capita income levels.

Although the difficulties with income measures are well established, measures of per capita income correlate reasonably well with other measures of economic well-being, such as life expectancy, infant mortality rates, and literacy rates. Other indicators, such as nutritional status and the per capita availability of hospital beds, physicians, and teachers, are also closely related to per capita income levels. While a difference of, say, 10 percent in per capita incomes between two countries would not be regarded as necessarily indicative of a difference in living standards between them, actual observed differences are of a much larger magnitude. India's per capita income, for example, was estimated at $270 in 1985. In contrast, Brazil's was estimated to be $1,640, and Italy's was $6,520. While economists have cited a number of reasons why the implication that Italy's living standard was 24 times greater than India's might be biased upward, no one would doubt that the Italian living standard was significantly higher than that of Brazil, which in turn was higher than India's by a wide margin.

The interpretation of a low per capita income level as an index of poverty in a material sense may be accepted with two qualifications. First, the level of material living depends not on per capita income as such but on per capita consumption. The two may differ considerably when a large proportion of the national income is diverted from consumption to other purposes; for example, through a policy of forced saving. Second, the poverty of a country is more faithfully reflected by the representative standard of living of the great mass of its people. This may be well below the simple arithmetic average of per capita income or consumption when national income is very unequally distributed and there is a wide gap in the standard of living between the rich and the poor.

The usual definition of a developing country is that adopted by the World Bank: "low-income developing countries" in 1985 were defined as those with per capita incomes below $400; "middle-income developing countries" were

defined as those with per capita incomes between $400 and $4,000. To be sure, countries with the same per capita income may not otherwise resemble one another: some countries may derive much of their incomes from capital-intensive enterprises, such as the extraction of oil, whereas other countries with similar per capita incomes may have more numerous and more productive uses of their labour force to compensate for the absence of wealth in resources. Kuwait, for example, was estimated to have a per capita income of $14,480 in 1985, but 50 percent of that income originated from oil. In most regards, Kuwait's economic and social indicators fell well below what other countries with similar per capita incomes had achieved. Centrally planned economies are also generally regarded as a separate class, although China and North Korea are universally considered developing countries. A major difficulty is that prices serve less as indicators of relative scarcity in centrally planned economies and hence, are less reliable as indicators of the per capita availability of goods and services than in market-oriented economies.

Estimates of percentage increases in real per capita income are subject to a somewhat smaller margin of error than are estimates of income levels. While year-to-year changes in per capita income are heavily influenced by such factors as weather (which affects agricultural output, a large component of income in most developing countries), a country's terms of trade, and other factors, growth rates of per capita income over periods of a decade or more are strongly indicative of the rate at which average economic well-being has increased in a country.

ECONOMIC GROWTH AND AGRICULTURE

Economic growth is an increase in per capita income. Agricultural growth is necessary for economic growth. Nearly every high-income country has a highly productive agricultural sector, and agricultural growth is critical in the process of economic growth. Among other things, economic growth involves the production of more goods and services, and a much wider range of goods and services, than before.

Economic growth agriculture's share of the economy declines with economic growth. As per capita income increases, percentage of labour force in agricultural production declines. Agriculture's share of Gross Domestic Product (GDP) also declines. GDP is a widely used measure of national income. Across states at a given point in time, or at a single country over time, the relationship between per capita income and agriculture's percentage of the labour force and GDP looks. Agriculture tends to decline more quickly as a percentage of GDP than as a percentage of the labour force.

POLICIES TO MARKET ACCESS

Poor infrastructure, limited resource base, lack of information, lack of or inadequate support institutions and poor policies affect the livelihoods of small-holder farmers. Other barriers include market standards, limited information, requirements for large initial capital investments, limited product differentiation,

and handicapping policies. While almost any of the farm produce sells at the village level market, consumers discriminate against produce that is comparatively inferior, hence farmers have, over time, adapted to selling only that which will sell.

POLICIES RELATED TO GLOBALIZATION

The effect of globalization on any country depends on that country's level of economic development, structures in place during the implementation stage, flexibility of its economy. Globalization has three dimensions: multiplication and intensification of economic, political, social and cultural linkages among people, organizations and states at the world level; the tendency towards the universal application of economic, institutional, legal, political and cultural practices; and the emergence of significant spill-over from the behaviour of individuals and societies to the rest of the world. Due to the interrelation of the various dimensions, policies made in one country are bound to have effects on another. With globalization, comes liberalization of markets. The food security threat caused by liberalization is due to dumping of heavily subsidized produce in developing states and pre-mature exposure of upcoming industries to genuine competition from producers in developing and developed states. In addition, most profits are repatriated by transnational companies reducing the potential for poverty reduction to direct employment alone. In most cases, the pay is low because the national policies do not protect the small-holder.

HANDICAPPING POLICIES

Poor policies have greatly affected the food security in India. This is mainly due to uneven development within states based on political grounds. Certain regions are developed preferentially for political reasons at the expense of others. The problem arises when the focus on policies, structures and institutions is put above that of the people themselves. When policies are not inclusive in their design they tend to handicap the exempted lot by providing barriers.

One such way in which this may take place is uneven development within states where certain regions are preferentially developed for political reasons at the expense of others. Polices that promote monopolistic competition for the large-scale industries hurt the cottage and small industry. When we fail to provide safety nets for vulnerable groups, we doom them to destruction.

CHANGE PROCESS AFFECTING AGRICULTURAL PRODUCTION AND LIVELIHOODS

The lack of transparent, timely and reliable crop and livestock marketing information is seen by many as one of the greatest challenges to the development of the agriculture industry in East India. Without access to information about agricultural products prices at different regional markets, farmers are unable to identify which points-of-sale offer the best prices for their agri-products. For

example, in Mbirikani, Kajiado County, Kenya, Maasai pastoralists once relied on middlemen to gain market information. However, a marketing information system has been developed by the Livestock Information Network and Knowledge System (LINKS) to support livestock producers and traders. Now the farmers use mobile phones to ask for livestock prices in Emali, Mombasa and Nairobi, and this knowledge significantly improves their bargaining power with livestock traders.

INCREASING MARKETING OPPORTUNITIES

Given the high dependency of pastoralists' livelihoods on the sale of livestock and livestock products, LINKS designed and implemented an Information Communication Technology (ICT) infrastructure to collate data on livestock sales and prices from a network of different markets for dissemination using SMS messages. This has been a success and has been used to develop a National Livestock Marketing Information System (NLMIS) in Kenya. NLMIS relies on a network of County livestock marketing officers and data monitors to transmit data between markets and the database.

The field officers are also trained to download, analyse, and summarize the information to transmit to pastoralists and traders, including information about prices and volumes of cattle, camels, sheep and goats at livestock markets. The market information is also made available online, and may be downloaded for printing and sharing with livestock communities with no internet access. The information is also shared by e-mail, posted on billboards at market places and can be requested through SMS.

Vibrant Markets

This change in communication has also transformed undeveloped markets in other value chains in agriculture. The availability of marketing information through SMS and information boards, competition among agri-products traders has increased, and this has improved and stabilized prices paid to farmers. Women have also benefited by providing animal health services, fodder and small loans to the traders. Empowering producers to negotiate for better prices has equipped market agencies and communities with appropriate tools and information to plan for and respond to changing incomes, and consequently has improved livelihoods.

Policy

The success of the marketing system has equipped planners and policymakers with the tools to track price trends, which are helping them, improve decision-making and devise appropriate interventions to mitigate the effects of deteriorating terms.

IT FOR AGRICULTURAL PRODUCTION AND MARKETING

IT is playing an important and vital role in agricultural production and marketing. IT allows farmers to save time on order and delivery and getting feedback. In the existing competition, there is a need to rapidly attract new

customers as well as retain existing customers. In order to take the real status of agricultural production and marketing, there is an urgent need to develop the following items:

- *Farmers' Crop Database must be Managed*: The database includes the kinds of crops, the size of cultivated area, time of harvest and yield. Farmers or the extension personnel transmit those data via the Internet to database server. Further, information provides the farmer with an important instrument for decision making and taking action.
- *Crops Information Service System should be Created:* This system analyses the crop data to create some statistical tables. Farmers can access these statistical data by browsing the homepage and make their production plan. Changes within the structure of agriculture will probably have an impact on the selection and types of acquisition of software and other integrated systems made by the farmers.
- *Production Techniques and Information Enquiry System should be Created*: This system integrates the production techniques and information, which are developed by experimental agricultural institutes and agricultural improvement stations. Farmers can find out relevant production information through this enquiry service system.
- *Production Equipment's Enquiry Service System should be Created*: This system gathers information from the companies of seeds and crop production equipment to build the production equipment's enquiry service system. At the same time, allow relevant companies to access this system and enter their own data. Therefore, farmers can order the needed items through this system.

Information is critical to the social and economic activities that comprise the development process. Development economy has witnessed for revolutions in agricultural, bio-technological, industrial and information technology. Good communication system and information system reinforce commitments to sustainable productivity. The Government of India is giving more thrust on agriculture, food and information technology sectors towards achievement of economic reforms to achieve high growth rate in production in the years to come.

The National Agriculture Policy announced addresses the challenges arising out of economic liberalization and globalization. It seeks to actualize the vast untapped growth potential of Indian agriculture, strengthen rural infrastructure to support faster agricultural development, promote value addition and secure a fair standard of living for farmers and farm workers. The National Agriculture Policy lays emphasis on the use of Information Technology for achieving a more rapid development of agriculture in India.

In pursuance thereof, the Department of Agriculture and Cooperation (DAC) has formulated information technology (IT) Vision 2020. This vision inter alia envisages that:

- Information relating to agriculture sector would be available to the ultimate users—the farmers—for optimizing their productivity and income;

- Extension and advisory services making use of information technology would be available to the farmers on round the clock basis;
- The tools for information technology will provide networking of agriculture sector not only in the country but also globally and the Union and State Government Departments will have reservoirs of data base; and
- The long term vision on "Information Technology in Agriculture Sector" is to bring farmers, researchers, scientists and administrators together by establishing "Agriculture on-line" through exchange of ideas/information.

In future, information technology will reduce the cost and time of information system. IT will bring new information services for agricultural development that will enable the farmers to have much greater control over the information channels.

AGRICULTURAL IMPLICATIONS OF IT

Information technology provides answers to a number of questions to the farmers. For example, what are the benefits of more irrigation? Is it cost-effective to apply additional chemicals? When is the best time to sell crops or buy inputs? With improved record-keeping, more detailed cost analysis and more sophisticated marketing strategies, farmers are making better decisions and earning higher profits.

The Internet is increasing communication and business opportunities within the agricultural community, which previously operated in the relative isolation of rural areas. Farmers, agricultural researchers, cooperatives, suppliers and buyers use the Internet to exchange ideas and information, as well as to conduct business with each other. Machinery, seed chemicals and other types of agricultural products can be purchased and sold online. People can search for jobs and employees. It is to be noted that, the farmer is in no position to use IT directly.

The literacy levels, language barrier as most of the application software are predominantly in English, cost of computers, poor communication infrastructure make it impossible for individual farmers, particularly small farmers to directly adopt IT. This calls for institutional effort to harness to create the necessary IT based services to farmers. But in India, one prominent problem is that most of the farmers own small holdings, this seems to be difficult. In this situation, it may be made possible by adopting the corporate farming system, which is the need of the hour with advent of new agricultural policy.

By taking up corporate farming, a group of farmers can install a computer and any educated young man from that group can undergo training of how to browse the Internet. He can provide the farmers current commodity, analysis reports on world markets and trade for different commodities. Food market overviews provide valuable information about some of the most important export market. IT can help to provide the information on the likely price distribution of key commodities

over the coming years. Such information helps farmers and traders make decisions on when and in what ways to market their grain. Whether, to sell at harvest or store on-farm in anticipation of higher later in the season. When combined with enterprise budget data, the information can also be used in deciding which crops to produce in the coming season. In order to encourage farmers to obtain best possible price, information on various agricultural output markets is also being provided. The objective of this activity is to provide status of price at different markets to facilitate farmer to move his produce to the market where he can expect better price. The entire exercise will not be useful unless necessary arrangements are made to ensure that the farmers utilize this facility. The contribution of information technology in bringing down costs, increasing efficiency and improving productivity and thereby contributing to the bottom line needs no special emphasis.

In the fertilizer marketing context, IT can play a major role in efficient sales operations, checking the marketing costs, safeguarding market share and providing efficient customer services. A well conceived IT set up can endow decision makers at all levels with better reflexes to effectively respond to market conditions. IT helps producers monitor and respond to weather variability on a day-to-day basis.

Solar-powered weather stations in the field can be hooked up to a farmer's computer to relay information about current air and soil temperature, precipitation, relative humidity, leaf wetness, soil moisture, day length, wind speed and solar radiation. Producers use the Internet to monitor prices quickly and as often as they like. Farmers from around the world can exchange ideas, post questions and get answers about specific topics. Thus, it is said that the importance of information technology in the field of agriculture is emerging.

2

Agricultural Productivity

Productivity is the efficiency of production of goods or services expressed by some measure. Measurements of productivity are often expressed as a ratio of an aggregate output to a single input or an aggregate input used in a production process, *i.e.*, output per unit of input, typically over a specific period of time. The most common example is the (aggregate) labour productivity measure, *e.g.*, such as GDP per worker. There are many different definitions of productivity (including those that are not defined as ratios of output to input) and the choice among them depends on the purpose of the productivity measurement and/or data availability. The key source of difference between various productivity measures is also usually related (directly or indirectly) to how the outputs and the inputs are aggregated into scalars to obtain such a ratio-type measure of productivity. Types of production are mass production and batch production.

Productivity is a crucial factor in the production performance of firms and nations. Increasing national productivity can raise living standards because more real income improves people's ability to purchase goods and services, enjoy leisure, improve housing and education and contribute to social and environmental programmes. Productivity growth can also help businesses to be more profitable.

USE

A recent source revealed that the average overall use of IMF credit per decade increased, in real terms, by 21% between the 1970s and 1980s, and increased again by just over 22% from the 1980s to the 1991–2005 period. Another study has suggested that since 1950 the continent of Africa alone has received $300 billion from the IMF, the World Bank, and affiliate institutions.

A study by Bumba Mukherjee found that developing democratic countries benefit more from IMF programmes than developing autocratic countries because policy-making, and the process of deciding where loaned money is used, is more transparent within a democracy. One study done by Randall Stone found that although earlier studies found little impact of IMF programmes on balance of payments, more recent studies using more sophisticated methods and larger samples "usually found IMF programmes improved the balance of payments".

Exceptional Access Framework – Sovereign Debt

The Exceptional Access Framework was created in 2003 when John B. Taylor was Under Secretary of the US Treasury for International Affairs. The new Framework became fully operational in February 2003 and it was applied in the subsequent decisions on Argentina and Brazil. Its purpose was to place some sensible rules and limits on the way the IMF makes loans to support governments with debt problem—especially in emerging markets—and thereby move away from the bailout mentality of the 1990s. Such a reform was essential for ending the crisis atmosphere that then existed in emerging markets. The reform was closely related to and put in place nearly simultaneously with the actions of several emerging market countries to place collective action clauses in their bond contracts.

In 2010, the framework was abandoned so the IMF could make loans to Greece in an unsustainable and political situation.

The topic of sovereign debt restructuring was taken up by IMF staff in April 2013 for the first time since 2005, in a report entitled "Sovereign Debt Restructuring: Recent Developments and Implications for the Fund's Legal and Policy Framework". The paper, which was discussed by the board on 20 May, summarised the recent experiences in Greece, St Kitts and Nevis, Belize and Jamaica. An explanatory interview with Deputy Director Hugh Bredenkamp was published a few days later, as was a deconstruction by Matina Stevis of the *Wall Street Journal*.

The staff was directed to formulate an updated policy, which was accomplished on 22 May 2014 with a report entitled "The Fund's Lending Framework and Sovereign Debt: Preliminary Considerations", and taken up by the executive board on 13 June. The staff proposed that "in circumstances where a (Sovereign) member has lost market access and debt is considered sustainable ... the IMF would be able to provide Exceptional Access on the basis of a debt operation that involves an extension of maturities", which was labeled a "reprofiling operation". These reprofiling operations would "generally be less costly to the debtor and creditors—and thus to the system overall—relative to either an upfront debt reduction operation or a bail-out that is followed by debt reduction ... (and) would be envisaged only when both (a) a member has lost market access and (b) debt is assessed to be sustainable, but not with high probability ... Creditors will only agree if they understand that such an

amendment is necessary to avoid a worse outcome: namely, a default and/or an operation involving debt reduction ... Collective action clauses, which now exist in most—but not all—bonds would be relied upon to address collective action problems."

IMPACT

According to a 2002 study by Randall W. Stone, the academic literature on the IMF shows "no consensus on the long-term effects of IMF programmes on growth".

Some research has found that IMF loans can reduce the chance of a future banking crisis, while other studies have found that they can increase the risk of political crises. IMF programmes can reduce the effects of a currency crisis.

Some research has found that IMF programmes are less effective in countries which possess a developed-country patron (be it by foreign aid, membership of postcolonial institutions or UN voting patterns), seemingly due to this patron allowing countries to flaunt IMF programme rules as these rules are not consistently enforced. Some research has found that IMF loans reduce economic growth due to creating an economic moral hazard, reducing public investment, reducing incentives to create a robust domestic policies and reducing private investor confidence. Other research has indicated that IMF loans can have a positive impact on economic growth and that their effects are highly nuanced.

CRITICISMS

Overseas Development Institute (ODI) research undertaken in 1980 included criticisms of the IMF which support the analysis that it is a pillar of what activist Titus Alexander calls global apartheid.

- Developed countries were seen to have a more dominant role and control over less developed countries (LDCs).
- The Fund worked on the incorrect assumption that all payments disequilibria were caused domestically. The Group of 24 (G-24), on behalf of LDC members, and the United Nations Conference on Trade and Development (UNCTAD) complained that the IMF did not distinguish sufficiently between disequilibria with predominantly external as opposed to internal causes. This criticism was voiced in the aftermath of the 1973 oil crisis. Then LDCs found themselves with payment deficits due to adverse changes in their terms of trade, with the Fund prescribing stabilization programmes similar to those suggested for deficits caused by government over-spending. Faced with long-term, externally generated disequilibria, the G-24 argued for more time for LDCs to adjust their economies.
- Some IMF policies may be anti-developmental; the report said that deflationary effects of IMF programmes quickly led to losses of output and employment in economies where incomes were low and unemployment was high. Moreover, the burden of the deflation is disproportionately borne by the poor.

- The IMF's initial policies were based in theory and influenced by differing opinions and departmental rivalries. Critics suggest that its intentions to implement these policies in countries with widely varying economic circumstances were misinformed and lacked economic rationale.

ODI conclusions were that the IMF's very nature of promoting market-oriented approaches attracted unavoidable criticism. On the other hand, the IMF could serve as a scapegoat while allowing governments to blame international bankers. The ODI conceded that the IMF was insensitive to political aspirations of LDCs while its policy conditions were inflexible.

Argentina, which had been considered by the IMF to be a model country in its compliance to policy proposals by the Bretton Woods institutions, experienced a catastrophic economic crisis in 2001, which some believe to have been caused by IMF-induced budget restrictions—which undercut the government's ability to sustain national infrastructure even in crucial areas such as health, education, and security—and privatisation of strategically vital national resources. Others attribute the crisis to Argentina's misdesigned fiscal federalism, which caused subnational spending to increase rapidly. The crisis added to widespread hatred of this institution in Argentina and other South American countries, with many blaming the IMF for the region's economic problems. The current—as of early 2006—trend towards moderate left-wing governments in the region and a growing concern with the development of a regional economic policy largely independent of big business pressures has been ascribed to this crisis.

In 2006, a senior ActionAid policy analyst Akanksha Marphatia stated that IMF policies in Africa undermine any possibility of meeting the Millennium Development Goals (MDGs) due to imposed restrictions that prevent spending on important sectors, such as education and health.

In an interview (2008-05-19), the former Romanian Prime Minister Cãlin Popescu-Tãriceanu claimed that "Since 2005, IMF is constantly making mistakes when it appreciates the country's economic performances". Former Tanzanian President Julius Nyerere, who claimed that debt-ridden African states were ceding sovereignty to the IMF and the World Bank, famously asked, "Who elected the IMF to be the ministry of finance for every country in the world?"

Former chief economist of IMF and former Reserve Bank of India (RBI) Governor Raghuram Rajan who predicted the Financial crisis of 2007–08 criticised the IMF for remaining a sideline player to the developed world. He criticised the IMF for praising the monetary policies of the US, which he believed were wreaking havoc in emerging markets. He had been critical of the ultra-loose money policies of the Western nations and IMF.

Countries such as Zambia have not received proper aid with long-lasting effects, leading to concern from economists. Since 2005, Zambia (as well as 29 other African countries) did receive debt write-offs, which helped with the country's medical and education funds. However, Zambia returned to a debt of over half its GDP in less than a decade. American economist William Easterly,

sceptical of the IMF's methods, had initially warned that "debt relief would simply encourage more reckless borrowing by crooked governments unless it was accompanied by reforms to speed up economic growth and improve governance," according to *The Economist*.

Conditionality

The IMF has been criticised for being "out of touch" with local economic conditions, cultures, and environments in the countries they are requiring policy reform. The economic advice the IMF gives might not always take into consideration the difference between what spending means on paper and how it is felt by citizens. Countries charge that with excessive conditionality, they do not "own" the programmes and the links are broken between a recipient country's people, its government, and the goals being pursued by the IMF.

Jeffrey Sachs argues that the IMF's "usual prescription is 'budgetary belt tightening to countries who are much too poor to own belts'". Sachs wrote that the IMF's role as a generalist institution specialising in macroeconomic issues needs reform. Conditionality has also been criticised because a country can pledge collateral of "acceptable assets" to obtain waivers—if one assumes that all countries are able to provide "acceptable collateral".

One view is that conditionality undermines domestic political institutions. The recipient governments are sacrificing policy autonomy in exchange for funds, which can lead to public resentment of the local leadership for accepting and enforcing the IMF conditions. Political instability can result from more leadership turnover as political leaders are replaced in electoral backlashes. IMF conditions are often criticised for reducing government services, thus increasing unemployment.

Another criticism is that IMF programmes are only designed to address poor governance, excessive government spending, excessive government intervention in markets, and too much state ownership. This assumes that this narrow range of issues represents the only possible problems; everything is standardised and differing contexts are ignored. A country may also be compelled to accept conditions it would not normally accept had they not been in a financial crisis in need of assistance.

On top of that, regardless of what methodologies and data sets used, it comes to same the conclusion of exacerbating income inequality. With Gini coefficient, it became clear that countries with IMF programmes face increased income inequality.

It is claimed that conditionalities retard social stability and hence inhibit the stated goals of the IMF, while Structural Adjustment Programmes lead to an increase in poverty in recipient countries. The IMF sometimes advocates "austerity programmes", cutting public spending and increasing taxes even when the economy is weak, to bring budgets closer to a balance, thus reducing budget deficits. Countries are often advised to lower their corporate tax rate. In *Globalization and Its Discontents*, Joseph E. Stiglitz, former chief economist

and senior vice-president at the World Bank, criticises these policies. He argues that by converting to a more monetarist approach, the purpose of the fund is no longer valid, as it was designed to provide funds for countries to carry out Keynesian reflations, and that the IMF "was not participating in a conspiracy, but it was reflecting the interests and ideology of the Western financial community."

Stiglitz concludes, "Modern high-tech warfare is designed to remove physical contact: dropping bombs from 50,000 feet ensures that one does not 'feel' what one does. Modern economic management is similar: from one's luxury hotel, one can callously impose policies about which one would think twice if one knew the people whose lives one was destroying."

The researchers Eric Toussaint and Damien Millet argue that the IMF's policies amount to a new form of colonization that does not need a military presence:

"Following the exigencies of the governments of the richest companies, the IMF, permitted countries in crisis to borrow in order to avoid default on their repayments. Caught in the debt's downward spiral, developing countries soon had no other recourse than to take on new debt in order to repay the old debt. Before providing them with new loans, at higher interest rates, future leaders asked the IMF, to intervene with the guarantee of ulterior reimbursement, asking for a signed agreement with the said countries. The IMF thus agreed to restart the flow of the 'finance pump' on condition that the concerned countries first use this money to reimburse banks and other private lenders, while restructuring their economy at the IMF's discretion: these were the famous conditionalities, detailed in the Structural Adjustment Programmes. The IMF and its ultra-liberal experts took control of the borrowing countries' economic policies. A new form of colonization was thus instituted. It was not even necessary to establish an administrative or military presence; the debt alone maintained this new form of submission."

International politics play an important role in IMF decision making. The clout of member states is roughly proportional to its contribution to IMF finances. The United States has the greatest number of votes and therefore wields the most influence. Domestic politics often come into play, with politicians in developing countries using conditionality to gain leverage over the opposition to influence policy.

Reform

Function and Policies

The IMF is only one of many international organisations, and it is a generalist institution that deals only with macroeconomic issues; its core areas of concern in developing countries are very narrow. One proposed reform is a movement towards close partnership with other specialist agencies such as UNICEF, the Food and Agriculture Organization (FAO), and the United Nations Development Programme (UNDP).

Jeffrey Sachs argues in *The End of Poverty* that the IMF and the World Bank have "the brightest economists and the lead in advising poor countries on how to break out of poverty, but the problem is development economics". Development economics needs the reform, not the IMF. He also notes that IMF loan conditions should be paired with other reforms—*e.g.*, trade reform in developed nations, debt cancellation, and increased financial assistance for investments in basic infrastructure. IMF loan conditions cannot stand alone and produce change; they need to be partnered with other reforms or other conditions as applicable.

US Influence and Voting Reform

The scholarly consensus is that IMF decision-making is not simply technocratic, but also guided by political and economic concerns. The United States is the IMF's most powerful member, and its influence reaches even into decision-making concerning individual loan agreements. The United States has historically been openly opposed to losing what Treasury Secretary Jacob Lew described in 2015 as its "leadership role" at the IMF, and the United States' "ability to shape international norms and practices".

Emerging markets were not well-represented for most of the IMF's history: Despite being the most populous country, China's vote share was the sixth largest; Brazil's vote share was smaller than Belgium's. Reforms to give more powers to emerging economies were agreed by the G20 in 2010. The reforms could not pass, however, until they were ratified by the US Congress, since 85% of the Fund's voting power was required for the reforms to take effect, and the Americans held more than 16% of voting power at the time. After repeated criticism, the United States finally ratified the voting reforms at the end of 2015. The OECD countries maintained their overwhelming majority of voting share, and the United States in particular retained its share at over 16%.

The criticism of the American-and-European dominated IMF has led to what some consider 'disenfranchising the world' from the governance of the IMF. Raúl Prebisch, the founding secretary-general of the UN Conference on Trade and Development (UNCTAD), wrote that one of "the conspicuous deficiencies of the general economic theory, from the point of view of the periphery, is its false sense of universality."

Support of Dictatorships

The role of the Bretton Woods institutions has been controversial since the late Cold War, because of claims that the IMF policy makers supported military dictatorships friendly to American and European corporations, but also other anti-communist and Communist regimes (such as Mobutu's Zaire and Ceauˆescu's Romania, respectively). Critics also claim that the IMF is generally apathetic or hostile to human rights, and labour rights. The controversy has helped spark the anti-globalization movement.

An example of IMF's support for a dictatorship was its ongoing support for Mobutu's rule in Zaire, although its own envoy, Erwin Blumenthal, provided a sobering report about the entrenched corruption and embezzlement and the inability of the country to pay back any loans.

Arguments in favour of the IMF say that economic stability is a precursor to democracy; however, critics highlight various examples in which democratised countries fell after receiving IMF loans.

A 2017 study found no evidence of IMF lending programmes undermining democracy in borrowing countries. To the contrary, it found "evidence for modest but definitively positive conditional differences in the democracy scores of participating and non-participating countries."

On 28 June 2021 the IMF approved a US$1 billion loan to the Ugandan government despite protests from Ugandans who protested in Washington, London and South-Africa.

Impact on Access to Food

A number of civil society organisations have criticised the IMF's policies for their impact on access to food, particularly in developing countries. In October 2008, former United States president Bill Clinton delivered a speech to the United Nations on World Food Day, criticising the World Bank and IMF for their policies on food and agriculture:

> *We need the World Bank, the IMF, all the big foundations, and all the governments to admit that, for 30 years, we all blew it, including me when I was president. We were wrong to believe that food was like some other product in international trade, and we all have to go back to a more responsible and sustainable form of agriculture.*
>
> *—Former U.S., president Bill Clinton, Speech at United Nations World Food Day, October 16, 2008*

The FPIF remarked that there is a recurring pattern: "the destabilization of peasant producers by a one-two punch of IMF-World Bank structural adjustment programmes that gutted government investment in the countryside followed by the massive influx of subsidized U.S., and European Union agricultural imports after the WTO's Agreement on Agriculture pried open markets."

Impact on Public Health

A 2009 study concluded that the strict conditions resulted in thousands of deaths in Eastern Europe by tuberculosis as public health care had to be weakened. In the 21 countries to which the IMF had given loans, tuberculosis deaths rose by 16.6%. A 2017 systematic review on studies conducted on the impact that Structural adjustment programmes have on child and maternal health found that these programmes have a detrimental effect on maternal and child health among other adverse effects. In 2009, a book by Rick Rowden titled *The Deadly Ideas of Neoliberalism: How the IMF has Undermined Public Health*

and the Fight Against AIDS, claimed that the IMF's monetarist approach towards prioritising price stability (low inflation) and fiscal restraint (low budget deficits) was unnecessarily restrictive and has prevented developing countries from scaling up long-term investment in public health infrastructure. The book claimed the consequences have been chronically underfunded public health systems, leading to demoralising working conditions that have fuelled a "brain drain" of medical personnel, all of which has undermined public health and the fight against HIV/AIDS in developing countries.

In 2016, the IMF's research department published a report titled "Neoliberalism: Oversold?" which, while praising some aspects of the "neoliberal agenda," claims that the organisation has been "overselling" fiscal austerity policies and financial deregulation, which they claim has exacerbated both financial crises and economic inequality around the world.

Impact on Environment

IMF policies have been repeatedly criticised for making it difficult for indebted countries to say no to environmentally harmful projects that nevertheless generate revenues such as oil, coal, and forest-destroying lumber and agriculture projects. Ecuador, for example, had to defy IMF advice repeatedly to pursue the protection of its rainforests, though paradoxically this need was cited in the IMF argument to provide support to Ecuador. The IMF acknowledged this paradox in the 2010 report that proposed the IMF Green Fund, a mechanism to issue special drawing rights directly to pay for climate harm prevention and potentially other ecological protection as pursued generally by other environmental finance.

While the response to these moves was generally positive possibly because ecological protection and energy and infrastructure transformation are more politically neutral than pressures to change social policy, some experts voiced concern that the IMF was not representative, and that the IMF proposals to generate only US$200 billion a year by 2020 with the SDRs as seed funds, did not go far enough to undo the general incentive to pursue destructive projects inherent in the world commodity trading and banking systems—criticisms often levelled at the World Trade Organization and large global banking institutions.

In the context of the European debt crisis, some observers noted that Spain and California, two troubled economies within respectively the European Union and the United States, and also Germany, the primary and politically most fragile supporter of a euro currency bailout would benefit from IMF recognition of their leadership in green technology, and directly from Green Fund-generated demand for their exports, which could also improve their credit ratings.

IMF AND GLOBALIZATION

Globalization encompasses three institutions: global financial markets and transnational companies, national governments linked to each other in economic

and military alliances led by the United States, and rising "global governments" such as World Trade Organization (WTO), IMF, and World Bank. Charles Derber argues in his book *People Before Profit,* "These interacting institutions create a new global power system where sovereignty is globalized, taking power and constitutional authority away from nations and giving it to global markets and international bodies".

Titus Alexander argues that this system institutionalises global inequality between western countries and the Majority World in a form of global apartheid, in which the IMF is a key pillar.

The establishment of globalised economic institutions has been both a symptom of and a stimulus for globalisation. The development of the World Bank, the IMF, regional development banks such as the European Bank for Reconstruction and Development (EBRD), and multilateral trade institutions such as the WTO signals a move away from the dominance of the state as the primary actor analysed in international affairs. Globalization has thus been transformative in terms of limiting of state sovereignty over the economy.

Impact on Gender Equality

The IMF says they support women's empowerment and tries to promote their rights in countries with a significant gender gap.

SCANDALS

Managing Director Lagarde (2011-2019) was convicted of giving preferential treatment to businessman-turned-politician Bernard Tapie as he pursued a legal challenge against the French government. At the time, Lagarde was the French economic minister. Within hours of her conviction, in which she escaped any punishment, the fund's 24-member executive board put to rest any speculation that she might have to resign, praising her "outstanding leadership" and the "wide respect" she commands around the world.

Former IMF Managing Director Rodrigo Rato was arrested in 2015 for alleged fraud, embezzlement and money laundering. In 2017, the Audiencia Nacional found Rato guilty of embezzlement and sentenced him to 41D 2 years' imprisonment. In 2018, the sentence was confirmed by the Supreme Court of Spain.

ALTERNATIVES

In March 2011, the Ministers of Economy and Finance of the African Union proposed to establish an African Monetary Fund.

At the 6th BRICS summit in July 2014 the BRICS nations (Brazil, Russia, India, China, and South Africa) announced the BRICS Contingent Reserve Arrangement (CRA) with an initial size of US$100 billion, a framework to provide liquidity through currency swaps in response to actual or potential short-term balance-of-payments pressures.

In 2014, the China-led Asian Infrastructure Investment Bank was established.

IN THE MEDIA

Life and Debt, a documentary film, deals with the IMF's policies' influence on Jamaica and its economy from a critical point of view. *Debtocracy*, a 2011 independent Greek documentary film, also criticises the IMF. Portuguese musician José Mário Branco's 1982 album *FMI* is inspired by the IMF's intervention in Portugal through monitored stabilisation programmes in 1977–78. In the 2015 film, *Our Brand Is Crisis*, the IMF is mentioned as a point of political contention, where the Bolivian population fears its electoral interference.

PARTIAL PRODUCTIVITY

Productivity measures that use one class of inputs or factors, but not multiple factors, are called partial productivities. In practice, measurement in production means measures of partial productivity. Interpreted correctly, these components are indicative of productivity development, and approximate the efficiency with which inputs are used in an economy to produce goods and services. However, productivity is only measured partially – or approximately. In a way, the measurements are defective because they do not measure everything, but it is possible to interpret correctly the results of partial productivity and to benefit from them in practical situations. At the company level, typical partial productivity measures are such things as worker hours, materials or energy used per unit of production. Before the widespread use of computer networks, partial productivity was tracked in tabular form and with hand-drawn graphs. Tabulating machines for data processing began being widely used in the 1920s and 1930s and remained in use until mainframe computers became widespread in the late 1960s through the 1970s. By the late 1970s inexpensive computers allowed industrial operations to perform process control and track productivity. Today data collection is largely computerized and almost any variable can be viewed graphically in real time or retrieved for selected time periods.

Labour Productivity

In macroeconomics, a common partial productivity measure is labour productivity. Labour productivity is a revealing indicator of several economic indicators as it offers a dynamic measure of economic growth, competitiveness, and living standards within an economy. It is the measure of labour productivity (and all that this measure takes into account) which helps explain the principal economic foundations that are necessary for both economic growth and social development. In general labour productivity is equal to the ratio between a measure of output volume (gross domestic product or gross value added) and a measure of input use (the total number of hours worked or total employment).

$$\text{labour productivity} = \frac{\text{output volume}}{\text{labour input use}}$$

The output measure is typically net output, more specifically the value added by the process under consideration, *i.e.*, the value of outputs minus the value of intermediate inputs. This is done in order to avoid double-counting when an output of one firm is used as an input by another in the same measurement. In macroeconomics the most well-known and used measure of value-added is the Gross Domestic Product or GDP. Increases in it are widely used as a measure of the economic growth of nations and industries. GDP is the income available for paying capital costs, labour compensation, taxes and profits.(OECD 2008,11) Some economists instead use gross value added (GVA); there is normally a strong correlation between GDP and GVA. (Freeman 2008,5)

The measure of input use reflects the time, effort and skills of the workforce. The denominator of the ratio of labour productivity, the input measure is the most important factor that influences the measure of labour productivity. Labour input is measured either by the total number of hours worked of all persons employed or total employment (head count). (Freeman 2008,5) There are both advantages and disadvantages associated with the different input measures that are used in the calculation of labour productivity. It is generally accepted that the total number of hours worked is the most appropriate measure of labour input because a simple headcount of employed persons can hide changes in average hours worked and has difficulties accounting for variations in work such as a part-time contract, leave of absence, overtime, or shifts in normal hours. However, the quality of hours-worked estimates is not always clear. In particular, statistical establishment and household surveys are difficult to use because of their varying quality of hours-worked estimates and their varying degree of international comparability.

GDP per capita is a rough measure of average living standards or economic well-being and is one of the core indicators of economic performance. (OECD 2008, 14) GDP is, for this purpose, only a very rough measure. Maximizing GDP, in principle, also allows maximizing capital usage. For this reason, GDP is systematically biased in favour of capital intensive production at the expense of knowledge and labour-intensive production.

The use of capital in the GDP-measure is considered to be as valuable as the production's ability to pay taxes, profits and labour compensation. The bias of the GDP is actually the difference between the GDP and the producer income. (Saari 2011,10,16)

Another labour productivity measure, output per worker, is often seen as a proper measure of labour productivity, as here: "Productivity isn't everything, but in the long run it is almost everything. A country's ability to improve its standard of living over time depends almost entirely on its ability to raise its output per worker."

This measure (output per worker) is, however, more problematic than the GDP or even invalid because this measure allows maximizing all supplied inputs, *i.e.*, materials, services, energy and capital at the expense of producer income.

MULTI-FACTOR PRODUCTIVITY

When multiple inputs are considered, the measure is called multi-factor productivity or MFP. Multi-factor productivity is typically estimated using growth accounting. If the inputs specifically are labour and capital, and the outputs are value added intermediate outputs, the measure is called total factor productivity or TFP. TFP measures the residual growth that cannot be explained by the rate of change in the services of labour and capital. MFP replaced the term TFP used in the earlier literature, and both terms continue in use (usually interchangeably) (Hulten 2009,7).

TFP is often interpreted as a rough average measure of productivity, more specifically the contribution to economic growth made by factors such as technical and organisational innovation. (OECD 2008,11). The most famous description is that of Solow's (1957): I am using the phrase 'technical change' as a shorthand expression for any kind of shift in the production function. Thus slowdowns, speed ups, improvements in the education of the labour force and all sorts of things will appear as 'technical change'. The original MFP model (Solow 1957) involves several assumptions: that there is a stable functional relation between inputs and output at the economy-wide level of aggregation, that this function has neoclassical smoothness and curvature properties, that inputs are paid the value of their marginal product, that the function exhibits constant returns to scale, and that technical change has the Hicks'n neutral form (Hulten, 2009,5). In practice, TFP is "a measure of our ignorance", as Abramovitz (1956) put it, precisely because it is a residual. This ignorance covers many components, some wanted (like the effects of technical and organizational innovation), others unwanted (measurement error, omitted variables, aggregation bias, model misspecification) (Hulten 2000,11). Hence the relationship between TFP and productivity remains unclear.

Individual and Team Productivity

The manager or leader of a team can significantly increase productivity in various ways. The outcome of this can produce the following benefits.

Team/Individual Reaction:

- Team or individual have positive reaction to a good manager. Creating efficiencies for the team or individual.
- The individual or team will gain more confidence having a strong manager/leader and in turn be more productive.
- Individuals having trust in their manager/leader which creates a better overall work environment and promotes productivity.
- Positive moral in the work environment, promoting productivity.
- Having a good manager/leader reduces turnover. Creating a stronger and more knowledgeable workforce that moves the productivity dial forward.

As an accounting result the MFP growth is 1.119-0.546-0.541=0.032 or 3.2%.

The residual problem of Multi Factor Productivity was solved by many authors who developed production income formation models where productivity was an integrated factor. For this purpose was needed Total Productivity concept.

TOTAL PRODUCTIVITY

When all outputs and inputs are included in the productivity measure it is called total productivity. A valid measurement of total productivity necessitates considering all production inputs. If we omit an input in productivity (or income accounting) this means that the omitted input can be used unlimitedly in production without any impact on accounting results. Because total productivity includes all production inputs, it is used as an integrated variable when we want to explain income formation of the production process.

Davis has considered the phenomenon of productivity, measurement of productivity, distribution of productivity gains, and how to measure such gains. He refers to an article suggesting that the measurement of productivity shall be developed so that it "will indicate increases or decreases in the productivity of the company and also the distribution of the 'fruits of production' among all parties at interest". According to Davis, the price system is a mechanism through which productivity gains are distributed, and besides the business enterprise, receiving parties may consist of its customers, staff and the suppliers of production inputs.

The role of total productivity as a variable when explaining how income formation of production is always a balance between income generation and income distribution. The income change created by production function is always distributed to the stakeholders as economic values within the review period.

BENEFITS OF PRODUCTIVITY GROWTH

Productivity growth is a crucial source of growth in living standards. Productivity growth means more value is added in production and this means more income is available to be distributed.

At a firm or industry level, the benefits of productivity growth can be distributed in a number of different ways:

- To the workforce through better wages and conditions;
- To shareholders and superannuation funds through increased profits and dividend distributions;
- To customers through lower prices;
- To the environment through more stringent environmental protection; and
- To governments through increases in tax payments (which can be used to fund social and environmental programmes).

Productivity growth is important to the firm because it means that it can meet its (perhaps growing) obligations to workers, shareholders, and governments (taxes and regulation), and still remain competitive or even improve its competitiveness in the market place. Adding more inputs will not increase the income earned per unit of input (unless there are increasing returns to scale). In fact, it is likely to mean lower average wages and lower rates of profit. But, when there is productivity growth, even the existing commitment of resources generates more output and income. Income generated per unit of input increases. Additional resources are also attracted into production and can be profitably employed.

DRIVERS OF PRODUCTIVITY GROWTH

In the most immediate sense, productivity is determined by the available technology or know-how for converting resources into outputs, and the way in which resources are organized to produce goods and services. Historically, productivity has improved through evolution as processes with poor productivity performance are abandoned and newer forms are exploited. Process improvements may include organizational structures (*e.g.*, core functions and supplier relationships), management systems, work arrangements, manufacturing techniques, and changing market structure. A famous example is the assembly line and the process of mass production that appeared in the decade following commercial introduction of the automobile. Mass production dramatically reduced the labour in producing parts for and assembling the automobile, but after its widespread adoption productivity gains in automobile production were much lower. A similar pattern was observed with electrification, which saw the highest productivity gains in the early decades after introduction. Many other industries show similar patterns. The pattern was again followed by the computer, information and communications industries in the late 1990s when much of the national productivity gains occurred in these industries.

There is a general understanding of the main determinants or drivers of productivity growth. Certain factors are critical for determining productivity growth. The Office for National Statistics (UK) identifies five drivers that interact to underlie long-term productivity performance: investment, innovation, skills, enterprise and competition. (ONS 3, 20)

- *Investment* is in physical capital — machinery, equipment and buildings. The more capital workers have at their disposal, generally the better they are able to do their jobs, producing more and better quality output.
- *Innovation* is the successful exploitation of new ideas. New ideas can take the form of new technologies, new products or new corporate structures and ways of working. Speeding up the diffusion of innovations can boost productivity.
- *Skills* are defined as the quantity and quality of labour of different types available in an economy. Skills complement physical capital, and are needed to take advantage of investment in new technologies and organisational structures.
- *Enterprise* is defined as the seizing of new business opportunities by both start-ups and existing firms. New enterprises compete with existing firms by new ideas and technologies increasing competition. Entrepreneurs are able to combine factors of production and new technologies forcing existing firms to adapt or exit the market.
- *Competition* improves productivity by creating incentives to innovate and ensures that resources are allocated to the most efficient firms. It also forces existing firms to organise work more effectively through imitations of organisational structures and technology.

INDIVIDUAL AND TEAM PRODUCTIVITY

Technology has enabled massive personal productivity gains—computers, spreadsheets, *e*-mail, and other advances have made it possible for a knowledge worker to seemingly produce more in a day than was previously possible in a year. Environmental factors such as sleep and leisure play a significant role in work productivity and received wage. Drivers of productivity growth for creative and knowledge workers include improved or intensified exchange with peers or co-workers, as more productive peers have a stimulating effect on one's own productivity. Productivity is influenced by effective supervision and job satisfaction. An effective or knowledgeable supervisor (for example a supervisor who uses the Management by objectives method) has an easier time motivating their employees to produce more in quantity and quality. An employee who has an effective supervisor, motivating them to be more productive is likely to experience a new level of job satisfaction thereby becoming a driver of productivity itself.

There is also considerable evidence to support improved productivity through operant conditioning reinforcement, successful gamification engagement, research-based recommendations on principles and implementation guidelines for using monetary rewards effectively, and recognition, based on social cognitive theory, which builds upon self-efficacy.

Detrimental Impact of Bullying, Incivility, Toxicity and Psychopathy

Workplace bullying results in a loss of productivity, as measured by self-rated job performance. Over time, targets of bullying will spend more time protecting themselves against harassment by bullies and less time fulfilling their duties. Workplace incivility has also been associated with diminished productivity in terms of quality and quantity of work.

A toxic workplace is a workplace that is marked by significant drama and infighting, where personal battles often harm productivity. While employees are distracted by this, they cannot devote time and attention to the achievement of business goals.

When toxic employees leave the workplace, it can improve the culture overall because the remaining staff become more engaged and productive. The presence of a workplace psychopath may have a serious detrimental impact on productivity in an organisation.

In companies where the traditional hierarchy has been removed in favour of an egalitarian, team-based setup, the employees are often happier, and individual productivity is improved (as they themselves are better placed to increase the efficiency of the workfloor). Companies that have these hierarchies removed and have their employees work more in teams are called liberated companies or "Freedom Inc.'s". The Kaizen system of bottom-up, continuous improvement was first practiced by Japanese manufacturers after World War II, most notably as part of The Toyota Way.

BUSINESS PRODUCTIVITY

Productivity is one of the main concerns of business management and engineering. Many companies have formal programmes for continuously improving productivity, such as a production assurance programme. Whether they have a formal programme or not, companies are constantly looking for ways to improve quality, reduce downtime and inputs of labour, materials, energy and purchased services. Often simple changes to operating methods or processes increase productivity, but the biggest gains are normally from adopting new technologies, which may require capital expenditures for new equipment, computers or software. Modern productivity science owes much to formal investigations that are associated with scientific management. Although from an individual management perspective, employees may be doing their jobs well and with high levels of individual productivity, from an organizational perspective their productivity may in fact be zero or effectively negative if they are dedicated to redundant or value destroying activities. In office buildings and service-centred companies, productivity is largely influenced and affected by operational byproducts—meetings. The past few years have seen a positive uptick in the number of software solutions focused on improving office productivity. In truth, proper planning and procedures are more likely to help than anything else.

PRODUCTIVITY PARADOX

Overall productivity growth was relatively slow from the 1970s through the early 1990s, and again from the 2000s to 2020s. Although several possible causes for the slowdown have been proposed there is no consensus. The matter is subject to a continuing debate that has grown beyond questioning whether just computers can significantly increase productivity to whether the potential to increase productivity is becoming exhausted.

NATIONAL PRODUCTIVITY

In order to measure the productivity of a nation or an industry, it is necessary to operationalize the same concept of productivity as in a production unit or a company, yet, the object of modelling is substantially wider and the information more aggregate. The calculations of productivity of a nation or an industry are based on the time series of the SNA, System of National Accounts. National accounting is a system based on the recommendations of the UN (SNA 93) to measure the total production and total income of a nation and how they are used. (Saari 2006, 9)

International or national productivity growth stems from a complex interaction of factors. Some of the most important immediate factors include technological change, organizational change, industry restructuring and resource reallocation, as well as economies of scale and scope. A nation's average productivity level can also be affected by the movement of resources from low-

productivity to high-productivity industries and activities. Over time, other factors such as research and development and innovative effort, the development of human capital through education, and incentives from stronger competition promote the search for productivity improvements and the ability to achieve them. Ultimately, many policy, institutional and cultural factors determine a nation's success in improving productivity.

At the national level, productivity growth raises living standards because more real income improves people's ability to purchase goods and services (whether they are necessities or luxuries), enjoy leisure, improve housing and education and contribute to social and environmental programmes. Some have suggested that the UK's 'productivity puzzle' is an urgent issue for policy makers and businesses to address in order to sustain growth. Over long periods of time, small differences in rates of productivity growth compound, like interest in a bank account, and can make an enormous difference to a society's prosperity. Nothing contributes more to reduction of poverty, to increases in leisure, and to the country's ability to finance education, public health, environment and the arts'.

Productivity is considered basic statistical information for many international comparisons and country performance assessments and there is strong interest in comparing them internationally. The OECD publishes an annual Compendium of Productivity Indicators that includes both labour and multi-factor measures of productivity.

REVEALED COMPARATIVE ADVANTAGE

The revealed comparative advantage is an index used in international economics for calculating the relative advantage or disadvantage of a certain country in a certain class of goods or services as evidenced by trade flows. It is based on the Ricardian comparative advantage concept.

It most commonly refers to an index, called the Balassa index, Comparative Advantage in Japan and the United States|journal=Journal of International Economic

Integration|year=1989|volume=4|issue=2|pages=8–22|doi=10.11130/jei.1989.4.2.8 |jstor=23000034|doi-access=free}}</ref> In particular, the revealed comparative advantage of country c in product/commodity/good p is defined by:

$$RCA_{cp} = \frac{E_{cp} / \sum_{p' \in P} E_{cp'}}{\sum_{c' \in C} E_{c'p} / \sum_{c' \in C, p' \in P} E_{c'p'}}, \text{ where:}$$

That is, the RCA is equal to the proportion of the country's exports that are of the class under consideration, $\frac{E_{cp}}{\sum_{p'} E_{cp'}}$, divided by the proportion of world exports that are of that class, $\frac{\sum_{c'} E_{c'p}}{\sum_{c',p'} E_{c'p'}}$.

A comparative advantage is "revealed" if RCA>1. If RCA is less than unity, the country is said to have a comparative disadvantage in the commodity or industry. The concept of revealed comparative advantage is similar to that of economic base theory, which is the same calculation, but considers employment rather than exports.

Example: in 2010, soybeans represented 0.35% of world trade with exports of $42 billion. Of this total, Brazil exported nearly $11 billion, and since Brazil's total exports for that year were $140 billion, soybeans accounted for 7.9% of Brazil's exports. Because 7.9/0.35 = 22, Brazil exports 22 times its "fair share" of soybean exports, and so we can say that Brazil has a high revealed comparative advantage in soybeans.

INTERNATIONAL MONETARY FUND

The International Monetary Fund (IMF) is an international financial institution, headquartered in Washington, D.C., consisting of 190 countries. Its stated mission is "working to foster global monetary cooperation, secure financial stability, facilitate international trade, promote high employment and sustainable economic growth, and reduce poverty around the world." Formed in 1944, started on 27 December 1945, at the Bretton Woods Conference primarily by the ideas of Harry Dexter White and John Maynard Keynes, it came into formal existence in 1945 with 29 member countries and the goal of reconstructing the international monetary system. It now plays a central role in the management of balance of payments difficulties and international financial crises. Countries contribute funds to a pool through a quota system from which countries experiencing balance of payments problems can borrow money. As of 2016, the fund had XDR 477 billion (about US$667 billion).

Through the fund and other activities such as the gathering of statistics and analysis, surveillance of its members' economies, and the demand for particular policies, the IMF works to improve the economies of its member countries. The organization's objectives stated in the Articles of Agreement are: to promote international monetary co-operation, international trade, high employment, exchange-rate stability, sustainable economic growth, and making resources available to member countries in financial difficulty. IMF funds come from two major sources: quotas and loans. Quotas, which are pooled funds of member nations, generate most IMF funds. The size of a member's quota depends on its economic and financial importance in the world. Nations with greater economic significance have larger quotas. The quotas are increased periodically as a means of boosting the IMF's resources in the form of special drawing rights.

The current managing director (MD) and Chairwoman of the IMF is Bulgarian economist Kristalina Georgieva, who has held the post since October 1, 2019. Indian-American economist Gita Gopinath, who previously served as Chief Economist, was appointed as First Deputy Managing Director, effective January 21, 2022. Pierre-Olivier Gourinchas replaced Gopinath as Chief Economist on January 24, 2022.

FUNCTIONS

According to the IMF itself, it works to foster global growth and economic stability by providing policy advice and financing the members by working with developing countries to help them achieve macroeconomic stability and reduce poverty. The rationale for this is that private international capital markets function imperfectly and many countries have limited access to financial markets. Such market imperfections, together with balance-of-payments financing, provide the justification for official financing, without which many countries could only correct large external payment imbalances through measures with adverse economic consequences. The IMF provides alternate sources of financing such as the Poverty Reduction and Growth Facility.

Upon the founding of the IMF, its three primary functions were: to oversee the fixed exchange rate arrangements between countries, thus helping national governments manage their exchange rates and allowing these governments to prioritize economic growth, and to provide short-term capital to aid the balance of payments. This assistance was meant to prevent the spread of international economic crises. The IMF was also intended to help mend the pieces of the international economy after the Great Depression and World War II as well as to provide capital investments for economic growth and projects such as infrastructure.

The IMF's role was fundamentally altered by the floating exchange rates post-1971. It shifted to examining the economic policies of countries with IMF loan agreements to determine if a shortage of capital was due to economic fluctuations or economic policy. The IMF also researched what types of government policy would ensure economic recovery. A particular concern of the IMF was to prevent financial crises such as those in Mexico in 1982, Brazil in 1987, East Asia in 1997–98, and Russia in 1998, from spreading and threatening the entire global financial and currency system. The challenge was to promote and implement a policy that reduced the frequency of crises among the emerging market countries, especially the middle-income countries which are vulnerable to massive capital outflows. Rather than maintaining a position of oversight of only exchange rates, their function became one of surveillance of the overall macroeconomic performance of member countries. Their role became a lot more active because the IMF now manages economic policy rather than just exchange rates.

In addition, the IMF negotiates conditions on lending and loans under their policy of conditionality, which was established in the 1950s. Low-income countries can borrow on concessional terms, which means there is a period of time with no interest rates, through the Extended Credit Facility (ECF), the Standby Credit Facility (SCF) and the Rapid Credit Facility (RCF). Non-concessional loans, which include interest rates, are provided mainly through the Stand-By Arrangements (SBA), the Flexible Credit Line (FCL), the Precautionary and Liquidity Line (PLL), and the Extended Fund Facility. The IMF provides emergency assistance via the Rapid Financing Instrument (RFI) to members facing urgent balance-of-payments needs.

Surveillance of the Global Economy

The IMF is mandated to oversee the international monetary and financial system and monitor the economic and financial policies of its member countries. This activity is known as surveillance and facilitates international co-operation. Since the demise of the Bretton Woods system of fixed exchange rates in the early 1970s, surveillance has evolved largely by way of changes in procedures rather than through the adoption of new obligations. The responsibilities changed from those of guardians to those of overseers of members' policies.

The Fund typically analyses the appropriateness of each member country's economic and financial policies for achieving orderly economic growth, and assesses the consequences of these policies for other countries and for the global economy. For instance, The IMF played a significant role in individual countries, such as Armenia and Belarus, in providing financial support to achieve stabilization financing from 2009 to 2019. The maximum sustainable debt level of a polity, which is watched closely by the IMF, was defined in 2011 by IMF economists to be 120%. Indeed, it was at this number that the Greek economy melted down in 2010. In 1995 the International Monetary Fund began to work on data dissemination standards with the view of guiding IMF member countries to disseminate their economic and financial data to the public. The International Monetary and Financial Committee (IMFC) endorsed the guidelines for the dissemination standards and they were split into two tiers: The General Data Dissemination System (GDDS) and the Special Data Dissemination Standard (SDDS).

The executive board approved the SDDS and GDDS in 1996 and 1997 respectively, and subsequent amendments were published in a revised *Guide to the General Data Dissemination System*. The system is aimed primarily at statisticians and aims to improve many aspects of statistical systems in a country. It is also part of the World Bank Millennium Development Goals (MDG) and Poverty Reduction Strategic Papers (PRSPs).

The primary objective of the GDDS is to encourage member countries to build a framework to improve data quality and statistical capacity building to evaluate statistical needs, set priorities in improving the timeliness, transparency, reliability, and accessibility of financial and economic data. Some countries initially used the GDDS, but later upgraded to SDDS.

Some entities that are not themselves IMF members also contribute statistical data to the systems:

- Palestinian Authority – GDDS
- Hong Kong – SDDS
- Macau – GDDS
- Institutions of the European Union:
  - The European Central Bank for the Eurozone – SDDS
  - Eurostat for the whole EU – SDDS, thus providing data from Cyprus (not using any DDSystem on its own) and Malta (using only GDDS on its own)

A 2021 study found that the IMF's surveillance activities have "a substantial impact on sovereign debt with much greater impacts in emerging than high income economies."

Conditionality of Loans

IMF conditionality is a set of policies or conditions that the IMF requires in exchange for financial resources. The IMF does require collateral from countries for loans but also requires the government seeking assistance to correct its macroeconomic imbalances in the form of policy reform. If the conditions are not met, the funds are withheld. The concept of conditionality was introduced in a 1952 executive board decision and later incorporated into the Articles of Agreement.

Conditionality is associated with economic theory as well as an enforcement mechanism for repayment. Stemming primarily from the work of Jacques Polak, the theoretical underpinning of conditionality was the "monetary approach to the balance of payments".

Structural Adjustment

Some of the conditions for structural adjustment can include:

- Cutting expenditures or raising revenues, also known as austerity.
- Focusing economic output on direct export and resource extraction,
- Devaluation of currencies,
- Trade liberalisation, or lifting import and export restrictions,
- Increasing the stability of investment (by supplementing foreign direct investment with the opening of facilities for the domestic market,
- Balancing budgets and not overspending,
- Removing price controls and state subsidies,
- Privatization, or divestiture of all or part of state-owned enterprises,
- Enhancing the rights of foreign investors vis-a-vis national laws,
- Improving governance and fighting corruption,
- Banning the use of cryptocurrencies.

These conditions are known as the Washington Consensus.

Benefits

These loan conditions ensure that the borrowing country will be able to repay the IMF and that the country will not attempt to solve their balance-of-payment problems in a way that would negatively impact the international economy. The incentive problem of moral hazard—when economic agents maximise their own utility to the detriment of others because they do not bear the full consequences of their actions—is mitigated through conditions rather than providing collateral; countries in need of IMF loans do not generally possess internationally valuable collateral anyway. Conditionality also reassures the IMF that the funds lent to them will be used for the purposes defined by the Articles of Agreement and provides safeguards that country will be able to

rectify its macroeconomic and structural imbalances. In the judgement of the IMF, the adoption by the member of certain corrective measures or policies will allow it to repay the IMF, thereby ensuring that the resources will be available to support other members.

As of 2004, borrowing countries have had a good track record for repaying credit extended under the IMF's regular lending facilities with full interest over the duration of the loan. This indicates that IMF lending does not impose a burden on creditor countries, as lending countries receive market-rate interest on most of their quota subscription, plus any of their own-currency subscriptions that are loaned out by the IMF, plus all of the reserve assets that they provide the IMF.

HISTORY

20th Century

The IMF was originally laid out as a part of the Bretton Woods system exchange agreement in 1944. During the Great Depression, countries sharply raised barriers to trade in an attempt to improve their failing economies. This led to the devaluation of national currencies and a decline in world trade.

This breakdown in international monetary cooperation created a need for oversight. The representatives of 45 governments met at the Bretton Woods Conference in the Mount Washington Hotel in Bretton Woods, New Hampshire, in the United States, to discuss a framework for postwar international economic cooperation and how to rebuild Europe.

There were two views on the role the IMF should assume as a global economic institution. American delegate Harry Dexter White foresaw an IMF that functioned more like a bank, making sure that borrowing states could repay their debts on time. Most of White's plan was incorporated into the final acts adopted at Bretton Woods. British economist John Maynard Keynes, on the other hand, imagined that the IMF would be a cooperative fund upon which member states could draw to maintain economic activity and employment through periodic crises. This view suggested an IMF that helped governments and to act as the United States government had during the New Deal to the great recession of the 1930s. The IMF formally came into existence on 27 December 1945, when the first 29 countries ratified its Articles of Agreement. By the end of 1946 the IMF had grown to 39 members. On 1 March 1947, the IMF began its financial operations, and on 8 May France became the first country to borrow from it.

The IMF was one of the key organizations of the international economic system; its design allowed the system to balance the rebuilding of international capitalism with the maximization of national economic sovereignty and human welfare, also known as embedded liberalism. The IMF's influence in the global economy steadily increased as it accumulated more members. The increase reflected, in particular, the attainment of political independence by many African countries and more recently the 1991 dissolution of the Soviet Union because most countries in the Soviet sphere of influence did not join the IMF.

The Bretton Woods exchange rate system prevailed until 1971 when the United States government suspended the convertibility of the US$ (and dollar reserves held by other governments) into gold. This is known as the Nixon Shock. The changes to the IMF articles of agreement reflecting these changes were ratified in 1976 by the Jamaica Accords. Later in the 1970s, large commercial banks began lending to states because they were awash in cash deposited by oil exporters. The lending of the so-called money center banks led to the IMF changing its role in the 1980s after a world recession provoked a crisis that brought the IMF back into global financial governance.

21st Century

The IMF provided two major lending packages in the early 2000s to Argentina (during the 1998–2002 Argentine great depression) and Uruguay (after the 2002 Uruguay banking crisis). However, by the mid-2000s, IMF lending was at its lowest share of world GDP since the 1970s.

In May 2010, the IMF participated, in 3:11 proportion, in the first Greek bailout that totaled €110 billion, to address the great accumulation of public debt, caused by continuing large public sector deficits. As part of the bailout, the Greek government agreed to adopt austerity measures that would reduce the deficit from 11% in 2009 to "well below 3%" in 2014. The bailout did not include debt restructuring measures such as a haircut, to the chagrin of the Swiss, Brazilian, Indian, Russian, and Argentinian Directors of the IMF, with the Greek authorities themselves (at the time, PM George Papandreou and Finance Minister Giorgos Papakonstantinou) ruling out a haircut.

A second bailout package of more than €100 billion was agreed over the course of a few months from October 2011, during which time Papandreou was forced from office. The so-called Troika, of which the IMF is part, are joint managers of this programme, which was approved by the executive directors of the IMF on 15 March 2012 for XDR 23.8 billion and saw private bondholders take a haircut of upwards of 50%. In the interval between May 2010 and February 2012 the private banks of Holland, France and Germany reduced exposure to Greek debt from €122 billion to €66 billion.

As of January 2012, the largest borrowers from the IMF in order were Greece, Portugal, Ireland, Romania, and Ukraine.

On 25 March 2013, a €10 billion international bailout of Cyprus was agreed by the Troika, at the cost to the Cypriots of its agreement: to close the country's second-largest bank; to impose a one-time bank deposit levy on Bank of Cyprus uninsured deposits. No insured deposit of €100k or less were to be affected under the terms of a novel bail-in scheme.

The topic of sovereign debt restructuring was taken up by the IMF in April 2013 for the first time since 2005, in a report entitled "Sovereign Debt Restructuring: Recent Developments and Implications for the Fund's Legal and Policy Framework". The paper, which was discussed by the board on 20 May, summarised the recent experiences in Greece, St Kitts and Nevis, Belize, and

Jamaica. An explanatory interview with Deputy Director Hugh Bredenkamp was published a few days later, as was a deconstruction by Matina Stevis of the *Wall Street Journal*.

In the October 2013 Fiscal Monitor publication, the IMF suggested that a capital levy capable of reducing Euro-area government debt ratios to "end-2007 levels" would require a very high tax rate of about 10%.

The Fiscal Affairs department of the IMF, headed at the time by Acting Director Sanjeev Gupta, produced a January 2014 report entitled "Fiscal Policy and Income Inequality" that stated that "Some taxes levied on wealth, especially on immovable property, are also an option for economies seeking more progressive taxation ... Property taxes are equitable and efficient, but underutilized in many economies ... There is considerable scope to exploit this tax more fully, both as a revenue source and as a redistributive instrument."

At the end of March 2014, the IMF secured an $18 billion bailout fund for the provisional government of Ukraine in the aftermath of the Revolution of Dignity.

Response and Analysis of Coronavirus

In late 2019, the IMF estimated global growth in 2020 to reach 3.4%, but due to the coronavirus, in November 2020, it expected the global economy to shrink by 4.4%.

In March 2020, Kristalina Georgieva announced that the IMF stood ready to mobilize $1 trillion as its response to the COVID-19 pandemic. This was in addition to the $50 billion fund it had announced two weeks earlier, of which $5 billion had already been requested by Iran. One day earlier on 11 March, the UK called to pledge £150 million to the IMF catastrophe relief fund. It came to light on 27 March that "more than 80 poor and middle-income countries" had sought a bailout due to the coronavirus.

On 13 April 2020, the IMF said that it "would provide immediate debt relief to 25 member countries under its Catastrophe Containment and Relief Trust (CCRT)" programme. In November 2020, the Fund warned the economic recovery may be losing momentum as COVID-19 infections rise again and that more economic help would be needed.

3

Agricultural Marketing in Developing Countries

Economic reforms have had sweeping impacts on agricultural markets in developing countries.

In general, state intervention has been reduced, notably with respect to:

- The abolition or sharp curtailing of parastatal marketing boards;
- Depreciation of formerly over-valued currencies rendering developing country exports more competitive and imports more expensive;
- A reduced public role in agricultural services, especially in subsidized credit, input and extension networks;
- A shift away from pan-territorial and pan-seasonal crop pricing strategies and pre-announced prices.

Reviewing agricultural markets research in sub-Saharan Africa and Asia, Jones concludes:

''In newly liberalized [food] markets in eastern and southern Africa... barriers of entry to trade are low, but the marketing system has little capacity to channel credit or spread risk. There are strong theoretical reasons for expecting the impact of and response to reforms to vary between different classes of producers. The absence of key markets, risk aversion, high transaction costs and the dual role of agricultural households as producers and consumers are critical features. The marketing system depends on both physical and institutional infrastructure... Collective action by market participants may address this but it may also lead to collusion over prices. Evidence from South Asia shows that food markets exhibit social barriers to entry, massive asset polarization, debt relationships

between large and small traders and traders and farmers, diverse institutional and contractual arrangements, and collusive behaviour, enforced in part by manipulation of the state regulatory system.''

This conclusion gives some clue to the reasons why NGOs and CBOs intervene in agricultural markets. When extension agents, researchers and development organizations working in rural areas ask farmers to prioritize their problems, agricultural marketing is repeatedly raised as one of the most important problems faced. It may arise in the context of the promotion of new crops or productivity-enhancing technology, or it may be felt particularly acutely in remoter areas poorly served by commercial traders, where parastatals no longer operate. NGO marketing interventions typically aim to fill critical gaps in the marketing system or address the power imbalances to which Jones refers. Nowhere are those marketing problems felt more acutely than in the areas for which it is most difficult to identify sustainable strategies to improve market access. Farmers in remote areas (either remote because of physical distance from markets or because of poor roads) are almost always poorly served by agricultural traders and are often obliged to accept seemingly unattractive prices for their produce. Distance from markets rules out the production of higher value more perishable crops, and reduces the linkages between these producers and other more specialized markets. By the same token, CBOs and NGOs seeking to promote alternative strategies for these disadvantaged communities face high costs and tangible obstacles that make their task particularly difficult. Poor access to markets is mirrored by poor access to all kinds of rural services. The poverty that results makes such communities particularly risk-averse. Where rainfall is uncertain, the situation is even worse, whilst the relative absence of trade does nothing to relieve the covariance in production. These are the challenging circumstances that make an examination of marketing interventions worthwhile. There is wide-ranging experience amongst the development NGO community. Some of these initiatives have taken-off and developed into self-sustaining activities, whilst others, although not conceived as such, have effectively become subsidydependent welfare programmes. This review identifies best practice and the conditions required for such programmes to work.

ORGANIZATION OF AGRICULTURAL MARKETING AND COMMODITY

Organised marketing of agricultural commodities has been promoted in the country through a network of regulated markets. Most of the State governments and Union Territories have enacted legislations (APMC Act) to provide for regulation of agricultural produce markets. While by the end of 1950, there were 286 regulated markets in the country, today the number stands at 7,521. Besides, the country has 27,294 rural periodical markets, about 15 per cent of which function under the ambit of regulation. The advent of regulated markets has helped in mitigating the market handicaps of producers/sellers at the

wholesale assembling level. But, the rural periodic markets in general, and the tribal markets in particular, remained out of its developmental ambit. Agriculture sector needs well functioning markets to drive growth, employment and economic prosperity in rural areas of the country. In order to provide dynamism and efficiency into the marketing system, large investments are required for the development of post harvest and cold chain infrastructure nearer to the farmers' field. A major portion of this investment is expected from the private sector, for which an appropriate regulatory and policy environment is necessary.

Alongside, enabling policies need to be put in place to encourage procurement of agricultural commodities directly from farmers' field and to establish effective linkage between the farm production and the retail chain and food processing industries. Accordingly, amendment to the State APMC Act for deregulation of marketing system in the country is suggested to promote investment in marketing infrastructure, motivating corporate sector to undertake direct marketing and to facilitate a national integrated market.

The Ministry of Agriculture formulated a model law on agricultural marketing for guidance and adoption by State Governments. The model legislation provides for establishment of Private Markets/Yards, Direct Purchase Centres, Consumer/ Farmers Markets for direct sale and promotion of Public Private Partnership in the management and development of agricultural markets in the country. Provision has also been made in the Act for constitution of State Agricultural Produce Marketing Standards Bureau for promotion of Grading, Standardisation and Quality Certification of agricultural produce. This would facilitate pledge financing, direct purchasing, forward/future trading and exports. Several States have initiated steps for amending the APMC Act.

- *Infrastructure Requirement:* Investment requirement for the development of marketing, storage and cold storage infrastructure in the country has been estimated to be huge and with a view to induce investment in the development of marketing infrastructure as envisaged above, the Ministry has implemented the following Plan Schemes:
    i. A capital investment subsidy scheme titled "Construction of Rural Godowns" is being implemented w.e.f. 1 April 2001. The main objectives of the scheme include creation of scientific storage capacity with allied facilities in rural areas to meet various requirements of farmers for storing farm produce, processed farm produce, agricultural inputs, *etc.*, and prevention of distress sale by creating the facility of pledge loan and marketing credit. Under the original scheme, back ended subsidy @ 25 per cent of capital cost of the project was provided. In case of NE States, hilly areas and SC/ST entrepreneurs, subsidy was provided @ 33.33 per cent of the capital cost of the project. The Scheme has since been modified with effect from 20 October 2004, to provide subsidy @ 25 per cent to farmers, Agriculture graduates, cooperatives and Central Warehousing Corporation/State Warehousing

Corporations. All other categories of individuals companies and corporations are now given subsidy @ 15 per cent of the project cost. The scheme has been made farmers' friendly by allowing subsidy for smaller godowns of 50 MT size in general and of 25 in hilly areas. Five lakh tonnes capacity to be created is reserved for small farmers. The scheme is being implemented through NABARD and NCDC. Till 31 May 2006, 11,583 storage projects having a capacity of 166.42 lakh tonnes have been sanctioned under the scheme.

ii. With a view to establish a nation-wide information network for speedy collection and dissemination of price and market related information to farmers, electronic connectivity is being provided to all important agricultural markets in the country under a Central scheme, "Market Research and Information Network". 2,408 market nodes and 92 State Marketing Boards and Directorate of Marketing and Inspection offices have been networked on a single portal, wherein daily prices of more than 300 commodities and about 2000 varieties are being reported. It is planned to connect 2,700 markets in all, under the scheme during the 10th Plan.

iii. The Ministry of Agriculture is implementing another Central Sector scheme for "Development/Strengthening of Agricultural Marketing Infrastructure, Grading and Standardisation". Under the scheme, investment subsidy is provided @ 25 per cent on the capital cost of the marketing infrastructure development project subject to a maximum of Rs 50 lakh for each project in all States and @ 33.3 per cent of capital cost subject to a maximum of Rs 60 lakh for each project in case of North Eastern States, hilly areas and to Scheduled Castes/Scheduled Tribes entrepreneurs. In respect of infrastructure projects of State Governments/State Agencies, there is no upper ceiling on subsidy to be provided under the scheme. The scheme is reform linked, to be implemented in those States/Union Territories wherein the law dealing with agriculture markets (Agricultural Produce Marketing Regulation Act) allows setting up of competitive agricultural markets in private and cooperative sectors, direct marketing and contract farming. The States of Andhra Pradesh, Punjab, Kerala, Tamil Nadu, Manipur, Sikkim, Madhya Pradesh, Himachal Pradesh, Nagaland, Rajasthan, Chattisgarh and Union Terriroty of Andaman and Nicobar Islands, Daman and Diu and Dadra and Nagar Haveli have notified to receive assistance under the Scheme. The remaining States/UTs are in the process of amending their APMC Acts. 158 training and awareness programmes have been conducted in the notified States/UTs. A

total number of 259 new project proposals have been provided advance subsidy of Rs 516.30 lakh by NABARD in the States of Madhya Pradesh, Tamilnadu, Punjab, Andhra Pradesh and Kerala.

iv. The Department has recently taken the initiative to promote modern terminal markets for fruits, vegetables and other perishables in important urban centres of the country. These markets would provide state of art infrastructure facilities for electronic auction, cold chain and logistics and operate through primary collection centres conveniently located in producing areas to allow easy access to farmers. The terminal markets are envisaged to operate on a 'Hub-and-Spoke' format wherein the Terminal Market (the hub) would be linked to a number of collection centres (the spokes), conveniently located in key production centers to allow easy access to farmers for the marketing of their produce. The concept on setting up of Terminal Markets for perishable commodities was discussed with the State Governments and interested private enterprises at a national conference of State Ministers held on 20 February 2006 at New Delhi. Based on the discussions, a Committee has been constituted under the Chairmanship of Director General, National Institute of Agricultural Marketing, Jaipur with members from participating State Governments to develop a framework for the bidding process for selecting the enterprise for the implementation of terminal market projects and to work out implementation modalities. Central assistance to these projects is planned by way of equity participation.

The Department of Agriculture and Cooperation has three organisations dealing with marketing under its administrative control, namely, the Directorate of Marketing and Inspection (DMI), Faridabad, the Ch. Charan Singh National Institute of Agricultural Marketing (NIAM), Jaipur and the Small Farmers Agri-Business Consortium (SFAC), New Delhi.

- *Directorate of Marketing and Inspection:* It is an attached office of the Department and is headed by Agricultural Marketing Adviser. The Directorate has its Head Office at Faridabad (Haryana), Branch Head Office at Nagpur (Maharashtra), 11 Regional Offices and the Central Agmark Laboratory at Nagpur. Besides, there are 26 Sub-Offices, 16 Regional Agmark Laboratories (RALs) spread all over the country.
  The main functions of the Directorate are as follow:
  1. Rendering advice on statutory regulation, development and management of agricultural produce markets to the States/UTs
  2. Promotion of Standardisation and Grading of agricultural and allied produce under the Agricultural Produce (Grading and Marking) Act, 1937

3. Market Research, Surveys and Planning
4. Training of personnel in Agricultural Marketing
5. Marketing Extension
6. Agricultural Marketing Information Network
7. Construction of Rural Godowns and
8. Development of Agricultural Marketing Infrastructure.

- *Grading and Standardisation:* The Agricultural Produce (Grading and Marking) Act, 1937 empowers the Government to fix quality standards, known as "AGMARK" standards and to prescribe terms and conditions for using the seal of 'AGMARK'. So far, grade standards have been notified for 182 agricultural and allied commodities. The purity standards under the provision of the Prevention of Food Adulteration (PFA) Act, 1954 and Bureau of Indian Standards (BIS) Act, 1986 are invariably taken into consideration while framing the grade standards. International Standards framed by Codex/International Standards Organisation (ISO) are also considered so that Indian produce can compete in the international market.

  During the year 2005-06, the final notification of Spices G & M Rules, 2005 is published, containing standards of eleven spices, namely, large Cardamom, Cardamom, Turmeric, Chillies, Ginger, Black Pepper, Coriander, Fennel, Fenugreek, Celery, Cumin, *etc.* The standards of Walnut duly harmonised with the international standards have been submitted to APEDA and were discussed in the Core Group's Meeting. The approval of Standing Committee on fresh Fruits and Vegetables is awaited for commodities like Lemons, Limes, Mandarins, Oranges, Grape Fruits, Walnuts in-shell and Walnut shelled.
- *National Institute of Agricultural Marketing:* The National Institute of Agricultural Marketing (NIAM) started functioning at Jaipur (Rajasthan) from 8 August 1988. NIAM has been imparting training to senior and middle level executives of agricultural and horticultural departments, Agro Industries, Corporations, State Marketing Boards, Agricultural Produce Market Committees and Apex level Cooperatives, Commodity Boards, export houses recognised by Agricultural and Processed Food Products Export Development Agency (APEDA), Commercial Banks and non-governmental organisations. Besides these clients, the NIAM also imparts training to farmers on marketing management. The main objectives of NIAM are:
  0. To provide specialised training in agricultural marketing designed to develop leadership potential in the management of agricultural marketing enterprises and services
  1. To undertake research in agricultural marketing for Government, Cooperative and other Institutes, both on public funding and by contract

2. To undertake appraisal of markets/marketing projects for approval and financial support by the Central Government, on consultancy basis
3. To formulate objective criteria for selective development of physical markets and to evolve a practical methodology for the application of such criteria in their planning
4. To offer advisory and consultant services on marketing policies, investment programmes and marketing development strategies and specific advice to marketing enterprises (State, Private and Cooperatives)
5. To survey, study and analyse the rural market management and to examine in depth the principal and practice of market regulation as a development sector in the agricultural economy.

The NIAM is managed by a Governing Body under the Chairmanship of Minister of Agriculture and an Executive Committee under the Chairmanship of Secretary, Department of Agriculture and Cooperation.

- *Training Activities:* The Institute organises Training Programmes for officials, farmers and other functionaries. In 2003-04 Management Development Programmes (MDP) were introduced. So far four MDPs have been successfully organised for leading companies like Bayer Crop Science, MICO BOSCH, *etc.* The MDPs were held at NIAM campus and 120 working executives of these MNCs working in various capacities have been benefited from this programme. All these MDPs were rated excellent by the participants and many other companies have shown keen interest in organising MDPs at NIAM, Jaipur.
- *Research:* The domestic Agricultural Marketing scenario has witnessed lot of changes in policies and regulations. The enactment of Model Act by some States have brought substantial improvements in trade and marketing. Following Research studies are being conducted by NIAM during the year 2005-06.
  0. Contract Farming-prospects and implications
  1. Commodity Trade Research
  2. Market led extension-a participatory approach
  3. Developing India GAP Standards
  4. Information need assessment of stakeholders in Agricultural Marketing-A case of Rajasthan
- *Project Formulation:* In order to generate resources and ensure optimum utilisation of the expertise of the NIAM faculty, the Institute is taking up several Consultancy Projects in the year 2005-06. These include setting up Modern Terminal Market for fruits and vegetables at Nasik, Chandigarh, Nagpur, Patna, Bhopal, Rai (Haryana), Multi-utility integrated facility Centre-Pack house at Ludhiana for

MARKFED, Punjab, State Master Plan for Market Development in Orissa, Price Forecasting for Agricultural Commodity in Karnataka, On-line Market information system for Karnataka, Designing, Planning and detailed Project report for CA Storage at Kolkata. Detailed Project Reports have been prepared for the Modern Terminal Markets at Nashik, Nagpur, Chandigarh, Bhopal and Rai (Haryana).

- *Post Garduate Programme in Agri-Business Managment (PGPABM):* The Institute has undertaken Post-Graduate Programme in Agri-Business Management (PGPABM) as a Sub-centre of MANAGE, Hyderabad from July 2001 and 50 students are presently undergoing Post-Graduate Programme in Agri-Business. The programme is designed to assist agricultural graduates to acquire the critical know-how to compete in the domestic and global business arena and to make them efficient agri-business managers.
- *Small Farmers Agri-Business Consortium:* The Small Farmers Agri-business Consortium (SFAC) was registered by Department of Agriculture and Cooperation as a Society under the Societies Registration Act, 1860 on 18 January 1994. Members at present include RBI, SBI, IDBI, EXIM Bank, Oriental Bank of Commerce, NABARD, Canara Bank, NAFED, United Phosphorous Ltd., *etc.*

  The SAFC is managed by a Board of Managers consisting of 20 members and chaired by Hon'ble Union Minister of Agriculture as its Ex-Officio President and the Secretary (Department of Agriculture and Cooperation), Government of India as its Ex-Officio Vice President. Managing Director is the Chief Executive of SFAC. SFAC has established 18 State level SFACs by contributing a corpus fund. The mission of the Society is to support innovative ideas for generating income and employment in rural areas by promoting private investments in agribusiness projects.

  The Central sector scheme for agri-business development implemented by SFAC was approved by the Government on 19 July 2005 for implementation during remaining period of the Tenth Plan with an outlay of Rs 48 crore. The scheme is being implemented by SFAC in close association with commercial banks for providing
- Venture Capital Assistance to agribusiness projects and assist farmer/ producer groups in preparation of quality Detailed Project Reports (DPR).

The main objectives of the scheme are to facilitate setting up of agribusiness ventures in participation with banks, catalyse private investment in setting up of agribusiness projects and thereby providing assured market to producers for increasing rural income and employment, strengthen backward linkages of agri-business projects with producers, assist farmers, producer groups, and agriculture graduates to enhance their participation in value chain through project

development facility, arrange training and visits, *etc.*, of agripreneurs setting up identified agribusiness projects. SFAC provides financial assistance to agribusiness projects by way of equity participation.

The quantum of SFAC venture capital assistance depended on the project cost and will be the lowest of the following:

- 10 per cent of the total project cost assessed by the bank
- 26 per cent of the project equity
- Rs 75 lakh

Higher venture capital assistance can be considered by SFAC to deserving projects on merit and/or to projects that are located in remote and backward areas, North-eastern and hilly States and projects recommended by State agencies.

The outlay for implementation of the scheme during 2005-2006 was Rs. 10 crore which has been utilised. During the year venture capital assistance has been sanctioned to 44 agribusiness projects and assistance has been provided for preparation of 11 Detailed Project Reports(DPRs).

TRAINING OF MARKETING PERSONNEL

Several training courses, viz.

(a) 11 months Diploma Course in Agricultural Marketing in Nagpur,
(b) 4 months Market Secretaries Course at Chandigarh, Lucknow and Hyderabad,
(c) 6 months Diploma in Livestock Marketing at Nagpur,
(d) 3 months training for grading supervisors at Nagpur
(e) 3 months Graders Course at Hubli, Lucknow, and Chandigarh,
(f) 4 months Training Course in Cotton Classing Centre at Surat,
(g) 6 months Training Course in Tobacco Grading at Guntur,
(h) 3 weeks course at Demonstration cum training centre in animal casing at Bombay and New Delhi are being run by the directorate of marketing and inspection.

In addition short term condensed training courses of one week duration organized for the state Government personnel in Kapas grading. As many as 407 candidates in the 11 months Diploma course, 1596 in 4 mths course; 212 in 3 mths course; and 76 in 3 mths grading course were trained by the end of 1972-73.

Market Extension

The directorate of marketing and inspection has set up a separate extension wing for the dissemination of information valuable to producers as well as to consumers.

The primary aim of the scheme is to enlighten the producer seller on consumer preference and to advise him on the proper methods of preparation for marketing, grading, storing, packaging, handling and transporting and to improve the quality of the produce and to secure a better return to the growers.

Since 1969, the Directorate of marketing and inspection has in collaboration with the directorate of extension launched a series of 'Agmark' exhibitions known as 'vital link between farm and home'. These have been held in New Delhi, Lucknow, Chandigarh, Trivandrum, Bombay, Calcutta, Bangalore, Nagpur, Ahmedabad, Madras and Hyderabad. These have designed to educate the general public in the field of agricultural marketing to promote quality consciousness among producers.

Marketing Intelligence

With a view to disseminating the marketing intelligence to the interested parties the directorate of marketing and inspection publishes the following journals:

1. Agricultural Marketing—a quarterly journal
2. Marketing Newsletter—a monthly letter
3. Agmark Statistics—yearly
4. Commodity Intelligence Bulletins for tobacco, wool, bristles, potatoes, *etc.*

MARKETING RESEARCH AND INVESTIGATION

The role of market research in the establishment of an efficient system of marketing cannot be overemphasized. In order to be able to introduce reforms one should know the defects and shortcomings of the prevailing system. This calls for and justifies the necessity of intensive research and investigation. Under the third five-year plan an elaborate scheme for conducting survey, and research in the various facets of agricultural marketing has been undertaken by the Directorate of marketing and inspection. Particular attention is being paid to the collection of market information, with regard to price spreads, shifts in marketing practices, consumption pattern, consumer preferences, directional movements, packaging, assembling, transportation, distribution, *etc.* Authentic statistics and data are being collected so that up-to date information may be maintained in respect of all important agricultural commodities. Besides the market surveys cover studies on the organizational aspect of the mktg. system, problem oriented studies, *etc.* Under the fourth five year plan a specialized study to estimate the post harvest losses and marketable surpluses of agricultural produce have been taken up on an all-India level.

The Research Wing of the Directorate of marketing and inspection has been further strengthened by creating the Market Research and Planning Cell. The cell has a big component of exports in the field of agricultural marketing research and is expected to increase the tempo of development in this field.

Marketing is a multistage process. For the improvement and development of marketing structure, a co-ordinate approach aiming at removing all the weak links of the marketing chain is essential. A package of improved marketing services in the form of regulated markets, grading, weighing, storing, transporting, handling services and marketing finance need to be made available

to ensure the producer a fair return from his production efforts and a better share in the price paid by the consumer. At the same time, market research programs should be oriented to the developing of an orderly and efficient marketing system. This is a crucial time in the development of agricultural marketing when the country is poised to enter an era of production surpluses. A piecemeal approach at this stage can be disastrous and can nullify the advantages gained by the farmer on the production front.

AGRICULTURAL MARKETING INFRASTRUCTURE

Infrastructure consists of a combination of national assets which sustain the addition of place, time and form utilities to the products and services. These include apart from the Government institutions and organizations, roads, railways, warehouses, market yards, cold stores, processing units, research and training institutions, means of communication and transportation including air cargo, sea cargo, *etc.* The basic rationale of any infrastructure is the sustenance it provides to production activity, income generation and social service supplies. It has also positive effect on income distribution because low per capita infrastructure limits the access of small and marginal farmers to the market.

The relationship between agricultural development and investment in infrastructure has been long recognized. Roads stimulate agricultural change and modernization not only through their immediate effects on relative prices and marketing opportunities but also through backward linkages. The roads open up opportunities for commercial agriculture and encourage shifts to production of higher value, transport – sensitive products (fruits, vegetables, dairy, poultry and marine products). Roads also improve access of the people to extension agents, banks, markets and health services. Market infrastructure is important not only for the performance of various marketing functions and expansion of the size of the market but also for transfer of appropriate price signals leading to improved marketing efficiency. Infrastructure facilities lead to reduction in marketing costs which is crucial for increasing the realization of growers and reducing the costs to the consumer.

The infrastructural facilities can be classified as physical and institutional. The roads, railways, transport facilities, electrification and storage structures are physical infrastructure whereas cooperatives, local self-government, banking institutions, extension agencies, marketing organizations and market intelligence net work are institutional infrastructure. For over four decades after independence, the public sector in India held a monopoly in the provision of most of the infrastructures. Till 1991, when the current period of economic reforms started, electricity, railways, roads, telecommunications, postal services and ports were among the sectors reserved for the public sector. However, after 1991, virtually all sectors of infrastructure have been opened to private investment. Nevertheless, for providing infrastructure in remote and difficult areas, the public sector would need to continue to play an important role.

MARKET SURPLUS AND AGRICULTURAL MARKETING INFRASTRUCTURE

In order to assess the adequacy of agricultural marketing infrastructure in the country, it is imperative to estimate the availability of agricultural production and marketed surplus. Generally, there is positive association between production and marketed surplus. Several studies carried out by individual researchers and national and international organizations provide the projections of both demand and supply of agricultural commodities at different points of time. Projections for too distant a period involve several assumptions which may not hold good. The Committee has, therefore, used the projections of production of various farm products as given by Kumar and Mathur for the period 2006-07. Projections of production and marketed surplus of various farm products for the year 2006-07, that even at the existing marketed surplus-output ratios, the quantities which the marketing system will be required to handle in future are quite large. For example rice output is projected at 103.5 million tonnes, meaning thereby that paddy output available for milling with rice milling sector would be around 155 million tonnes. The marketed surplus of all cereals taken together would be 102.74 million tonnes. As regards pulses, the marketed surplus is projected at 15.20 million tonnes which will require considerable increase in the pulse milling capacity. Reduction of proporation of population on agriculture would enable rise in market surpluses. The marketed surplus of oilseeds is projected to go up from 17.19 million tonnes during 1999-2000 to 26.90 million tonnes during 2006-07. In the case of sugarcane, the marketed quantity is projected to reach 327.75 million tonnes. Raw cotton output is projected at 3.2 million tonnes during 2006-07. similarly fruit and vegetables marketing system will be required to handle 91.88 million tonnes of vegetables and 68.38 million tonnes of fruits.

As regards livestock products, it is projected that by 2006-07, the marketed surplus of milk would be 71.7 million tonnes, meat and eggs 6.0 million tonnes and of marine products 9.80 million tonnes. Considering all the perishables together (fruits, vegetables and livestock products), the marketed surplus is anticipated to go up by 43.4 percent during the next seven years from 172.69 million tonnes during 1999-2000 to 247.76 million tonnes during 2006-07. The capacity to clean, grade, pack, process and transport these perishables would have to expand to handle the additional marketed quantities. From the view point of complete supply chain, from farm to the market, the infrastructure for all types of perishable horticulture produce is required at following levels:

(a) Small pre-cooling units and or zero-energy cool chambers in the production areas where the field heat of the produce is to be removed at fast rate to bring down the temperature of the produce to the desired level before putting the product in the cold storages. The refrigerated transport units from the farm to the cold storages are also utilized as mobile pre-cooling units for this purpose;
(b) Collection Centres near to the farms;
(c) Medium to small cold storages having multi-product, multi-chamber facilities are the most popular segment where horticulture produce is stored as transit godowns;

(d) Specialized cold storage with facility of built in pre-cooling; high humidity and Controlled/Modified Atmosphere are required for storage of the produce for a longer period. These specialized storages are essential for extended shelf life of the produce and without these storages the requirement of storing the produce to meet the demand in the off season is not feasible;
(e) Other components like ripening chambers close to the markets and display cabinets at retail outlets;
(f) Linkages for conversion of fresh produce in other marketable forms;
(g) Integrated Pack Houses to serve farms in respective regions having an area of around 5000-10000 hectare. Farms associated with each of the centres would collect farm produce and bring them to common cold storage centres, where these products could be given treatments, such as washing, sorting, grading and packing. These products will then be preserved in the appropriate cold storage facility. The services of these centres will not only increase the value of the farm product, but will also remove most of the unwanted bio-degradable bio-mass from the horticulture products, which can be utilized as farm manure or even as cattle feed.

The electronic trading would be more appropriate form of direct marketing between different buyers and sellers. Every market committee should be provided with facility of electronic trading by setting up a special kiosk for the purpose. The young entrepreneur who can set up portals on their own to provide such facilities could be supported financially through a plan scheme.

Their responsibilities would include to inform the buyers and sellers about online demand of different products; product specifications with regard to quality, pack size, packaging material, quantity and the time frame of supply; the transport cost involved and the marketing charges likely to be incurred in the market where the goods are to be delivered; facilities available to the farmer in the buying market; Re-handling of the produce, if necessary, in the supplying market to suit to the requirement of the buyer market; the rules and regulations of the destination market, if it is located outside the state at distant place, and other specific information as may be conducive for the seller to transact the business with the purchasers; and the legal provisions related to storage, transportation, phyto-sanitary requirements, *etc.*

Telephone is the most convenient way of communication which can reduce cost of marketing besides meeting other needs in the villages. However, upto March 2001, only 59 per cent of 6,70,000 villages were connected by telephone. The tele-density *i.e.*, number of telephones per hundred population was only 3.5 per cent compared to an average of 16 in the world and 60 in the developed world.

Though, it has been targeted to increase this to 7 per cent by 2005 and 15 by 2010, the progress seems to be slow.

There is a need to speed up the investment in this regard. Telephone connection technology by telephone lines seems to be slow and requires heavy investment for laying telephone lines. Therefore, the option of wireless

technology (WCL), should be examined. The Committee recommends that all the remaining villages should be connected within five years. Also, at the same time e-communication should be encouraged either through village panchayat or private entrepreneurs. Such communication or Cyber Café or village kiosks can become information centres.

Rural Connectivity

Rural roads constitute one of the most important marketing infrastructure which reduce the cost of production and marketing by providing external economies to farmers, traders and public at large. It is well known that investment in infrastructure of this type has very high returns to the society. The status of rural roads in India indicates that only 47.83% villages were covered with roads till mid 90s.

Therefore, there is an urgent need for investment in providing connectivity to remaining villages. Considering average road length as 4 km., to connect each village with the main road, public yard or sub-yard, the total length of rural roads required to connect to remaining 3.7 lakh villages comes to around 14.8 lakh kms. If average cost is taken as Rs.5 lakhs per km, the investment requirement is Rs.74,000 crores. Though the Government of India has made special provision for link roads in rural areas under Prime Minister's programme there is a need for additional investment.

Physical Facilities in Rural Markets

Agricultural produce markets established under market regulation programme have been playing an important role in providing market places to the farmers to dispose off their produce. These have also provided physical facilities and an institutional environment to the traders, processors and other market functionaries for conduct of their trading activities. The studies revealed that farmers, on an average, get a reasonably higher price by selling their produce in the regulated market yards compared to rural, village and unregulated wholesale markets. Most of the regulated market yards in the country at present lack facilities for handling the produce arriving there. The space for auction platform is less and the number of shops and godowns in the premises is small. It reduces the effective participation of traders. Absence of storage godowns at market level further perpetuates the problems of traders in general and continuous movement of goods in particular. The number of fruit and vegetables markets brought under regulation is small. Further the markets, which have been exclusively developed for handling of fruits and vegetable, do not have sufficient facilities for handling the produce available in the area. The Directorate of Marketing and Inspection and several state governments have assessed the requirements of investment for development of market yards in respective states. Though several questions relating to the desirability of continuing with government sponsored market yards are being raised, the Expert Committee is of the view that creation of physical infrastructure at primary market places is

absolutely essential irrespective of the institutional arrangements for managing these yards. The investment requirement for development of market yards/sub-yards during the next ten years is estimated at Rs.6026 crores.

Specialised in Rural Markets

Apart from general purpose markets, there is need for developing specialized markets for fruit and vegetables. It has been assessed that there are at least 241 such places in the country where fruit and vegetables markets should be developed. The infrastructure required for such markets depends on the volume of arrivals which in turn depends on the size of population to which these markets cater. The investment requirement for fruit and vegetables markets in the country is around Rs.970 crores.

Farmers' Markets

Several State Governments have initiated a process of direct marketing by producers to the consumers. The states of Punjab, Haryana, Rajasthan, Tamil Nadu and Andhra Pradesh have established Apni Mandi in their areas. However, this has been promoted so far only at the state headquarters and at some district headquarters. There is a need to promote these in all the districts. The Committee recommends that farmers markets be promoted in all the districts of the country to accelerate the process of direct marketing by the farmers.

Rural periodic market is the first contact point for producer – sellers for encashing their agricultural produce and buying other goods needed by them. There are in all 27294 rural periodic markets including those for livestock, in the country. But even minimum necessary infrastructural facilities do not exist in most of these rural periodic markets. There is urgent need to develop these rural periodic markets in a phased manner with necessary infrastructure amenities to have a strong base level link in the marketing chain. Once developed, these places, where periodic markets function, can also serve as farmers/consumers markets. The investment requirement for developing these primary rural market places is estimated at Rs.2146 crores.

Storage/Warehousing Infrastructure

Storage infrastructure is necessary for carrying over the agricultural produce from production periods to consuming periods. Lack of adequate scientific storage facilities cause heavy losses to farmers in terms of huge wastage in quantity and quality of products in general and of fruit and vegetables in particular.

Seasonal fluctuations in prices are aggravated in the absence of proper scientific storage facilities. Central and State Warehousing Corporations have constructed warehouses in the different States. Food Corporation of India and some State governments have also created warehousing facilities and godowns. The total covered storage capacity available with FCI., CWC and SWC is estimated at 26.4 million tonnes. In addition, storage capaciaty of around 25.3

million tonnes is available with public, private and cooperative sectors. In the background of 200 million tonnes production the available storage capacity of 52 million tonnes is quite inadequate. It is estimated that about 20 million tons of grains are stored in the form of CAP(Covered & Plinth). This clearly shows that the country needs much more facility than what is available now. This is specially more important for hill and remote areas in several states. For an additional 20 million storage capacity the investment required @Rs.2700 per tons is Rs.5400 crores. The private sector needs to be encouraged to enter the storage and warehousing activity and make investment of this magnitude.

The Finance Minister in the 2001-2002 Budget has announced creation of Rural Godowns for non-perishables on the lines of construction of cold storages under the back-ended subsidy scheme implemented by the National Horticulture Board. In this connection, in the light of past experience, the Expert Committee recommends that definition of rural godown should include a house, warehouse located in a rural area where a rural periodic market/market yard/sub-yard/ collection centres for different agricultural commodities already exists. It may also include D class municipalities or harvesting centres. Any private entrepreneur, cooperative, APMCs, SWC/CWC, registered NGOs, Farmers Registered Organisations, Accredited microcredit organisations and shelf-help groups should be eligible to construct and operate rural godown under the scheme.

The Godowns should be of viable capacity and rat proof with scientific storage following the specification drawn by CWC/SWC. The growers/process's, State procurement agencies, wholesalers, other agencies involved in PDS, *etc.*, should be included as potential users. The subsidy to the construction of godowns may be limited to 25% of the total cost. The godowns should be declared as deemed warehouses under the State Warehousing. APMC market fee, sales tax, purchase tax, octroi, *etc.*, should not be leviable on the goods stored. Similarly, provisions of Essential Commodity Act, Labour Act, Mathadi Act, Shop Establishment Act, Industrial Disputes Act, *etc.*, should not be applicable to these Warehouses. The material stored in rural godowns should be backed by warehousing receipts with common regulatory framework for negotiability. The godown owners/ operators should be permitted to play the role of on-lender so as to channel credit to potential users. Considering the importance of rural godowns to farmers, bankers/financiers should be allowed maximum spread of 2% or less over the NABARD refinance rate.

Cold Storage

India produces 134.5 million tons of fruit and vegetables and the output is likely to go up during the next 10 years. It is a matter of concern that more than 30 per cent of fruits and vegetables produced in the country are lost due to lack of proper handling, stoarge and procesing facilities. Cold storages are most important infrastructural need for perishable and semi perishable commodities which need an immediate attention. Presently a total of 4199 cold storages are existing in the country with a total storage capacity of 15.38 million tonnes.

The sector-wise availability of storage capacity. The present storage capacity available is sufficient only for 10 per cent of total production of fruits and vegetables. In the next 10 years with the anticipated increase in production of fruit and vegetables and other perishable commodities, the cold storage capacity requirement would be much higher. Foreseeing the future requirements of the fresh/precooked/frozen fruits and vegetables and their products as well as anticipated change in the food habits in favour of processed food, the capacity requirement for post harvest management of perishables is estimated at more than five times the presently available capacity.

In the next 10 years, 15000 additional cold storage units with a capacity of 45 million tonnes should be created. The additional capacity requirement would need an investment of the order of Rs.27,000 Crores. The investment should basically be made by the private sector only. In future, there would be a need for multi-chamber type of cold storage units for various perishable and other products. For encouraging private entrepreneurs there is a need to provide subsidy to make the units viable for some initial years. This apart, the regulatory arrangements should also be reviewed and simplified for attracting private investment in this venture. There is a need to provide incentives in reducing current expenses such as tax relief in electricity.

Reefer Vans/Containers

The country would also require reefer container/vans for transport of perishable items for domestic and export marketing. At present their availability in the country is negligible in comparison to the present production of perishable commodities. For handling the expected higher production in the next 10 years, at least 3000 reefer containers/vans with a capacity of 8 tons each would be required. This would require an investment of Rs.600 crores, which should be encouraged in the private and cooperative sector. There is a need to encourage the investors in this area by providing incentives.

Cleaning, Grading and Packaging

The importance of these facilities can be hardly over emphasized. At present, the grading facility is available only in 1321 markets out of total number of 7127 regulated markets. The quantity graded at producers level is almost negligible. There is a need to create facilities for cleaning, grading and packaging not only at primary level but also in the villages from where produce is brought to the market for sale. In the absence of such facility at the village level, the kind of pollution and congestion created at market yards during the peak arrivals period is well known. The APMCs should encourage private entrepreneurs to promote such units in or around the yard/sub-yards. There is need to promote proper packaging after grading so that further chances of adulteration or temptation may not be there. Besides this there is a strong need to educate the farmers for proper packaging and grading before they bring the produce to the market. Scientific packaging should be encouraged at the farm level through

subsidy support. The Expert Committee feels that this is an important activity, and an investment of Rs.2000 crores should be earmarked for this purpose during the next 10 years.

Export Zones and Food Parks

With a view to taking advantage of new international trade environment, there is a need to encourage export of high value traditional/non-traditional products grown in various parts of the country. Commodities having export potential are several fruits and vegetables, raw as well as processed and packed spices like cumin, fennel, coriander and other farm products like fenugreek and hena for which there is significant demand by Indian Diaspora and others in several countries. However, there is a need to educate and train the growers of these crops in producing, grading and packing for overseas markets and create necessary infrastructure.

A scheme of creating Export Oriented Agri-Zones (EOAZ) has been announced by the Govt. of India (Ministry of Commerce) which should be promoted by providing institutional and physical infrastructure in each of these as per the needs of the specific commodity. In some of EOAZs, there is also a need to establish what is called Food Parks. In these parks, some common facilities like electricity and warehouse should be created with central government assistance which will help in attracting investment by the private sector and the state government. While most of the investment should be made by the private entrepreneurs, as a way of incentive, government should invest in common facilities, and quality certification. The estimated public investment is Rs.200 crores and private investment of around 400 crores on fifty such EOAZs. In identification of EOAZs and Food Parks, the Government of India, through APEDA and DMI should take an active stance, rather than leaving it to the state governments. The Committee further recommends that commodity wise export potential studies be commissioned before establishing EOAZs.

Processing and Value Addition

Considering the increase in demand for value added and processed products, there is a need to enhance the capacity of agro-processing sector. This will not only help in stabilizing the prices realized by farmers but also in creating employment in rural areas. The food-processing sector alone provides tremendous potential in this area. For attracting private initiative and investment in food processing, the Government of India through Department of Food Processing and National Horticulture Board have already formulated several schemes of assistance. A ten year tax holiday has been announced. However, the state governments should also come forward and grant relief in terms of sales tax and other local taxes on processed products. Cheaper processed products will expand demand for such products.

At present, value addition is estimated at only seven per cent and processing only two percent of the total production. Within next ten years, there is a need

to increase value addition to 35 percent and processing to atleast 10 percent. Quality control and standardization will be extremely important in this endeavour. The Central government should establish or encourage a network of food analysis laboratories in the country. This will also be necessary to face competition from imported processed products. The investment potential in value addition and food processing is quite large. According to our esimates, the potential is Rs.150,000 crores. If conducive policy environment and incentive frame work is created, private sector can be attracted to make investment of this magnitude.

MARKETING FUNCTIONARIES (AGENCIES)

The transfer of produce or goods takes place through a chain of middlemen or agencies. In the primary market the main functionaries are the producer, the village or itinerary merchant, pre-harvest contractors, commission agents, transport agents, *etc.* In the secondary market the processing and manufacturing agents are the additional functionaries. Financing agents such as shroffs, banks and co-operatives may also take part. In the terminal or export market the commercial analyst and shipping agent also gets involved in the transfer of goods.

The functionaries have their own set up. They may be individuals, partners or co-operatives who may buy and sell on ready and future basis at a price determined by forces of supply and demand. Each functionary renders some service in the process of marketing and also earns a varying margin of profit for himself. This procedure makes marketing rather complicated and inflates the price of the produce. The nature of some of the agricultural products for *e.g.*, their bulk form and perishability and their seasonal availability further add to the complexity of agricultural marketing.

MARKETING IMPROVEMENTS

India being a primary producing country, agriculture plays a vital role, both as an essential infrastructure and a development component in generating and sustaining a higher national income. Out of a national income of about Rs. 38,921 crores in 1972-73 as much as Rs. 17,500 crores or about 44.9% is contributed by agriculture and allied sectors. It is estimated that about 50% of the agricultural produce is available as marketable surplus. The marketing system in India provides sustenance for about 3 million persons who are engaged in performing various marketing function. In the field of exports too, the agricultural sector accounts for about 50% of the total value.

The process involved in the disposal of such a substantial produce of great economic importance are significant not only for the farmer but also for the country as a whole. The unreasonably low return that the farmer gets for his produce and the excessive margin of profit retained by the intermediaries attracted the Government ‘s attention and it was felt that the economic condition of the agriculturists could not be improved unless determined steps were taken to establish an orderly system of marketing in the country.

GOVERNMENT REGULATORY PROGRAMMES

With this object in view, a number of marketing surveys were conducted by the Directorate of Marketing and Inspection which revealed the shortcomings in the country's marketing system. A rectification of these deficiencies was sought to be achieved by rationalizing various activities and standardizing various practices in the markets through legislation or otherwise. The primary objective of improving the system of agricultural marketing was not only to remove the handicaps from which the producer-seller was suffering but also to increase his income by ensuring him a fair price.

Regulation of Market

Prevailing market practices and market charges made a deep cut in the share of the producer in the price paid by the consumer. Some of the market charges were authorized whereas others were more than what the service rendered warranted. It was felt that a remunerative price to the producer could only be ensured if the market practices and market charges were regulated and rationalised. And thus the regulation of the markets has been given a high priority in the various Five Year Plans. The markets are sought to be regulated through an Act of each legislature. The Act is generally known as the Agricultural Produce Markets Act and it is provided for the removal of various malpractices widely prevalent in the markets for the settlement of disputes between sellers and buyers and for the promoting of orderly marketing of farm produce in general. Various state Governments have made considerable progress in this field by bringing in the necessary legislation. The Acts enabling the respective states to regulate the markets generally provide for the notification of market areas and the commodities to be covered in the act in different areas. A 'Marketing Committee' consisting of the representatives of growers, traders, merchants, local bodies and Government nominees administers the working of each market. The functions of the market committee are to frame bye-laws, define local market prices, fix market prices payable to various functionaries, license the functionaries, settle disputes, supervise weightment and promote the development of orderly marketing in general. The committee is generally empowered to raise funds for its working by levying a small fee on the produce bought and sold in the market in addition to the license fees received from the functionaries.

Market surveys. A survey conducted in 496 markets in 1961-62 has shown that after the regulation the market charges have been reduced by 48%. Another survey of selected commodities revealed that for some commodities market charges have been reduced by as much as 98%.

Although the first market to be regulated was Karanja in 1886 the regulation of markets did not make headway till the first Five Year plan. It got a fill up in the second and third five year plan.

The states and union territories which have regulated the markets are: Andhra Pradesh(335), Bihar(62), Chandigarh(1), Delhi(3), Gujarat(212), Mysore(102),

Madhya Pradesh(233), Haryana(80), Kerela(6), Maharashtra(212), Orissa(34), Punjab(95), Rajasthan(90), Tamil Nadu(136), Tripura(1), Uttar Pradesh(264), Goa, Daman and Diu(1), West Bengal(15), and Himachal Pradesh(5). The states and union territories which are yet to regulate markets are Assam, Andaman and Nicobar islands, Arunachal Pradesh, Dadra and Nagar Haveli, Jammu and Kashmir, Laccadive and Minicoy islands, Meghalaya, Mizoram, Nagaland, and Pondicherry. Necessary measures to regulate markets in these states and union territories are at various stages of progress. It is expected that these states and union territories will regulate the markets by the end of the Fifth plan.

All the states where necessary legislation has since been passed, have formulated phased programs for the regulation of markets. By the end of the fifth plan it is expected that all the wholesale assembling markets would be brought within the regulatory orbit. As a result of this scheme, excessive commissions and other market charges have been substantially rationalized. Unauthorized and arbitrary deductions have been prohibited and malpractices stopped. The issue of sale slips by licensed commission agents to the sellers, indicating the details of sale proceeds, deductions effected etc has been made obligatory. Weightment is also done by licensed weightmen of the market committee.

The dissemination of marketing information and news is one of the functions of the market committees. This is done through the displaying of the prices prevailing in the market and also in the neighbouring markets on the notice boards and announcements through loud speakers at regular intervals. This information is also supplied to the Central Government and the State Government and also to other market committees. Arrangements have been made for the maintenance of reliable statistics arrivals, sales, stocks, prices etc which are maintained by the market committees.

It is also obligatory on the part of the market committee to provide the market yards with the necessary amenities. In some of the markets that have been regulated amenities like rest houses, cattle sheds and water troughs have been provided by the market committees for the convenience of the producer sellers. Facilities for grading before sale and storage have also been provided. A survey of 500 regulated markets was undertaken by the Directorate of Marketing and Inspection in the Ministry of Agriculture in 1970-71 and 1971-72, with a view to assessing the adequacy and efficiency of the existing regulated markets and highlighting their drawbacks and deficiencies and suggesting measures to develop them. One of the most important drawbacks has been the inadequate financial resources of some of the market committees. During the fourth plan, a central sector scheme was drawn up by the Ministry of Agriculture to provide a grant at 20% of the cost of development of market, subject to a maximum of Rs. 2 lakhs. The balance will have to be provided by the commercial banks. An important development in the field of regulated markets is the keen interest taken by the International Development Agency (IDA) in the development of the infrastructure in regulated markets. The IDA is financing the development

of infrastructure in 50 markets of Bihar. The World Bank has approved a loan assistance of 6.5 crores to Karnataka also for the development of markets.

CONTRACT TERMS

Under the existing trade practices, the sale of produce in a primary market takes place on the basis of the visual inspection of the goods, and in the secondary and terminal markets on the inspection of the samples. Thereafter the buyer and the seller decide upon the terms either orally or through written contracts. The contract terms specify the quality and quantity of the produce, the time and place of delivery, the price and terms of payment, handling and incidental charges, the procedure for settlement of disputes and penalties. The terms of contract were not standardized and thus varied for every individual transaction, and were more favourable to the buyer.

With a view to improving trade practices, All-India standard contract terms have been drawn up for a number of commodities. In standard contract terms the definition of quality and allowances in respect of refraction, damaged goods have been specifically standardized. though the adoption of these standard contract terms by traders is voluntary they have to a large extent strengthened the position of the producer-seller and have improved the quality of the product marketed.

STANDARDISATION AND GRADING

In order to gain the confidence and establish a rational relationship between the quality of a produce and its price, it is necessary to devote some attention to the proper preparation sifting and sorting of a material according to certain attributes before it is taken to the market. This is sought to be achieved by grading the produce in conformity with certain accepted quality standards viz. shape, size, form, weight, and other physical and technical characteristics. The produce brought to the market is very often contaminated with dust, stones and other foreign matter added either deliberately or by accident. Sometimes the produce is immature or not properly dried or contains shrivelled grains or damaged and rotten material. Such a produce brings a lower price to the farmers. Care should be exercised while assembling the produce of different farmers so that the good material is not mixed with the inferior material brought in by some farmers.

The Government of India had recognized the need to introduce the standardization of agricultural produce which would enable the farmers to derive the benefits of grading in terms of fair practices according to the prescribed standards and enacted the Agricultural Produce Grading and Marking Act in 1937. The Act empowers the central Government to prescribe grade standards indicating the quality of articles included in the schedule and specify grade designation marks to represent particular grades or qualities. The Act provides for the grading and marketing of agricultural produce. The grade standards prescribed under this act are based on both physical and chemical characteristics

and are formulated after analysing representative samples of each commodity collected from different regions and different seasons. Besides the international standards and special requirements of overseas consumers are also taken into account while formulating these standards for the commodities which are exported. The grade standards are reviewed and amended from time to time in the light of the shift of the pattern of production and trade and changes in the consumer's preferences. The grades are designated as the 'Agmark' grades.

A central Agmark Laboratory at Nagpur with sixteen regional laboratories at Guntur, Madras, Bombay, Kanpur, Cochin, Rajkot, Calcutta, Sahidabad, Jamnagar, Bangalore, Patna, Tuticorin, Virudhunagar, Mangalore, Alleppey and Kozhikode are assisting to provide adequate laboratory facilities for fixing grade standards for new commodities, for revising old grade standards and for routine qualtiy control work.

Grade for Export

Grading of agricultural produce under the A.P. (G and M) Act is voluntary. Exports of certain agricultural commodities have however been prohibited unless duly graded and marked in accordance with the grade standards laid down under the A.P. Act 1937. The power to so prohibit exports was derived under the provisions of the sea-customs act. The Directorate of Marketing and Inspection under the Ministry of Agriculture exercises a three tier control on the quality of agricultural commodities that are graded under 'Agmark' before they are exported. This is done through inspection.

Grading for Internal Trade

Commodities such as cotton, ghee, butter, rice, wheat, atta, gur, eggs, arecanut, potatoes, fruits, bura, pulses, vegetable oils and ground spices are being presently graded under; Agmark' on voluntary basis.

Grading at Farmers Level

The grading of agricultural commodities under 'Agmark' has been consumer oriented. Generally the grading was done at the level of the traders. At this stage the producer was not a direct beneficiary of the grading scheme. It was felt the need to introduce grading at the producers' level. Thus the Directorate of marketing and inspection introduced a scheme for setting up commercial grading units.

Grading of Fruits and Vegetable Products

With a view to exercising quality control over fruits and vegetables the Government promulgated the Fruits Product Order under the essential Commodities Act. The preservatives and colours to be used are also clearly laid down. The order also stipulates the hygienic and sanitary methods which must be adopted by the manufacturers. The license for all this is issued by the executive Director, food and Nutrition board.

The total number of licensed factories was 1194. The total average production of fruits and vegetable products in the country during 1970 has been estimated as 156 thousand tonnes valued at Rs. 32.66 crores. Some of the products are very popular in foreign markets and are a good source of foreign exchange. In 1970 alone fruit products worth Rs. 2.92 crores were exported from India.

Regulation of Cold Stores

Most of the problems relating to the marketing of fruits and vegetables can be traced to their perishability. Perishability is responsible for high marketing costs, market gluts, price fluctuations and other similar problems. At low temperature, perishability is considerably reduced and the shelf life is increased and thus the importance of cold storage or refrigeration. The first cold store in India was reported to have been established in Calcutta in 1892. However significant progress in the expansion of the cold storage industry in the country has been made only after independence.

An ad-hoc survey of the cold stores carried out by the directorate of marketing and inspection in 1955 showed that the total available cold storage in the country was only 77 thousand tonnes. The survey also highlighted the need to regulate the cold storage industry in a planned manner.

With a view to ensuring the observance of proper conditions in the cold stores and to providing for development of the industry in a scientific manner, the Government of India and the ministry of agriculture promulgated an order known as "cold storage order, 1964" under Section 3 of the Essential Commodities Act,1955. The order is applicable in respect of every cold store with a capacity more than 8.4 cu m. The jurisdiction of this Order extends to the whole of India except West Bengal. Under this order, it is obligatory on every operator of the cold store to obtain a license from the Licensing Officer before using the installation for storing any food stuffs eg. fruit, vegetables, meat, fish, dairy products. The Agricultural Marketing Advisor to the Government of India is the Licensing Officer.

The directorate of marketing and inspection is enforcing the cold storage order. The field staff posted in the regional and sub offices located in different states regularly inspects the cold stores and offers necessary guidance for better and scientific preservation of foodstuffs. Besides the directorate of marketing and inspection gives general guidance on all technical matters concerning the setting up of cold stores to the intending entrepreneurs. The Government of India constituted a Central Cold Storage Advisory Committee consisting of official and non official members, representing the growers, owners, machinery manufacturers, research organizations, *etc*. The Committee advises the Government on all matters pertaining to the enforcement of Cold Storage Order and the future development of the industry.

At the end of 1973-74 there were 1503 cold stores in the country with a capacity of 18.70 lakh tonnes. Uttar Pradesh had the maximum number of cold stores of 9.37 lakh tonnes followed by Bihar with 169 cold stores with 2.10 lakh tonnes capacity and West Bengal with 133 cold stores with 3.15 lakh tonnes capacity.

Out of 1217 cold stores licensed during 1970, 1021 representing 84% of the total were owned by the private sector, whereas 121 and 75 were owned by the public and co-operative sector respectively. The respective capacity is 13.88 lakh tonnes, 0.25 lakh tonnes and 0.73 lakh tonnes. Though numerically the cold stores in the co-operative sector were less than those in the public sector the capacity was more. The National Co-operative Development Corporation (NCDC) has formulated a scheme for financial assistance for setting up new cold stores in the co-operative sector.

Potato is the most important commodity which is presently placed in the cold stores accounting for as much as 92 % of the total capacity in the country. The remaining 8% is being utilized for other perishables viz. fruits, vegetables, meat, sea-foods, dairy and poultry products. With the attainment of self-sufficiency in the production of food grains, greater attention is being paid to the increased production of protective foods such as fruits, vegetables, fish, poultry and dairy products. These products being highly perishable are required to be kept in cold stores. Owing to the inadequate cold storage facilities at present considerable losses occur in the case of these commodities. There is enough scope for expanding the cold-storage industry with a view to providing facilities for preserving and prolonging the shelf life of these protective foods which are essential for human health.

Consumer Protection

In the marketing process the producers and consumers are the two weak ends of the chain. It is incumbent on the part of the Government to protect the interests of both of them. Producers are sought to be protected through the regulation of the markets, grading at the producers level and other similar measures. Consumer's interests on the other hand are safeguarded by grading under 'Agmark' at the level of traders.

The progress towards making the consumer quality conscious is slow. With the growing popularity of semi-processed foods the danger of sub-standard food articles being marketed has become manifold. With this in view steps have been taken in many directions., *e.g.* Acts relating to grading and standardisation of agricultural commodities, certification marks in respect of manufactured goods, pure food laws, laws relating to weights and measures, and laws relating to the manufacture of fruits and vegetable products have been passed and enforced. Commodities such as ghee, vegetable oils, butter, honey and powdered spices are being graded and marked under 'Agmark' under the provisions of the Agricultural Produce (Grading and Marking) Act 1937. The Agmark attempts to provide a third party guarantee for the consumer. It not only certifies the purity of the product but also gives an indication of their quality by the grade-designating mark. The economic incentive to the producer-manufacturer is reflected in the premium the Agmarked product fetches in the market over the ungraded products.

Running parallel to the enforcement of laws, certain measures to complement the effort of achieving the overall objective of consumer protection are also

being adopted. Monopoly procurement of food grains being operated by the Food corporation of India and other state departments achieves the two objectives of ensuring a remunerative price to the farmers and a uniform and reasonable price commensurate with the quality of the produce to the consumers.

The task of consumer education and protection is formidable and the Government machinery alone will be inadequate to accomplish this task. There is a need of active consumers' movement as in other countries. The Consumers' Guidance Society has been established with the objective of educating the consumers about their rights and responsibilities and advising them on the quality of products available in the market. Similarly it has advised the producers and manufacturers to abide by such standards as are necessary for the health and safety of the users.

Co-Operative Marketing

The existing institutional structure of co-operative marketing is such that the co-operatives are functioning at the primary level, at the secondary level (taluka or district) and at the state level. In pursuance of a recommendation of the Dantwala Committee, efforts have been made to persuade the state Governments to divert the middle tier viz. the district marketing federations, of the functions legitimately falling within the purview of the state or primary marketing societies, so that a two-tier system can be brought into operation. The co-operatives in different states have been federated into a central level federation viz. the National Agricultural Co-operative Marketing Federation (NAFED). At the end of 1960-70 as many as 3335 primary cooperative marketing societies were operating. Of these more than 500 were specialized commodity marketing societies for special crops, cotton, fruits and vegetables. In certain states intermediate organizations at district and state levels have also been established. At the end of 1960-70, 232 such societies were functioning. They included some commodity federations also. At the state level 28 apex co-operative marketing federations are functioning. They are normally handling all the commodities. There are a few apex cooperative societies which are handling exclusively a particular commodity *e.g.*, two apex societies in Gujarat are handling cotton, one is handling fruits and vegetables and one in Uttar Pradesh is handling sugarcane only. In order to strengthen and develop co-operative marketing to an extent where it may have an impact on the marketing of agricultural produce, several measures have been initiated. Steps are also being taken to see that there is an effective co-ordination between the state cooperative departments and their counterparts dealing with agricultural marketing. Consequently there has been a significant expansion in the operations of marketing co-operatives. This is exclusive of the value of agricultural requisites and consumer articles handled by the marketing cooperatives. The main commodities marketed by the cooperatives were sugarcane, cotton, oilseeds, fruits, vegetables and plantation crops.

In pursuance of the decision of the Government, a scheme of outright purchases of agricultural produce by the co-operative marketing societies was

launched in 1964-65 in 200 selected marketing societies. The basic theme of this scheme has been to bring the small producers within the fold of co-operative marketing together for such farmers. To provide the necessary financial backing the scheme envisaged the creation of a price-fluctuation fund. The fund envisages meeting losses if suffered by the co-operative marketing societies at different levels as a result of outright purchases of agricultural produce.

The scheme has been operative in several states. During 1969-70 the value of the agricultural produce purchased under the outright purchase scheme was about 34 crores. As a result of this scheme there has been a greater involvement of cooperative societies in the marketing of agricultural produce. Besides this scheme has given impetus to inter-state trade by the cooperatives. They transacted about Rs. 66.55 crores worth of agricultural produce during 1969-70.

Interstate Trade

The co-operative marketing societies are devoting increasing attention to inter state trade in agricultural produce. The main commodities are wheat, pulses, plantation crops, copra, spices, fruits and vegetables. The bulk of the transactions were made by the Punjab Apex Federation. During 1970-71 the NAFED acted as the agency of the co-operatives of Jammu and Kashmir for marketing their apples outside the state.

Co-operative Export of Agricultural Produce

The export of agricultural produce by the co-operative sector continues to be a growing activity.

The bulk of the exports are made by National Agricultural Cooperative Marketing Federation Ltd., which accounted for exports worth Rs. 5.64 crores. Besides, the Gujrat State Cooperative Marketing Federation Ltd., the Khanna Cooperative Marketing Federation Ltd., the Kerela state Cooperative Marketing Federation Ltd., the Jalgaon district fruit sales societies and the coconut oil millers society also cooperated to exports to countries like Kuwait, Malaysia, Ceylon, Singapore, Bahrain, Doha, Dubai, Iran,Muscat. The Khanna Solvent Extraction Plant in the Punjab State exported de-oiled cake worth Rs. 35 lakhs during 1969-70. The main commodities exported by the cooperatives were pulses, chillies, onions, pepper, de-oiled cake, potatoes and kardi extraction meal. The exports were mainly made to Ceylon and other important markets were Mauritius, Kuwait, Doha, Bahrain, Hong Kong, the USSR, the UK, Iran, Czechoslovakia and France. Some of the traditional items of export have been marketed in non traditional areas. Pulses were exported to Cuba and onions to Malaysia and Singapore. The cooperatives also assisted various agencies to export agricultural commodities. In this connection exports of coffee and raw sugar were made.

During 1970-71, NAFED exported agricultural produce worth Rs. 5.26 crores. The Jalgaon District Fruit Sale Societies Cooperative Marketing Federation Ltd., directly exported bananas worth Rs. 34 lakhs to Kuwait and Bahrain Islands.

Co-operative Cold Stores

Co-operatives are also to facilitate the storage and marketing of perishable commodities especially seed potatoes. By the end of the Third plan the cooperatives had established 87 cold stores and the target for the fourth plan was set at 45 more. At the end of December 1971 there were as many as 96 cooperative cold stores with a capacity of 1.42 lakhs tonnes.

4

Role of Agri-business in Agricultural Economics

Agriculture is considered as the backbone of our economy. Pakistani agriculture contributes approximately 20.8 per cent of the country's gross domestic product (GDP), provides large scale employment and fulfills the food and nutritional requirements of the nation. It provides important raw materials for some major industries. Pakistani agriculture faces numerous challenges with a rapidly changing business environment, pace of technological globalization, competitive environment and changing role of government.

Today, agriculture has achieved commercial importance and has changed from subsistence farming, import commercial farming, import oriented to export oriented, supply driven technology to demand driven technology, *etc*. New inputs and new technologies are hitting market every day. The market for processed and packaged food products is increasing day by day and therefore there is a vital need of trained manpower in this business.

Only 9 per cent of total food products are being fresh processed in Pakistan and 2 percent for value addition, whereas 40 per cent food is wasted during packaging and transportation. Many businesses started building up in and around agriculture. This resulted in growth of Agri-business.

Demand for traditional agricultural economics is diminishing, there is a growing need for the economics and management of the food sector and the environment. Departments of agricultural economics have shown great flexibility in including agri-business in their Bachelor's and Master's teaching programs. Ph.D and research programs appear to adjust more slowly to changing demand.

Although agricultural economics programs are providing a variety of service course offerings, opportunities for joint programs with biological, physical, and natural sciences, particularly resource management, are not being exploited. If business schools decide to compete for agri-business students in the future, missed opportunities with other departments and schools may become very costly. If this profession is to remain viable in the long run, it must continue to evolve, developing opportunities with biological, physical, and natural disciplines, in order to meet the demands of a changing market.

Agri-business management is becoming a popular career choice for agriculture students and there is great need to develop the professional agri-business managers who can, not only fill the management requirements of the changing agriculture scenario but also prove to be a great support to the farmers. Agri-business education is a qualification that helps mould the personnel into good managers having managerial expertise.

Agri-business includes all business enterprises that buy from or sell to farmers. The transaction may involve either a product, a commodity or a service and encompasses items such as (a) productive resources *e.g.*, feed, seed, fertilizers equipment, energy, machinery, *etc.* (b) agricultural commodities *e.g.*, food and fibre, *etc.* (c) facilitative services *e.g.*, credit, insurance marketing, storage, processing, transportation, packing, distribution, *etc.* Agri-business can also be defined as science and practice of activities with backward and forward linkage related to production, processing, marketing and trade, distribution of raw and processed food, feed, fiber including supply of inputs and service for these activities.

In a developing country like Pakistan, agri-business system with forward and backward linkages consists of following four major sectors such as agricultural input, agricultural production, agricultural processing-manufacturing or agro processing," and agricultural marketing-distribution sector.

These four sectors act as interrelated parts of a system in which the success of each sector depends, to a large extent, on the proper functioning of the other sectors. Thus, agri-business is all about how to conduct successful business in the food and agriculture related sectors.

Agri-business management is nothing but, the application of management principles for agriculture.

Keeping in view the importance of Agri-business sector Government of Pakistan has launched "Agri-business Development and Diversification Project (ADDP)" a joint initiative of the Ministry of Food, Agriculture and Livestock and the Asian Development Bank. Launched in 2005, the Project aims at enhancing economic growth and fostering employment generation through development of a competitive and sustainable agri-business sector.

For effective coordination with provincial governments and private sector, interventions are carried out through project implementation offices in all the provinces and special areas of the country. Initially focusing on horticulture and livestock and dairy sub-sectors, Project interventions would result in

increased productivity, improved product quality, and value addition by addressing constraints throughout the product value chain from production to markets. The Project strategies are comprehensive and systemic and based on international best practices, designed to minimize market and institutional failures and rigidities.

Under the umbralla of ADDP, Agri-business Support Fund (ASF) was establieshed to provides funds on matching grant basis (non-returnable) for Business Development Services, to individuals & firms engaged in agri-related businesses, enabling them to employ modern techniques & practices and build within themselves the different skills, know-how, expertise and market understanding required by a fast-changing economic environment and to improve their productivity, profitability, competitiveness and creditworthiness.

ASF aims to support employment generation and economic growth by developing a competitive and sustainable agri-business sector in Pakistan and specifically focuses on the areas Horticulture, Floriculture, Livestock (Excluding poultry and fishery) and dairy.

The overall focus of the ASF is to strengthen and support demand driven private sector service delivery mechanisms throughout the agri-business value chain including supply inputs, production, processing, and market access for domestic and export markets. The specific focus is on horticulture and hortibusiness and livestock and dairy business.

AGRICULTURE BECOMES THE NEXT BIG THING

What might Canada's next great growth industry be? Smart phones, oil sands technology, aerospace, alternative energy, nuclear power, biotech? Each of those industries has a "been there, done that" feel about them, even if a couple of them could keep thriving for years to come. Agriculture is the one industry you might not even consider putting on the list.

Most Canadians live in cities and don't think about agriculture. They think food comes from supermarkets. The connection back to the farm, to the export terminals, to the commodity futures markets, to the R&D labs, where seeds are engineered, and to the farm equipment assembly plants is often not made.

Yet Canada has all the ingredients needed to become the world's premier farm-to-fork economy. A new report by Australia's Macquarie Agricultural Funds Management concludes that heroic efforts will be needed to feed a global population that will expand by 40 per cent by 2050. Some countries will struggle to feed their citizens; food riots broke out in dozens of poor countries at the height of the food crisis in 2008.

But others might thrive. Macquarie notes that "those countries with a robust agricultural sector, sustainable farming practices, modern infrastructure, reliable water access and safer political structures will increasingly become the global agricultural powerhouses." The report doesn't specifically mention Canada, but Canada checks off all the boxes, and then some.

Besides vast amounts of land and water, superb infrastructure and technological expertise, Canada has fertilizer and lots of it. Potash, mined in Saskatchewan, is an essential, irreplaceable and relatively rare fertilizer ingredient. Potash Corp. (POT-T141.43-4.78-3.27%) controls as much as 30 per cent of the world's supply and the nutrient is coveted by China, India and other countries with burgeoning populations. It is not just a national champion; it is a global champion, one with a bright future in an essential and expanding industry.

Surprisingly, the Canadian government, which has almost never met a foreign takeover it didn't love, appeared to agree. Late Wednesday, Investment Canada ruled that BHP Billiton's ownership of the company would not provide a "net benefit" to Canada. The decision means BHP's $38.6-billion (U.S.) hostile offer for Potash Corp. is unlikely to go ahead, though the company was given another month to persuade the feds to change their minds. Foreign control of the world's top fertilizer company would undeniably have been a blow to Canada's global agri-business ambitions and Potash Corp.'s desire to build on its commanding position in a strategic resource. It is impossible to exaggerate the importance of potash. Consider that the global population is expected to rise from 6.5 billion to 9.2 billion between 2005 and 2050, which in itself will require a massive amount of extra agricultural production. Additional pressure will come from changing diets. According to the UN Food and Agriculture Organization, global per capita meat consumption is expected to rise to 52 kilograms, from 37 kilos, by 2050. Feeding people more meat is an inefficient use of farmland; it takes eight kilos of grain to produce one kilo of beef.

Now for the really bad news. It's not going to be easy to expand production to stuff all those extra burger-craving mouths. The amount of arable land in the developed world has been in decline since the mid-1980s and a reversal of the trend is unlikely. The arable land footprint is expanding in the developing world, but not nearly as fast as it was a few decades ago. That's because rampant deforestation is no longer an attractive option. Compounding the problem is a lack of water. Water scarcity is reaching crisis levels in some African and Middle Eastern countries. With the amount of arable land increasingly slowly, improving crop yields on existing farmland becomes the default option.

The best way to do so is through irrigation (within the constraints of water supply) or fertilizer, assuming the farmer can afford fertilizer. Spreading nutrients on crops may not improve yields overnight. In some cases, fertilizer has to be applied over several years to improve yields. The point being, much more fertilizer will be required every year to keep the planet fed. As food prices rise, farm incomes should rise too, allowing farmers to afford more crop nutrients.

Potash Corp. is poised to become one of the key players in the global effort to ramp up food production like never before. The world cannot make more land, but Potash Corp. can make more fertilizer. It is encouraging news that the federal government has, in effect, decided that this task should be a homegrown affair. A surefire growth industry for Canada has not been hobbled after all.

MARKETABLE AND MARKETED SURPLUSES

Every agricultural commodity is, in fact, produced for sale in the market to earn some cash income and thereby meet many other family requirements which are not satisfied on the farm.

Even foodgrains which are grown by the farmers are not merely meant for satisfying his own family requirements but are also meant for satisfying the needs of non-farming population in the towns and cities.

But of course, the surplus available for sale varies from farmer to farmer for various reasons. This is also true for other food crops like edible oilseeds, fruits, vegetables, milk, eggs,*etc.*

All the produce of these crops is not available for sale because some quantities are retained for seed purpose, home consumption, gifts to friends and relatives and some quantities are lost due to spoilage, *etc.*

Thus, two concepts viz. "marketable surplus" and "marketed surplus" have been coined to ascertain the quantity of produce available for marketing and the quantity actually marketed.

The quantities are estimated as mentioned below:

1. Production on a farm.
2. Utilization.
   a. Seed purpose.
   b. Home consumption.
   c. Gifts to friends and relatives.
   d. Kind wages to labour. Total (a to d)
3. Marketable surplus (1 - 2)
   Losses due to spoilage
   Marketed surplus (3-4).

CASH CROP OR COMMERCIAL CROP

The larger the quantity actually marketed, greater the cash income to a farmer. Accordingly, crops also came to be known as cash crops, which earn more cash income to the farmers. The marketable or marketed surpluses depend upon type of crop *i.e.*, foodgrain, other food crop or non-food crop. In the case of foodgrain and other food crops, the surpluses are generally less on small and marginal farms and their proportions very widely according to the size of holding and other related factors. But in the case of non-food crops viz. Cotton, sugarcane, *etc.*, which are used as raw material in agro-based industry, almost all the production is available for sale except small quantities kept for seed. In these crops, marketable surpluses are nearly 100 per cent. Such crops are called as cash crops or commercial crops. On the same analogy, even food crops with large marketable surpluses (say above 50%), can be regarded as cash or commercial crops.

As a result of the development of these two concepts, the studies regarding marketable and marketed surpluses have aroused interest in the minds of

researchers in Agricultural Marketing with a view to identify or categories certain crops as cash crops or commercial crops. Identification of certain crops as commercial or cash crops has many policy implications from the point of view of development of good organized markets and other infrastructure facilities such as roads, storage's (including cold storage's for perishables), communication, market information, banking services, *etc.*

Marketable and marketed surpluses of some commodities are given in the table. Following inferences emerge from this table:

1. Marketable surplus for foodgrains, particularly in a deficit state are low and such crops may not be considered as commercial crops in that area. But in Punjab, wheat which is a foodgrain crop is a commercial crop as its marketable surplus is around 85%.
2. All fruit crops are definitely commercial crops because their marketable surpluses are above 96%.
3. Similarly, vegetables are also commercial crops, which is evident from their marketable surpluses being above 96% and marketed surpluses above 85%.
4. Special mention needs to be made about milk. Some 25-30 years back, dairy activity was just carried out as subsidiary to crop production to meet the family requirement of milk and no surplus. But after the development of new high yielding cow and buffalo breeds, improvement in feeding and management practices of milk animals, certain of marketing facilities through Govt. Milk Schemes and Producer's Co-operatives, the milk production has increased very rapidly. It has spread in the rural area and it has now become an important commercial activity as can be seen from the marketable surpluses ranging from 77% to 92% with the farmers. On some farms, where number of crossbred cows or pure buffaloes is more than 5, dairy has become main enterprise surpassing crop production. Diary has assumed a commercial status providing regular cash income to farmers and employment to his family.

Some oil seed crops like groundnut, sunflower, safflower, soyabean, castor and other crops like cotton and sugarcane are also recognized as commercial crops as the marketable surpluses in them are almost 100% and therefore they are cash crops for the farmers. In addition, there are some crops, which are grown in small pockets, but they have large marketable surpluses and hence they are cash crops for farmers in those areas.

AGRICULTURAL GROWTH AND PERFORMANCE

While the above analysis has provided a general view of the impact of economic reforms, this chaper examines agricultural growth and performance in the states of Bihar, Karnataka, Tamil Nadu and Punjab with their attendant policy implications. The yields for various crops in these states differ greatly. While Tamil Nadu had the highest yield in rice, oil seeds and sugarcane, Punjab

enjoyed the highest yields in wheat, coarse cereals, pulses and food grains. Karnataka on the other hand is seen to do well in cotton and Bihar performed quite well in pulses and coarse cereals. Further analysis and findings by Kalirajan and others (2001) show that Punjab had made remarkable achievements on the agricultural front while Bihar had remained stagnant in the last two decades, with Karnataka and Tamil Nadu showing moderate achievement. Clearly, differences in physical endowments, climatic conditions and institutional characteristics are some of the reasons for the varying productivity performance. Thus, having across the board economic reforms is likely to work less effectively than state-specific policy measures that enable each state's agricultural yields to reach their full potential. The comparative advantage of each state's agricultural production should be determined and with inter-state restrictions removed, total agricultural output would see a very significant increase.

For example, Karnataka with less favourable soil and water resources should be given incentives to concentrate on agro-processed products and corporate agriculture in horticulture, floriculture and animal husbandry, or to undertake watershed development to help with dry land agriculture. Many studies have indicated that with watershed areas, productivity growth has been mainly due to seed and fertilizer use. Thus, this state has to be given input subsidies for high yielding seed varieties but at the same time, the farmers need to be educated on the over use of chemical fertilizers.

With Bihar, agricultural performance is problematic on many fronts. First, although demographic pressure has increased and agricultural technology has improved, most of the uncultivated land is concentrated in southern Bihar, where irrigation facilities have not kept pace and the soil is of poor quality. Given the physiography of southern Bihar, wells are also unsuitable and thus the dominant mode of irrigation has been through tanks whose expansion and maintenance has been neglected. Second, the infrastructural facilities of Bihar have been lagging as seen by the infrastructure development. Due to infrastructural bottlenecks, availability of modern goods and services has not increased or their supply remains costly or unreliable.

Third, agriculture in Bihar is dominated by small and marginal farmers and the prevalence of mass poverty is largely related to the backwardness of agriculture. Fourth and importantly, the state agricultural policies in Bihar are in dire need of review. The semi-feudal production condition still exists in rural areas and the ineffective protection of tenancy rights has hindered agricultural growth. The slow pace of land consolidation reflects inadequate financial outlays and a shortage of manpower. Kalirajan and others (2001) note that marketing and extension services in Bihar are also rather weak compared to the other states.

Punjab on the other hand, was one of the few states which enjoyed the success of land reforms and the high priority of investment in rural infrastructure. Also, the irrigation base of the small and medium sized farms was comparable to that of large farms. In addition, the Punjab Agricultural University at Ludhiana contributed to the development of new seed varieties.

However, there are clear signs of a decline in crop yields since the 1990s and this has been associated with the increasing use of fertilizers and excessive water use which have increased the unit cost of production as a result of declining soil quality. Hence, care is needed when providing further input subsidies in fertilizer and water use. Another related fact is the steep increase in wages in Punjab and in the absence of productivity increases, the cost increase has affected the profitability of farmers. With Tamil Nadu, the main crop has been rice as this state is blessed with two monsoons. But from 1992-1997, there has been a steady decline in the areas irrigated by canals and an increase in well-irrigated areas while the use of tanks remains an unreliable source of irrigation. However, major improvements in about 10 rice varieties released in the early 1990s can be expected to improve productivity growth in rice production although pests and diseases as well as imbalance in the use of fertilizers are major constraints. Thus Tamil Nadu could do with subsidies of pesticides and farmers should be educated on the more effective use of fertilizers to obtain high yields. Interestingly, the cropping pattern of late has shown increasing substitution of food crops by commercial crops but there is concern that the benefits will reach farmers only with the development of adequate infrastructure such as roads and markets. However, that Tamil Nadu has a higher index than the all India average of infrastructure.

Challenges of Globalization

It is important to realize that globalization poses many challenges to a developing country like India, which had relied on a state directed and regulated policy regime for more than four decades. In moving to a more open, market-based economy there are many transitional problems that the country has to manage. The Government must play a pro-active role in facilitating the globalization process so that the opportunity sets for the economic agents are widened and the adverse effects of globalization are minimized. The Indian Government must also prepare the necessary information base and develop its capacity to articulate India's concerns and policy trade-offs in the international forums for multilateral trade and environmental negotiations.

In addition, the Government should embark on an extensive programme to educate farmers on the need to meet the standards required in the export markets. In fact, India needs to seek technical assistance in creating the capacity for meeting such standards and to consider watershed developments for environmental considerations. Equally important is the need to disseminate information about possible export markets to farmers, so that market access is achieved at minimum cost. Given the requisite information about markets and profitability, the likelihood of farmers investing in post-harvest and processing technologies and storage and efficient transportation arrangements as well as developing supporting infrastructure is very high.

Although the brave and bold move by India to reduce the tariff rate for agricultural products from 113 per cent in 1990-1991 to 26 per cent in 1997-1998 deserves to be applauded, the question of whether India is ready to compete

in world markets remains to be seen. The infant industry argument may still hold for India to shield itself from external competition but one can easily question the length of time that is required to that end. Also, a delay in opening up to foreign trade has the danger that local producers may become too complacent and never be ready for competition.

As India opens up externally, it is also expected to face vulnerability in the wider international price fluctuations and thus Acharya (1998) claims that a minimum price support scheme is important. These prices can also act as a signal to adopt modern inputs and invest in yield-raising infrastructure for increasing production. For instance, keeping basic staple food grains at reasonable prices would induce farmers to switch over to high value crops. However, during the 1990s, Kalirajan and others (2001) shows that procurement prices especially for rice and wheat have been increasing faster than the general price level. Such high prices along with guaranteed purchases by the Food Corporation of India have pushed up market prices. These higher prices are partly responsible for the large buffer stocks with the Food Corporation. If this trend continues, India's comparative advantage will be eroded.

With openness and high price instability, unstable export revenue can also be expected. One way of reducing such risk is for India to diversify her agricultural exports. For example, since 1990, even in commodities such as tea, coffee, cocoa and spices, where India is supposed to have a comparative advantage international prices have been unstable. Besides increasing the type of exports to obtain more export revenue, India should also seriously consider exporting more value added agricultural products through agro-processing such as processed vegetables, fruits, fish and meat products given that export or even local demand for basic agricultural products would decline as incomes rise. The move to higher value added activities within the agricultural sector also spells greater opportunities for industrialization and vice versa as borne by Kalirajan and Shand's (1997) findings of a bi-directional relationship between agriculture and industry for most Indian states. On the other hand, Sivakumar and others (1999) establish empirical evidence of high forward linkages of agriculture due to the presence of agro-industries while Satyasai and Viswanathan (1999) show the significance of the spillover effects to the industrial sector via the intensive use of purchased inputs in the agricultural sector.

The lack or slow pace of internal or domestic liberalization is also seen to hinder the possible gains from external or trade liberalization. For example, although central zoning restrictions have been abolished, state government restrictions on inter-state and even inter-district restrictions on marketing and movement of goods still exist in many cases. This interferes with the benefits from crop specialization and economies of scale arising from comparative advantage. The land market is another example of distortion whereby land ceilings exist preventing the operation of large-sized farms. This has led to the emergence of a large number of small economically unviable land holdings. The easy leasing of land should be permitted with assurance of resumption. Yet

another problem lies with the insufficiency of credit to agriculture. From 1995-1996, the Rural Infrastructure Development Fund was set up to allocate funds for the completion of projects and the government has committed itself to strengthening the cooperative credit structure through substantial refinancing and restructuring of the Regional Rural Banks. However, as mentioned earlier, due to varying institutional factors in the Indian states, these domestic reforms can be expected to yield quite different results.

Although India missed the opportunity to open up two decades ago, its attempts to do so now must be regarded as better late than never. Others such as Desai (1999) observe that, "the logic of the global economy as well as India's interests dictate that India become proactive in its liberalization policies. India must liberalize not because it has no choice but because it is the best choice".

His lament that India has adopted a 'victim mentality' when it really needs to adopt a 'winner mentality' has become less of a concern as over time, India has shown commitment to stay on the bandwagon of globalization. Having realized that globalization is a necessary but not a sufficient condition for high growth production, India has undertaken economic reforms, both internal and external. However, it must be ensured that these reforms are synchronized so that the pace of both reforms is set right in order to work hand in hand to promote agricultural productivity growth.

Thus, training the farmers and educating them appropriately to change their mindset and reorienting them to take up new activities or adopt foreign technology is of utmost importance. In this context, it is necessary to involve non-governmental organizations in training and mobilizing the rural poor to face the challenge of liberalization.

Also, with domestic economic reforms, more care needs to be exercised to draw up state-specific liberalization measures to maximize their benefits. Lastly, in the implementation of these reforms for successful globalization, one crucial element, not entirely within control is the need for good governance and stability in the political and economic environment. Political leaders who are the ultimate decision makers in these matters need to examine their own role dispassionately.

It is quite apparent that at this relatively early stage, there is little observable evidence of gains to India's agricultural performance after opening up. However, there could easily be benefits that have not yet surfaced, or are yet to be identified and perhaps too difficult or intangible to measure.

Whatever the case, it is highly likely that it is too soon to assess the full impact of globalization and economic reforms. Furthermore, the process of liberalization has been gradual and remains incomplete. For example, the complete removal of quantitative restrictions after March 2001 will have provided an opportunity for Indian farmers to tap world markets and, if they are successful, results should start to become evident soon. Export promotion via the development of export and trading houses as well as effective liberalizing export promotion zone schemes for agriculture are fairly recent measures and only time will tell as to how effective these measures are. Other possibilities such as agro-industry parks for promoting exports are also in the pipeline.

AGRICULTURAL DEVELOPMENT STRATEGIES

The lack of development in African countries has caused their economies to fall further and further behind those of the leading industrial nations. Many different development strategies have been tried. Some African countries have successfully encouraged investment in mining, tourism and industry. In agriculture, producers have been encouraged to move away from subsistence farming towards a more commercial approach as governments realised that income generated from the sale of surplus production could be used to improve productivity.

Agricultural development in ECA has faced an uphill struggle for the last twenty years. In an effort to stimulate development many countries borrowed heavily from bodies such as the IMF and from the commercial banking sector. These loans were not granted without strings attached, however. Most African countries were obliged to liberalise their economies by adopting significant policy changes often applied in packages known as Structural Adjustment Programmes (SAPs).

These programmes included a number of elements but generally included requirement to:

- Devalue the currency (to discourage imports and make exports more competitive),
- To make the currency freely convertible with other currencies,
- To cut public expenditure (in order to lower taxes),
- To dismantle state controlled marketing boards,
- To privatise state-owned industries (to raise capital and stimulate competition),
- To cut import restrictions (to encourage local industries to become more efficient),
- To allow foreign companies to freely repatriate profits (to encourage inward investment),
- And to boost exports.

The economists who designed SAPs were convinced that the only way African countries could transform their economies was to encourage inward investment and earn foreign exchange to invest in infrastructure and lay the foundations for industrialisation. These measures assumed that any country could compete in the world market if production and investment was concentrated in areas where they were deemed to have a competitive advantage. The only activity in which ECA nations could be said to have a competitive advantage in the world market was in the production of agricultural products and the exploitation of natural resources such as forestry, fishing and mining. The major flaw in this strategy was that similar advice was given to almost all tropical countries at the same time. Coffee-producing countries were encouraged to boost coffee production; sugar producers should produce more sugar, and so on. This resulted in over-production of these commodities which caused prices to plunge in the international markets. On average, current prices of tropical products (taking

dollar inflation into account) are only about one seventh of those prevailing in 1980 (UN General Assembly). Economists call this phenomenon the fallacy of composition - less income is earned as more commodities are produced.

Another component of SAPs which many observers believe to have been counter-productive was the requirement to cut public expenditure. All too often this meant a cut in health programmes, education and agricultural extension. These measures have tended to reduce, rather than enhance the flexibility of the workforce and to curtail agricultural development. Overall, the record of inward investment has been poor and the ending of currency controls has increased opportunities for transfer pricing abuse (where companies over-price imports and under-price exports to reduce tax liability).

The most important SAP reform affecting the distribution of agricultural products has been the dismantling of state-controlled marketing boards and the practice of setting fixed purchasing and sales prices for commodities. It was assumed that government control of markets had obscured the forces of competition in supply and demand in the economy. A free market system would unleash these forces and increase productivity. It would force producers to meet the demands of consumers both in price and quality. Farmers would be able to buy inputs cheaper from competing suppliers, and the country, as a whole, would become more competitive in world markets. Unfortunately, competitive and transparent markets did not emerge spontaneously (Shepherd). Most African farmers have too little land to produce truck-loads of goods and they are widely dispersed over the countryside. There is not enough business to encourage more than one trader to operate in many areas. Farmers have no means of communicating with the outside world or even the nearest town and they are often unwilling to risk the investment of bringing their goods to market resulting in considerable waste. Laws may have been passed which ban collusion among traders to pay low prices to farmers and charge high prices to consumers, but there are often insufficient resources to enforce such laws. Most traders have no experience of free market conditions and are reluctant to put their fellow traders out of business with serious competition.

Advocates of SAPs point to examples of countries that have improved their economies after adopting SAPs (World Bank) but there are few in Africa. Most ECA countries were not able to implement SAPs until relatively recently but rates of poverty have increased in many of these countries. Intense conflict, both within and between countries of the region, drought, desertification and, now HIV/AIDS have further weakened economic development in ECA. Most critics of the reform process, however, acknowledge that markets in African countries must be made more competitive and SAPs are designed to do that but this process may take a considerable time.

Trade Agreements

Economic links between ECA countries and their former colonial rulers have been maintained since independence. The economies of these countries have

been moulded to meet the needs of their European counterpart for a hundred years or more and it would have been difficult for them to make the necessary changes in production patterns to trade successfully with other countries. The Europeans too needed to maintain supplies of raw materials and export markets in Africa and to protect the business of their trading companies.

In 1975 all ten countries covered by this study became party to the Lomé Convention. The Convention established trade, aid and cultural relationships between 15 European countries and 71 so called ACP (African, Caribbean and Pacific) countries which had either been colonies of, or had had strong historical links with, Europe.

This agreement did not rule out bilateral or multilateral agreements with other countries but did give ACP countries preferential access to European markets. ECA countries have also decided to try to stimulate regional trade by bringing their economies closer together in regional economic agreements such as COMESA and SADC.

East Africans have exchanged goods and ideas with many other peoples of the world for millennia. In these exchanges of goods, cultural links have been established which have influenced ECA life at all levels – in religion, the arts, public sector structures, the economy and agriculture. In the last decade or two, however, this process has accelerated tremendously. There is no agreed definition of globalisation.

It is simply a term which has been used recently to describe the impact of innovations in communication and transport systems on trade and the growing interdependence of nations due to economic sophistication and burgeoning output. In addition, high levels of protection between trading blocks of countries are breaking down as barriers to trade are reduced. These changes have made it possible to increase the volume of trade between countries in agricultural products.

It became clear that overall levels of trade could be increased if trade barriers were reduced, where there was agreement to do so, and that international trade should be governed by mutually agreed rules. The most active trading nations have been keen to find new markets for their goods and to reduce the barriers to free trade. These countries, however, have been reluctant to expose their own markets to foreign competition, especially unfair competition from subsidised or sub-standard goods.

At the international level, global liberalisation was stimulated by the General Agreement on Tariffs and Trade (GATT) which was first implemented in 1948 as a mechanism to promote free and fair trade among member countries. Several rounds of negotiations of trade rules have occurred throughout the history of GATT. The Uruguay Round, which began in 1986, was the eighth of the GATT rounds. In April 1994, officials from more than 100 countries gathered in Marrakech, Morocco to sign the Uruguay Agreement and to confer the role of further trade reforms on the newly established World Trade Organisation. The reform process is by no means complete. Almost all countries have now

committed themselves to the objectives associated with their membership of the WTO. (6 out of the 10 countries covered in this study are WTO members). In order to meet these objectives, countries are obliged to further reform their existing internal economic and external trade policies. The future of trade and agriculture in ECA is inextricably linked to the rate and direction of these reforms.

5

Capital Formation in Indian Agriculture

Growth of any economy or sector primarily depends on three factors, namely, change in the demographic composition (expansion of workforce), capital accumulation (both physical and human) and innovation. Capital is thus one of the most crucial factors in the growth/production process. It is a fact that during the green and post-green revolution periods, both public and private capital formation in agriculture made significant contribution to the farm sector's growth. Initially, agricultural development was mainly driven by public investment in: (i) agricultural infrastructure (like power, roads, irrigation and R&D), (ii) extension services, (iii) development of markets and storage facilities, *etc.* Subsequently, encouraged by their increased returns owing to improvements in infrastructure by such investments, farmers were induced to make private investment in land development, groundwater irrigation, farm mechanization, HYV seeds, chemical fertilizers, *etc.* More recently, private corporate sector also entered into the agricultural R&D, extension, marketing, contract farming and other agricultural related services. These investments have substantially supplemented the public investment in agriculture.

The above outline suggests that although agriculture is relatively a labour intensive activity, it also requires huge amount of fixed as well as working capital to perform various agricultural operations efficiently. In particular, timely investment is crucial as it is linked to seasonal factors like rain and weather change. While big and rich farmers usually have better access to capital inputs and enjoy the benefits of economies of scale, the poor farmers belonging to the

'small and marginal farmers' segment especially in the underdeveloped agricultural regions, face critical scarcity of capital. Further, as in most other cases, they do not have the ability to make investment in fixed assets. In view of this, any investment made by them cannot be economically viable in view of their small size of operational holdings and low investment capacity. In the face of this ground reality, how to make capital affordable to about 80 percent of small farmers is one of the key issues that need policy attention. Against this background, the present unit aims at discussing the various aspects related to capital formation in Indian Agriculture. Apart from an outline of the concepts, processes and measurement issues of capital formation, we will study about the role of capital formation, determinants of private capital formation, trends in capital formation, flow of institutional credit to agriculture, *etc.*

CONCEPTUAL OUTLINE

There is a distinction between the term capital and capital formation. There are also associated concepts like: fixed/working capital, public/private capital, investment, gross/net fixed capital formation, consumption of fixed capital, *etc.* Generation of data on capital and capital formation, and its usage, requires a clear idea about these concepts.

Capital

The term capital connotes those 'assets' which are used as inputs in the process of production to generate further goods and services. It is thus not the same as money but refers to assets for the generation of which 'investment' of both money and human efforts are required. A second characteristic of capital is, thus, that the asset must have been created by 'human efforts' and not available in a natural form. Thus, although land is the most important basic resource in agriculture, land itself is not considered capital. But any investment made on land development would be termed as capital as it satisfies the criteria of 'human efforts' and an 'asset' useful in the agricultural production process. Further, capital can be tangible or intangible. Tangible capital in agriculture refers to productive physical assets like tractor, irrigation pumpsets, farmhouse buildings, warehouses, inventories of inputs, *etc.* Intangible capital in agriculture refers to investment made in health, education and training of farm workers. Indeed, expenditures on such aspects increases the 'human capital' base of agriculture which help the farmers to raise their productivity by adopting new technologies and farm management practices.

Capital Formation

Capital formation, on the other hand, is a process of building up the stock of capital. It is achieved by saving a part of current income of the economy and investing it in the making of capital goods like machines, tools, plants and equipments, transportation, storage and communication facilities, *etc.* An increase in the capital stock depends on the amount of new investment made in

a particular asset. It is important to note that the capital assets used in production are consumed with time which depreciates its value. This is called as 'depreciation'. Hence, if the rate of capital consumption (depreciation) is lower than the rate of additional investment made in the capital, then the stock of that capital will be increasing over time. Such investments could be for the maintenance of capital assets (which increases the life span and quality of working of the assets) and/or for the purchase of new assets. Capital formation, thus, directly depends on the amount of investment made in the capital assets during a financial year. There is a conceptual difference between capital and investment. Investment is a flow concept measured over a period of time, usually during a financial year. On the other hand, capital is a stock concept measured at a point of time, usually at the end of a financial year. Note that capital formation contributes significantly to the process of economic development by: (i) helping to build the physical infrastructure; (ii) facilitating the adoption of modern production techniques and methods; (iii) improving the productive capability of workers; (iv) enabling the efficient use of natural resources; and (v) facilitating the adoption of technological changes raising as a result the farm production, productivity and income.

Types of Capital and Capital Formation

Capital used in agriculture can broadly be classified into two categories: (i) fixed capital and (ii) working capital. Fixed capital is that capital which lasts for more than one year. It includes the investment in farm machines such as tractor, pump-sets, and other assets like tube-wells, land development, farm building, *etc.*

Working capital is that capital which lasts for less than one year such as expenses on seeds, fertilizers, wages to the workers, *etc.* Thus, capital formation in agriculture comprise of additions to the fixed capital less disposals and change in inventories. Inventories include materials and supplies meant for intermediate inputs in production and finished goods for sale (*e.g.*, packaging). Fixed capital formation consists of net addition to fixed assets (*i.e.*, total addition minus depreciation) in the current year. For the stock of capital to be maintained, additional investment equal to the amount of capital consumed (*i.e.*, depreciation) should be made in that year. Fixed Capital Formation can further be classified into Gross Fixed Capital Formation (GFCF) and Net Fixed Capital Formation (NFCF).

The GFCF consists of sum of all additions to the existing stock of fixed capital in the current year while NFCF refers to GFCF net of depreciation in the current year. Depreciation [*i.e.*, consumption of fixed capital (CFC)] is calculated only for all fixed assets (tangible and intangible). In particular, CFC is not calculated for: (i) valuables that are acquired (as their value, in real terms, is not expected to decline over time); (ii) livestock; (iii) non-produced assets, such as, land, mineral or other deposits; (iv) work in progress; and (v) value of fixed assets destroyed by acts of war or major natural disasters.

Capital, on the basis of ownership, is categorised as private and public. Capital owned by local, state and central governments, such as, municipal sewage lines, dams, power projects, roads, canals, warehouses, market-sheds, *etc.*, are public capital. Any capital owned by private individuals/companies, such as farm machinery and equipment is termed as private capital. Both public and private capital is necessary for the development of agricultural sector.

Sources of Capital Formation

There are two sources of capital formation: domestic and external. Domestic sources comprise of: (i) voluntary and involuntary savings, (ii) public borrowings, (iii) activation of idle resources, and (iv) deficit financing. There are two major sources of voluntary savings *viz.*, household sector and corporate sector; the two together contributes to about 90 percent of our total savings with the 'public sector' occupying the third position accounting for the remaining 10 percent of total savings. Of these three constituents, the household sector's saving accounts for the highest (around 60 percent). As we know, the household sector's savings depends upon distribution of income and wealth in the economy, per capita income, propensity to save, availability of banking infrastructure, rate of interest, *etc.* It also depends on non-economic factors like savings for children's education and marriage, health and old-age security, *etc.* The corporate sector refers to the non-governmental private companies. Involuntary savings are mobilized by the government through instruments like taxation and compulsory savings (*e.g.*, provident fund). Public or government borrowing refers to mobilisation of savings through issuing of bonds (*e.g.*, infrastructure development bond). Activation of idle resources refer to engaging surplus agricultural workforce in works of productive asset creation like construction of roads, tube-wells, canals, school buildings, *etc.* Recall that the Lewis theory of unlimited supply of labour is based on this idea. Finally, the government can also raise capital through deficit financing which could be used to generate productive assets in the public sector. External sources of capital formation include: (i) foreign direct investment (FDI), (ii) external government borrowings (EGBs), (iii) External Commercial Borrowings (ECBs) and (iv) development assistance from international institutions like World Bank, NRI deposits, *etc.* FDI inflows can be an important source of capital formation in developing countries. These inflows not only help to reduce the capital scarcity but also bring technology, management practices and trained human resource. They can also have a positive impact on the performance of domestic companies. This is particularly true when the domestic companies enter into collaboration with the foreign companies. EGBs refer to financial resources raised by the central and state governments from foreign institutions like the World Bank for the development of infrastructure like water and sanitation projects, road, health and power projects, *etc.* ECBs are private sector borrowings from abroad which could be used for investment purposes. All these help to increase the capital-base of the economy.

SYSTEM OF ACCOUNTING FOR CAPITAL FORMATION

In India, the annual publication National Accounts Statistics (NAS) published by the Central Statistical Organization (CSO) presents data on capital formation in the Indian economy for all industrial sectors including agriculture. The CSO largely follows guidelines of the United Nations System of National Accounts (UN-SNA) which revises and improves the SNA periodically. Recently, the UN has recommended the SNA-2008. In the CSO's current estimates, which are based on new base year 2004-05, the recommendations of SNA-2008 are incorporated to the extent of availability of data. These relate to treating R&D expenditures in public sector as capital expenditures, adopting the declining balance (of life of assets) method for estimating the consumption of fixed capital and capital stock, *etc.* For the purpose of estimation of national accounts in the NAS, the economy is divided into 9 sub-sectors *viz.*: (i) agriculture, forestry & fishing; (ii) mining and quarrying; (iii) manufacturing; (iv) electricity, gas & water supply; (v) construction; (vi) trade, hotels & restaurants; (vii) transport, storage & communication; (viii) financing, insurance, real estate & business services; and (ix) community, social and personal services. The capital assets of these sub-sectors are valued at market prices (both at current and constant prices). In particular, the estimates of gross fixed capital formation (GFCF) are prepared separately for each of the three institutional sectors, namely, public sector, private corporate sector and household sector. The GFCF in the household sector is estimated from the data collected through various NSSO surveys. This is then inter/extrapolated with the observed growth in gross value of output or value added. Estimates of public sector GFCF are based on the annual budget documents, while data on private corporate sector GFCF are provided by the RBI.

The public sector GFCF in agriculture is mainly due to major irrigation projects undertaken by the departmental commercial undertakings. The contribution of small scale works like minor irrigation, horticulture, livestock and development of government farms is accounted for by the non-departmental commercial undertakings. For accounting purposes, expenditure made by the ministry of agriculture, rural development, *etc.* [on crop husbandry, soil and water conservation, preservation of wildlife and other agricultural programmes (leading to tangible or intangible assets)], is accounted for as capital formation in public administration (and not agriculture). Capital formation in the private corporate sector due to plantation activities is estimated by collecting the data from the tea, coffee and rubber boards.

In the household sector, capital formation is due to construction activities such as digging of wells/tube-wells, construction of bunds and farmhouses, *etc.* These are estimated by using the results of All India Debt and Investment Survey (AIDIS) conducted once in ten years. For the post-survey years, the estimates are made by projecting the base year results using the indices of rural construction and agricultural production specially computed for the purpose. Acquisition of

agricultural machinery and transport equipments are estimated by extrapolating the AIDIS results by using the results of Annual Survey of Industries. Increment in livestock is estimated by extrapolating the results of livestock censuses conducted once in five years. As most of the forests are owned by the government, the estimates of capital formation for forestry is compiled from the budget documents. For fishing activities, the GFCF is estimated as net addition to capital stock comprising of the mechanised and non-mechanised fishing boats, *etc.* by using the results of Indian Livestock Census (ILC). Once again, for the pre/post-census years, the results are extrapolated.

Capital Formation in Agriculture and for Agriculture

A distinction has recently been made between capital formation *in* agriculture and *for* agriculture. This is due to an opinion among experts that capital formation in some industries/activities also benefits the farm sector and therefore a part of such capital formation should be accounted for in agriculture. In view of this, the government constituted a committee headed by Prof. B. B. Bhattacharya. The committee, in its report (2004), broadened the scope of agricultural capital formation by including all those activities which indirectly helped the agricultural sector to raise its production/productivity. Classifying the agricultural capital formation into two categories *viz.*, capital formation in agriculture and capital formation for agriculture, the Committee estimated the proportion of GFCF of many industries which should be taken as 'GFCF for agriculture'. The industries considered for this purpose are: (i) fertilizer and pesticides, (ii) electricity/gas/water supply, (iii) construction, (iv) trade, (v) railways, (vi) storage, (vii) communications, and (viii) banking and insurance. Table shows the proportion of GFCF estimated to be taken for agriculture in this regard. While for agriculture and agricultural machineries sectors this proportion was 1.0 (*i.e.*, 100 percent), for fertilizers and pesticides it was highest at 0.96 (*i.e.*, 96 percent). The proportions recommended for other sectors in descending order of their values are: storage (69.3 percent), trade (24.5 percent), communications (9.1 percent), construction (8.8 percent), electricity (8.6 percent) and banking & insurance (5.3 percent). The suggested method of adding on to the GFCF of agriculture from the capital formation in the other sectors would, thus, amount to presenting a more realistic estimate of the GFCF for the agricultural sector.

Table: Sector-wise Proportions of GFCF for Agriculture.

Sector	Agriculture, etc.	Agricultural Machinery	Fertilizers & Pesticides	Electricity, Gas & Water Supply	Construction	Trade	Railways	Storage	Communication	Banking & Insurance
Proportion of GFCF	1.00	1.0	0.9616	0.0855	0.088	0.245	0.066	0.693	0.091	0.0525

ROLE OF CAPITAL FORMATION IN AGRICULTURE

Capital and labour are the two important factors of production. To some extent, they are substitutable but to a greater extent they are complementary to each other. Both fixed capital and working capital are required for agriculture to perform its various operations in a timely and cost-effective manner. This is also needed for augmenting agricultural production and productivity by way of raising the cropping intensity, changing the cropping pattern and reducing the pre and post-harvest losses. In brief, therefore, capital formation in agriculture helps to bring technical progress by shifting the production frontier upward. It does this by providing several benefits like: (i) increase in yield; (ii) timely completion of farm operations; (iii) maximum possible land utilization; (iv) shift in the cropping pattern; and (v) diversification of agriculture. The capital formation thus facilitates to expand agricultural market as these benefits result in more marketable surplus. The market expansion, in turn, not only raises the farm income but also provides easy access to agricultural products to the consumers. In the process, it helps to ensure food security for the growing population and raw material security to the agro-based industries. Capital formation also helps in improving the quality of agricultural produce through better storage and transportation facilities. These, in turn, increases the prospects of agro-exports. India can play a major role in global market for farm products as it has a fairly large land area and large labour force under agriculture. The role of GFCF in contributing to the growth of the sector can also be explained in terms of the types of capital in general and the complementarity that exists between the public and private capitals in particular.

Fixed Capital and Working Capital

Fixed capital comprise of investment made in machines, tools, farm building, tractor, land levellers, cultivators, harvesters, dug well & tube well, irrigation structure, tree-stock, livestock, land development, soil & water conservation harvesting structures, *etc.* These are assets created which would help raise the farm production, productivity and income. Likewise, working capital helps to purchase various farm inputs such as seeds, fertilizer, pesticides, irrigation water, hiring of agricultural labour, hiring of machines and draught power. Easy access to these inputs and resources is necessary for the timely performance of various agricultural operations. In other words, without access to fixed and working capitals, it would not be feasible to do farming.

Public Capital and Private Capital

It would be helpful to assess the role of capital formation in agriculture, if we classified the capital formation into two categories *viz.*, public and private sector capital formation. Public sector capital formation comprise of investment made by central, state and local governments for creating the various tangible and intangible assets. These could be by way of: (i) land development, (ii)

minor and major irrigation projects, (iii) soil and water conservation and harvesting works, (iv) afforestation, rural roads and electrification of villages, (v) agricultural research and development, farmers' training & capacity building, *etc.* You can see that all these investments/assets are of such a nature and magnitude which only the public investment can create. They are also of the nature of 'non-excludable public goods' for which reason alone one can argue that only the state can be expected to play this role. Private capital, on the other hand, are investment made by farmers for irrigation like wells, bore-wells, electric motors, diesel engines, tractors and other farm equipment. It also includes expenditure on land development, farm buildings, *etc.* The working capital includes farmers' purchase of various inputs needed. Investment for agriculture would include investment made by the private companies in manufacturing farm machines, tools and other inputs, besides a certain share of investment in storage and markets. It is, therefore, clear that both public and private investment in agriculture is necessary for energizing the agricultural operations.

Complementarity between Public and Private Capital

Public and private investment in agriculture is both complementary as well as substitutive. There are instances where an increase in public investment has led to increase in private investment in agriculture. For instance, the government investment in irrigation, roads and power projects are observed to induce private investment in agriculture. In other words, if basic agricultural infrastructure is created by the government, farmers would get incentive to invest their private capital for buying tractors and pump-sets and installing tube-wells in the canal command areas. This suggests that the complementarity effect is seen by way of induced investment by individual farmers in agriculture. On the other hand, public investment can also be considered as a substitute of private investment in agriculture. For instance, if government installs deep tube wells, especially in the canal command areas with the purpose of supplementing the surface irrigation and ensuring assured supply of irrigation water for agriculture, the farmers would not need to make their own investment in groundwater irrigation. Farmers generally make investment in fixed and working capital where they are purely in private domain, whereas public investment is done to create assets of a type that are mostly in public domain. The assets created by public investment may be used by the farming community with or without user charges. Examples of such usage can be cited in canal irrigation, soil & water conservation structures, agriculture research & extension services, rural roads, electricity, *etc.* Some studies have estimated that the elasticity of private investment to public investment in irrigation and power are about 0.15. Thus, while an increase in public investment has a positive impact on private investment, there could also be situations where the private investment may increase to compensate the decline in public investments. However, such situations are unlikely to be in the larger community interest but more for private self-serving nature. In other words, asymmetry in the impact of increasing and decreasing public investment

on private investment are real. Public capital is used for the larger purpose of development of new seeds, technology, inputs, agricultural services, and agricultural markets. Even though access to the new technology and inputs to the farmers is also provided by private agri-business companies and input dealers as is the case under contract farming, there can be no substitute for the larger purpose of a general kind that the public investments generate.

IMPACT OF ACCESS TO INSTITUTIONAL CREDIT ON CAPITAL FORMATION

Access to credit facilities is one of the key determinants of private capital formation in agriculture. Farmers' credit needs are met by institutional and non-institutional sources. Non-institutional sources of credit comprise of loan taken by the farmers from money lenders, input dealers, traders, relatives, *etc.* Institutional sources consist of commercial banks, cooperative banks, regional rural banks (RRBs) and cooperative credit societies. A majority of Indian farmers do not have access to the institutional credit and hence they mostly rely on non-institutional sources who charge very high interest rate ranging between 36-60 percent per annum. Consequently, most of the farmers come under the debt trap and find it difficult to get out of it. Of late, coupled with conditions of uncertain market trends, this has become a major reason for farmer's suicides. Although, agriculture is in the priority sector and 18 percent of total institutional credit flow is targeted for it, the bank credit to this sector has never reached this level. Ignorance of farmers, cumbersome procedures, and attitude of bank officials often restrict the farmers to get institutional credit. Banks usually avoid giving credit to farmers due to relatively higher transaction and operation costs. In case of default of payments, the procedure of recovery of bank loan is so cumbersome and complicated that it acts as a deterrent to advance loans to them.

On the basis of time period for credits, agricultural credit is classified into three categories, *viz.*, short term, medium term and long term. The short term loan, often referred to as 'crop loan', is provided normally for a period of less than one year for purchasing seeds, manure, fertilizer, and pesticides or for meeting labour charges. It is to be repaid within one year, especially after crop harvesting.

The medium-term loans are given for a period ranging from 1-5 years for purposes such as land development, purchase of livestock, farm machinery and generation of other productive assets. Long term loan is taken for fixed capital formation such as purchase of tractors, installation of tube-wells, development of land, *etc.* Such types of loans are taken for a period ranging from 5-20 years. As per the Situation Assessment Survey (SAS) of NSS-2003, 58 percent of the outstanding amount of loan to the farmers at all-India level was from institutional sources and the balance from non-institutional sources. Further, 58.4 percent of the total outstanding loans to the indebted farmers were taken for productive purposes.

Table shows the trend in short term and medium/long term loans over the period 2001-11 presented for five-yearly intervals. This is because, due to year-toyear fluctuations, it is more realistic to take a look at the figures with a time lag.

Table. Trends in Flow of Institutional Credit to Agricultural Sector.

Category of Credit	2001-01	2005-06	2010-11
Short term loan (% to total)	63.1	58.4	71.4
Medium/Long term *% to total)	36.9	41.6	28.6
Total (%)	100.0	100.0	100.0
Total (Rs. in crores)	52827	180485 (3.4)	446779 (2.5)

Between the two end time points, there is an increase in the institutional credit for short term loans of farmers. This shows that the emphasis on credit has been for the purposes of input purchase and some productive assets. There is a corresponding decline in the share of credit raised for medium/long term. This trend is suggestive of either a reduced interest of farmers in the purchase of costlier assets or increased reluctance on the part of banks to provide long-term loans. In absolute terms, the increase in credits advanced has declined from 3.4 times increase over 2001-06 to 2.5 times increase over 2006-11. The decline might suggest a relatively more difficult and stressful time in the immediate preceding 5-year time period as compared to the period 2001-06. However, it also shows that the government's policy of providing short-term credit to farmers through issuing Kisan Credit Cards (KCCs) has proved effective in catering to the short-term credit needs of farmers. The long term and medium term credit constituted only 28.6 percent of total credit flow to the agriculture in 2010-11. The shift in the composition of the agricultural credit in favour of short-term credit has implications for private sector fixed capital formation in agriculture. More seriously, since the rate of interest on KCC loan is low at 7 percent per annum and there is also a provision of interest-subsidy if loan is repaid in time, some farmers especially those having large size of holdings, are reported to have availed the cheap KCC loan and use the money for advancing loans to the needy people at the relatively much higher interest rate prevailing in the informal money market. Such trends need to be curbed by strict monitoring of credit utilisation profiles in order that the process of capital formation does not suffer.

TRENDS IN GROSS CAPITAL FORMATION

Gross capital formation in agriculture (GCFA) as percent of total GCF of the economy was 20.2 percent in 1979-80. This has since fallen down steeply to just about 7.7 percent in 2009-10. By public/private sector distribution, this has resulted in a steep low in the share of public sector's GFCF in agriculture: from 54 percent in 1981- 82 to 24.4 percent in 1991-92 (*i.e.*, more than 100 percent decline) and to a further low of 14.3 percent in 2001-02. This shows that since the mid-1980s, capital formation in agriculture has been largely driven by the private sector's capital formation so much so that by the late 1990s, private

investments accounted for approximately three quarters of total investments in the sector. However, in the more recent years, the share of public sector GCFA has increased from 14.3 percent in 2002-03 to 26.3 percent 2006-07 although there has once again been a decline to 18.5 percent in 2009-10. The declining share of agriculture in the total public and private sector GCF in the Indian economy reveals that the capital formation in the non-agricultural sectors grew faster than that in the agricultural sector. This is quite obvious because over a period of time, contribution of agriculture in the overall GDP of the country has also declined significantly. However, if we estimate GCFA in terms of its percentage share in the agricultural GDP, we find that GCFA as percentage of agricultural GDP has increased over a period of time.

Reasons for Decline in Public Sector Capital Formation

Declining share of public investment is a serious issue because it is not only critical for enhancing total factor productivity (TFP) growth but also for attracting private sector investment in the sector. Some estimates indicate that a 10 percent decrease in public investments leads to a 2.4 percent reduction in agricultural GDP. Notwithstanding this, there are several reasons for the deceleration of public investment in agriculture. Prominent among them are: (i) diversion of resources from direct investment to subsidies; (ii) increase in cost of maintenance of the existing projects; (iii) delays in completion of projects; and (iv) stagnated R&D investment. Above all, the process of macro economic contraction and the consequent reducing development role of the state, during the post-liberalisation period, is the main factor in reducing public sector investment in the farm sector. As curtailing non-plan expenditure in order to reduce fiscal deficit was difficult for the government, it opted for cutting down capital expenditure in both agriculture and social sector during 1990s. Although, the government could not succeed in bringing fiscal deficit under control, productive investment in farm sector significantly declined. Rising agricultural subsidies on food, fertilizers, credit, and other inputs crowded out the real investment in agriculture. Further, the agricultural subsidies distorted the cropping pattern, created inefficiency in resource allocation and adversely affected the agricultural sustainability.

Agriculture is a state subject. Most of the states are in severe fiscal crisis due to fiscal mismanagement and the populist measures adopted by them. The bad fiscal situation of the state governments has had adverse effect on the real investment in agriculture. The cumulative expenditure of the states on agriculture and allied activities as a percentage of total expenditure has hovered around 4-6 percent since the mid 1990s compared to 8 percent in 1980-81. Mid-term review of the 9th Plan emphasised the fact that the whole approach to agriculture in the previous decade had been directed at securing increased agricultural production through input-subsidization rather than through investment in productive fixed assets and infrastructure. Public sector capital formation can be enhanced by targeting and downsizing the agricultural subsidies, and

ploughing back the resources so generated to agricultural sector as investments in irrigation and other infrastructural activities. Selling off the public sector enterprises to partially finance the resources for agricultural investments also helps push up the public sector investment at the desired cost of minimising the inefficiency of such public sector agricultural organisations. Removing distorting subsidies would also lead to a reduction in environmental damage and an increase in the government resource mobilisation.

Some economists are of the opinion that decline of the public sector capital formation has been compensated by the increase in the private sector capital formation. However, increase in private sector capital formation would not entirely compensate the decline in the public sector capital formation as the nature of capital formation in private sector is different from that of public sector. Private sector investment is mostly made in creating capital formation in the areas of farm mechanisation, land levelling, groundwater irrigation (*e.g.*, bore well/tube-wells), *etc.*, while public sector investment is made to create long-term assets like: construction of dams, canals, roads, marketing yards, rural electrification, agricultural R&D, *etc.* These types of capital are clearly not formed by the private sector. In fact, these types of capital are required to induce more private capital formation in agriculture. For instance, rural electrification encourages the farmers to install electric-operated tube-wells. We shall take a more closer look at the determinants of private capital formation now.

DETERMINANTS OF PRIVATE CAPITAL FORMATION IN AGRICULTURE

There are several factors affecting the private investment in agriculture. Important among them are: (i) terms of trade and flow of institutional credit, (ii) public sector investment in agricultural infrastructure, (iii) agricultural subsidies, (iv) flow of technology, (v) increase in size of operational holdings, *etc.* Favourable terms of trade to agriculture would increase the profitability in agriculture and encourage the farmers to spend more in GCF.

As discussed earlier, access to institutional credit to the farmers at cheaper rate of interest is one of the key determinants of both fixed and working capital formation in the farm sector. Public sector investment in irrigation, power, road, markets, soil and water conservation, agricultural R&D, extension, *etc.,* induces the private investment in agriculture as such public investments are complementary to private investment. Although in general, subsidies could have negative impact on private investment, agricultural subsidies on tractors, pump sets, fertilizers, electricity, diesel, *etc.,* have positive impact on the private sector capital formation in agriculture. Likewise, while the rising agricultural subsidies adversely affects the public GCFA and increases inefficiency in the resource allocation, these subsidies induce the farmers to purchase more capital assets and thus raise the private GCFA.

Technological advancement in agriculture also positively affects the private capital formation in agriculture. The new technologies adopted in agriculture during green and post-green revolution periods have been more capital intensive when compared to the traditional technology.

Rising number of operational holdings due to division of holdings are likely to increase the GCFA, as division of holdings increases the demand for investment in farm assets and machinery. The number of operational holdings in India has increased from 97.2 million in 1985-86 to 120.82 million in 2000-01, an addition of 23.66 million holdings. The availability of institutional credit and subsidies to the farm sector motivates these divided holdings to increase investment in farm machinery. Several empirical studies have established that terms of trade for agriculture and institutional credit to farmers have positive and significant impact on private capital formation at national level. Two inferences that can be drawn from these factors are:

- Since public investment in key agricultural infrastructures has positive impact on private capital formation, the government should increase the public investment in irrigation, power, road, market, R&D, *etc.*, to encourage private investment in agriculture; and
- Terms of trade for agriculture may be improved through subsiding inputs. This suggests that agricultural subsidies should not be completely phased out but rationalised and effectively targeted.

EXCHANGE RATE

In finance, an exchange rate is the rate at which one currency will be exchanged for another currency. Currencies are most commonly national currencies, but may be sub-national as in the case of Hong Kong or supra-national as in the case of the euro.

The exchange rate is also regarded as the value of one country's currency in relation to another currency. For example, an interbank exchange rate of 114 Japanese yen to the United States dollar means that ¥114 will be exchanged for US$1 or that US$1 will be exchanged for ¥114. In this case it is said that the price of a dollar in relation to yen is ¥114, or equivalently that the price of a yen in relation to dollars is $1/114.

Each country determines the exchange rate regime that will apply to its currency. For example, a currency may be floating, pegged (fixed), or a hybrid. Governments can impose certain limits and controls on exchange rates. Countries can also have a strong or weak currency. There is no agreement in the economic literature on the optimal national exchange rate (unlike on the subject of trade where free trade is considered optimal). Rather, national exchange rate regimes reflect political considerations.

In floating exchange rate regimes, exchange rates are determined in the foreign exchange market, which is open to a wide range of different types of buyers and sellers, and where currency trading is continuous: 24 hours a day except weekends (*i.e.*, trading from 20:15 GMT on Sunday until 22:00 GMT Friday).

The spot exchange rate is the current exchange rate, while the forward exchange rate is an exchange rate that is quoted and traded today but for delivery and payment on a specific future date.

In the retail currency exchange market, different buying and selling rates will be quoted by money dealers. Most trades are to or from the local currency. The buying rate is the rate at which money dealers will buy foreign currency, and the selling rate is the rate at which they will sell that currency. The quoted rates will incorporate an allowance for a dealer's margin (or profit) in trading, or else the margin may be recovered in the form of a commission or in some other way. Different rates may also be quoted for cash, a documentary transaction or for electronic transfers. The higher rate on documentary transactions has been justified as compensating for the additional time and cost of clearing the document. On the other hand, cash is available for resale immediately, but incurs security, storage, and transportation costs, and the cost of tying up capital in a stock of banknotes (bills).

THE RETAIL EXCHANGE MARKET

Currency for international travel and cross-border payments is predominantly purchased from banks, foreign exchange brokerages and various forms of bureaux de change. These retail outlets source currency from the interbank markets, which are valued by the Bank for International Settlements at US$5.3 trillion per day. The purchase is made at the spot contract rate. Retail customers will be charged, in the form of commission or otherwise, to cover the provider's costs and generate a profit. One form of charge is the use of an exchange rate that is less favourable than the wholesale spot rate. The difference between retail buying and selling prices is referred to as the bid–ask spread.

QUOTATIONS

There is a market convention that rules the notation used to communicate the fixed and variable currencies in a quotation. For example, in a conversion from EUR to AUD, EUR is the fixed currency, AUD is the variable currency and the exchange rate indicates how many Australian dollars would be paid or received for 1 euro.

In some areas of Europe and in the retail market in the United Kingdom, EUR and GBP are reversed so that GBP is quoted as the fixed currency to the euro. In order to determine which is the fixed currency when neither currency is on the above list (*i.e.*, both are "other"), market convention is to use the fixed currency which gives an exchange rate greater than 1.000. This reduces rounding issues and the need to use excessive numbers of decimal places. There are some exceptions to this rule: for example, the Japanese often quote their currency as the base to other currencies.

Quotation using a country's home currency as the price currency is known as direct quotation or price quotation (from that country's perspective) For example, €0.8989 = US$1.00 in the Eurozone and is used in most countries.

Quotation using a country's home currency as the unit currency (for example, US$1.11 = €1.00 in the Eurozone) is known as indirect quotation or quantity quotation and is used in British newspapers; it is also common in Australia, New Zealand and the Eurozone.

Using direct quotation, if the home currency is strengthening (that is, appreciating, or becoming more valuable) then the exchange rate number decreases. Conversely, if the foreign currency is strengthening and the home currency is depreciating, the exchange rate number increases.

Market convention from the early 1980s to 2006 was that most currency pairs were quoted to four decimal places for spot transactions and up to six decimal places for forward outrights or swaps. (The fourth decimal place is usually referred to as a "pip"). An exception to this was exchange rates with a value of less than 1.000 which were usually quoted to five or six decimal places. Although there is no fixed rule, exchange rates numerically greater than around 20 were usually quoted to three decimal places and exchange rates greater than 80 were quoted to two decimal places. Currencies over 5000 were usually quoted with no decimal places (for example, the former Turkish Lira). *e.g.*, (GBPOMR: 0.765432 -: 1.4436 - EURJPY: 165.29). In other words, quotes are given with five digits. Where rates are below 1, quotes frequently include five decimal places.

In 2005, Barclays Capital broke with convention by quoting spot exchange rates with five or six decimal places on their electronic dealing platform. The contraction of spreads (the difference between the bid and ask rates) arguably necessitated finer pricing and gave the banks the ability to try to win transactions on multibank trading platforms where all banks may otherwise have been quoting the same price. A number of other banks have since followed this system.

EXCHANGE RATE REGIME

Countries are free to choose which type of exchange rate regime they will apply to their currency. The main types of exchange rate regimes are: free-floating, pegged (fixed), or a hybrid.

In free-floating regimes, exchange rates are allowed to vary against each other according to the market forces of supply and demand. Exchange rates for such currencies are likely to change almost constantly as quoted on financial markets, mainly by banks, around the world.

A movable or adjustable peg system is a system of fixed exchange rates, but with a provision for the revaluation (usually devaluation) of a currency. For example, between 1994 and 2005, the Chinese yuan renminbi (RMB) was pegged to the United States dollar at RMB 8.2768 to $1. China was not the only country to do this; from the end of World War II until 1967, Western European countries all maintained fixed exchange rates with the US dollar based on the Bretton Woods system. But that system had to be abandoned in favour of floating, market-based regimes due to market pressures and speculation, according to President Richard M. Nixon in a speech on August 15, 1971, in what is known as the Nixon Shock.

Still, some governments strive to keep their currency within a narrow range. As a result, currencies become over-valued or under-valued, leading to excessive trade deficits or surpluses.

EXCHANGE RATE CLASSIFICATION

From the perspective of bank foreign exchange trading:

- *Buying Rate:* Also known as the purchase price, it is the price used by the foreign exchange bank to buy foreign currency from the customer. In general, the exchange rate where the foreign currency is converted to a smaller number of domestic currencies is the buying rate, which indicates how much the country's currency is required to buy a certain amount of foreign exchange.
- *Selling Rate:* Also known as the foreign exchange selling price, it refers to the exchange rate used by the bank to sell foreign exchange to customers. It indicates how much the country's currency needs to be recovered if the bank sells a certain amount of foreign exchange.
- *Middle Rate:* The average of the bid price and the ask price. Commonly used in newspapers, magazines or economic analysis.

According to the length of delivery after foreign exchange transactions:

- *Spot Exchange Rate:* Refers to the exchange rate of spot foreign exchange transactions. That is, after the foreign exchange transaction is completed, the exchange rate in Delivery within two working days. The exchange rate that is generally listed on the foreign exchange market is generally referred to as the spot exchange rate unless it specifically indicates the forward exchange rate.
- *Forward Exchange Rate:* To be delivered in a certain period of time in the future, but beforehand, the buyer and the seller will enter into a contract to reach an agreement. When the delivery date is reached, both parties to the agreement will deliver the transaction at the exchange rate and amount of the reservation. Forward foreign exchange trading is an appointment-based transaction, which is due to the different time the foreign exchange purchaser needs for foreign exchange funds and the introduction of foreign exchange risk. The forward exchange rate is based on the spot exchange rate, which is represented by the "premium", "discount", and "parity" of the spot exchange rate.

According to the method of setting the exchange rate:

- *Basic Rate:* Usually choose a key convertible currency that is the most commonly used in international economic transactions and accounts for the largest proportion of foreign exchange reserves. Compare it with the currency of the country and set the exchange rate. This exchange rate is the basic exchange rate. The key currency generally refers to a world currency, which is widely used for pricing, settlement, reserve currency, freely convertible, and internationally accepted currency.

- *Cross Rate:* After the basic exchange rate is worked out, the exchange rate of the local currency against other foreign currencies can be calculated through the basic exchange rate. The resulting exchange rate is the cross exchange rate.

Other Classifications

According to the payment method in foreign exchange transactions:

- Telegraphic exchange rate
- Mail transfer rate
- Demand draft rate

According to the level of foreign exchange controls:

- *Official Rate:* The official exchange rate is the rate of exchange announced by a country's foreign exchange administration. Usually used by countries with strict foreign exchange controls.
- *Market Rate:* The market exchange rate refers to the real exchange rate for trading foreign exchange in the free market. It fluctuates with changes in foreign exchange supply and demand conditions.

According to the international exchange rate regime:

- *Fixed Exchange Rate:* It means that the exchange rate between a country's currency and another country's currency is basically fixed, and the fluctuation of exchange rate is very small.
- *Floating Exchange Rate:* It means that the monetary authorities of a country do not stipulate the official exchange rate of the country's currency against other currencies, nor does it have any upper or lower limit of exchange rate fluctuations. The local currency is determined by the supply and demand relationship of the foreign exchange market, and it is free to rise and fall.

Whether inflation is included:

- *Nominal Exchange Rate:* An exchange rate that is officially announced or marketed which does not consider inflation.
- *Real Exchange Rate:* The nominal exchange rate eliminating inflation

FACTORS AFFECTING THE CHANGE OF EXCHANGE RATE

1. *Balance of Payments:* When a country has a large international balance of payments deficit or trade deficit, it means that its foreign exchange earnings are less than foreign exchange expenditures and its demand for foreign exchange exceeds its supply, so its foreign exchange rate rises, and its currency depreciates.
2. *Interest Rate Level:* Interest rates are the cost and profit of borrowing capital. When a country raises its interest rate or its domestic interest rate is higher than the foreign interest rate, it will cause capital inflow, thereby increasing the demand for domestic currency, allowing the currency to appreciate and the foreign exchange depreciate.

3. *Inflation Factor:* The inflation rate of a country rises, the purchasing power of money declines, the paper currency depreciates internally, and then the foreign currency appreciates. If both countries have inflation, the currencies of countries with high inflation will depreciate against those with low inflation. The latter is a relative revaluation of the former.
4. *Fiscal and Monetary Policy:* Although the influence of monetary policy on the exchange rate changes of a country's government is indirect, it is also very important. In general, the huge fiscal revenue and expenditure deficit caused by expansionary fiscal and monetary policies and inflation will devalue the domestic currency. The tightening fiscal and monetary policies will reduce fiscal expenditures, stabilize the currency, and increase the value of the domestic currency.
5. *Speculation:* If speculators expect a certain currency to appreciate, they will buy a large amount of that currency, which will cause the exchange rate of that currency to rise. Conversely, if speculators expect a certain currency to depreciate, they will sell off a large amount of the currency, resulting in speculation. The currency exchange rate immediately fall. Speculation is an important factor in the short-term fluctuations in the exchange rate of the foreign exchange market.
6. *Government Market Intervention:* When exchange rate fluctuations in the foreign exchange market adversely affect a country's economy, trade, or the government needs to achieve certain policy goals through exchange rate adjustments, monetary authorities can participate in currency trading, buying or selling local or foreign currencies in large quantities in the market. The foreign exchange supply and demand has caused the exchange rate to change.
7. *Economic Strength of a Country:* In general, high economic growth rates are not conducive to the local currency's performance in the foreign exchange market in the short term, but in the long run, they strongly support the strong momentum of the local currency.

Emerging Markets

Research on target zones has mainly concentrated on the benefit of stability of exchange rates for industrial countries, but some studies have argued that volatile bilateral exchange rates between industrial countries are in part responsible for financial crisis in emerging markets. According to this view the ability of emerging market economies to compete is weakened because many of the currencies are tied to the US dollar in various fashions either implicitly or explicitly, so fluctuations such as the appreciation of the US dollar to the yen or deutsche Mark have contributed to destabilizing shocks. Most of these countries are net debtors whose debt is denominated in one of the G3 currencies.

In September 2019 Argentina restricted the ability to buy US dollars. Mauricio Macri in 2015 campaigned on a promise to lift restrictions put in place by the

left-wing government including the capital controls which have been used in Argentina to manage economic instability. When inflation rose above 20 percent transactions denominated in dollars became commonplace as Argentinians moved away from using the peso. In 2011 the government of Cristina Fernández de Kirchner restricted the purchase of dollars leading to a rise in black market dollar purchases. The controls were rolled back after Macri took office and Argentina issued dollar denominated bonds, but when various factors led to a loss in the value of the peso relative to the dollar leading to the restoration of capital controls to prevent additional depreciation amidst peso selloffs.

FLUCTUATIONS IN EXCHANGE RATES

A market-based exchange rate will change whenever the values of either of the two component currencies change. A currency becomes more valuable whenever demand for it is greater than the available supply. It will become less valuable whenever demand is less than available supply (this does not mean people no longer want money, it just means they prefer holding their wealth in some other form, possibly another currency).

Increased demand for a currency can be due to either an increased transaction demand for money or an increased speculative demand for money. The transaction demand is highly correlated to a country's level of business activity, gross domestic product (GDP), and employment levels. The more people that are unemployed, the less the public as a whole will spend on goods and services. Central banks typically have little difficulty adjusting the available money supply to accommodate changes in the demand for money due to business transactions.

Speculative demand is much harder for central banks to accommodate, which they influence by adjusting interest rates. A speculator may buy a currency if the return (that is the interest rate) is high enough. In general, the higher a country's interest rates, the greater will be the demand for that currency. It has been argued that such speculation can undermine real economic growth, in particular since large currency speculators may deliberately create downward pressure on a currency by shorting in order to force that central bank to buy their own currency to keep it stable. (When that happens, the speculator can buy the currency back after it depreciates, close out their position, and thereby make a profit.)

For carrier companies shipping goods from one nation to another, exchange rates can often impact them severely. Therefore, most carriers have a CAF charge to account for these fluctuations.

PURCHASING POWER OF CURRENCY

The real exchange rate (RER) is the purchasing power of a currency relative to another at current exchange rates and prices. It is the ratio of the number of units of a given country's currency necessary to buy a market basket of goods in the other country, after acquiring the other country's currency in the foreign exchange market, to the number of units of the given country's currency that would be necessary

to buy that market basket directly in the given country. There are various ways to measure RER. Thus the real exchange rate is the exchange rate times the relative prices of a market basket of goods in the two countries. For example, the purchasing power of the US dollar relative to that of the euro is the dollar price of a euro (dollars per euro) times the euro price of one unit of the market basket (euros/goods unit) divided by the dollar price of the market basket (dollars per goods unit), and hence is dimensionless. This is the exchange rate (expressed as dollars per euro) times the relative price of the two currencies in terms of their ability to purchase units of the market basket (euros per goods unit divided by dollars per goods unit). If all goods were freely tradable, and foreign and domestic residents purchased identical baskets of goods, purchasing power parity (PPP) would hold for the exchange rate and GDP deflators (price levels) of the two countries, and the real exchange rate would always equal 1.

The rate of change of the real exchange rate over time for the euro versus the dollar equals the rate of appreciation of the euro (the positive or negative percentage rate of change of the dollars-per-euro exchange rate) plus the inflation rate of the euro minus the inflation rate of the dollar.

REAL EXCHANGE RATE EQUILIBRIUM AND MISALIGNMENT

The Real Exchange Rate (RER) represents the nominal exchange rate adjusted by the relative price of domestic and foreign goods and services, thus reflecting the competitiveness of a country with respect to the rest of the world. More in detail, an appreciation of the currency or a high level of domestic inflation reduces the RER, thus reducing the country's competitiveness and lowering the Current Account (CA). On the other hand, a currency depreciation generates an opposite effect, improving the country's CA.

There is evidence that the RER generally reaches a steady level in the long-term, and that this process is faster in small open economies characterized by fixed exchange rates. Any substantial and persistent RER deviation from its long-run equilibrium level, the so-called RER misalignment, has shown to produce negative impacts on a country's balance of payments. An overvalued RER means that the current RER is above its equilibrium value, whereas an undervalued RER indicates the contrary. Specifically, a prolonged RER overvaluation is widely considered as an early sign of an upcoming crisis, due to the fact that the country becomes vulnerable to both speculative attacks and currency crisis, as happened in Thailand during the 1997 Asian financial crisis. On the other side, a protracted RER undervaluation usually generates pressure on domestic prices, changing the consumers' consumption incentives and, so, misallocating resources between tradable and non-tradable sectors.

Given that RER misalignment and, in particular overvaluation, can undermine the country's export-oriented development strategy, the equilibrium RER measurement is crucial for policymakers. Unfortunately, this variable cannot be observed. The most common method in order to estimate the equilibrium RER is the universally accepted Purchasing Power Parity (PPP) theory, according

to which the RER equilibrium level is assumed to remain constant over time. Nevertheless, the equilibrium RER is not a fixed value as it follows the trend of key economic fundamentals, such as different monetary and fiscal policies or asymmetrical shocks between the home country and abroad. Consequently, the PPP doctrine has been largely debated during the years, given that it may signal a natural RER movement towards its new equilibrium as a RER misalignment.

Starting from the 1980s, in order to overcome the limitations of this approach, many researchers tried to find some alternative equilibrium RER measures. Two of the most popular approaches in the economic literature are the Fundamental Equilibrium Exchange Rate (FEER), developed by Williamson (1994), and the Behavioural Equilibrium Exchange Rate (BEER), initially estimated by Clark and MacDonald (1998). The FEER focuses on long-run determinants of the RER, rather than on short-term cyclical and speculative forces. It represents a RER consistent with macroeconomic balance, characterized by the achievement of internal and external balances at the same time. Internal balance is reached when the level of output is in line with both full employment of all available factors of production, and a low and stable rate of inflation.

On the other hand, external balance holds when actual and future CA balances are compatible with long-term sustainable net capital flows. Nevertheless, the FEER is viewed as a normative measure of the RER since it is based on some "ideal" economic conditions related to internal and external balances. Particularly, since the sustainable CA position is defined as an exogenous value, this approach has been broadly questioned over time. By contrast, the BEER entails an econometric analysis of the RER behaviour, considering significant RER deviations from its PPP equilibrium level as a consequence of changes in key economic fundamentals.

According to this method, the BEER is the RER that results when all the economic fundamentals are at their equilibrium values. Therefore, the total RER misalignment is given by the extent to which economic fundamentals differ from their long-run sustainable levels. In short, the BEER is a more general approach than the FEER, since it is not limited to the long-term perspective, being able to explain RER cyclical movements.

BILATERAL VS. EFFECTIVE EXCHANGE RATE

Bilateral exchange rate involves a currency pair, while an effective exchange rate is a weighted average of a basket of foreign currencies, and it can be viewed as an overall measure of the country's external competitiveness. A nominal effective exchange rate (NEER) is weighted with the inverse of the asymptotic trade weights.

A real effective exchange rate (REER) adjusts NEER by appropriate foreign price level and deflates by the home country price level. Compared to NEER, a GDP weighted effective exchange rate might be more appropriate considering the global investment phenomenon.

PARALLEL EXCHANGE RATE

In many countries there is a distinction between the official exchange rate for permitted transactions and a parallel exchange rate that responds to excess demand for foreign currency at the official exchange rate. The degree by which the parallel exchange rate exceeds the official exchange rate is known as the parallel premium.

ECONOMIC MODELS OF EXCHANGE RATES

Uncovered Interest Rate Parity Model

Uncovered interest rate parity (UIRP) states that an appreciation or depreciation of one currency against another currency might be neutralized by a change in the interest rate differential. If US interest rates increase while Japanese interest rates remain unchanged then the US dollar should depreciate against the Japanese yen by an amount that prevents arbitrage (in reality the opposite, appreciation, quite frequently happens in the short-term, as explained below).

The future exchange rate is reflected into the forward exchange rate stated today. In our example, the forward exchange rate of the dollar is said to be at a discount because it buys fewer Japanese yen in the forward rate than it does in the spot rate. The yen is said to be at a premium.

UIRP showed no proof of working after the 1990s. Contrary to the theory, currencies with high interest rates characteristically appreciated rather than depreciated on the reward of the containment of inflation and a higher-yielding currency.

Balance of Payments Model

The balance of payments model holds that foreign exchange rates are at an equilibrium level if they produce a stable Current account (balance of payments)current account balance. A nation with a trade deficit will experience a reduction in its foreign exchange reserves, which ultimately lowers (depreciates) the value of its currency. A cheaper (undervalued) currency renders the nation's goods (exports) more affordable in the global market while making imports more expensive. After an intermediate period, imports will be forced down and exports to rise, thus stabilizing the trade balance and bring the currency towards equilibrium.

Like purchasing power parity, the balance of payments model focuses largely on tradeable goods and services, ignoring the increasing role of global capital flows.

In other words, money is not only chasing goods and services, but to a larger extent, financial assets such as stocks and bonds. Their flows go into the capital account item of the balance of payments, thus balancing the deficit in the current account. The increase in capital flows has given rise to the asset market model effectively.

Asset Market Model

The increasing volume of trading of financial assets (stocks and bonds) has required a rethink of its impact on exchange rates. Economic variables such as economic growth, inflation and productivity are no longer the only drivers of currency movements. The proportion of foreign exchange transactions stemming from cross border-trading of financial assets has dwarfed the extent of currency transactions generated from trading in goods and services.

The asset market approach views currencies as asset prices traded in an efficient financial market. Consequently, currencies are increasingly demonstrating a strong correlation with other markets, particularly equities.

Like the stock exchange, money can be made (or lost) on trading by investors and speculators in the foreign exchange market. Currencies can be traded at spot and foreign exchange options markets. The spot market represents current exchange rates, whereas options are derivatives of exchange rates.

MANIPULATION OF EXCHANGE RATES

A country may gain an advantage in international trade if it controls the market for its currency to keep its value low, typically by the national central bank engaging in open market operations in the foreign exchange market. Some claim that, in the early twenty-first century, the People's Republic of China had been doing this over a long period of time. Other nations, including Iceland, Japan, Brazil, and so on have had a policy of maintaining a low value of their currencies in the hope of reducing the cost of exports and thus bolstering their economies. A lower exchange rate lowers the price of a country's goods for consumers in other countries, but raises the price of imported goods and services for consumers in the low value currency country.

In general, exporters of goods and services will prefer a lower value for their currencies, while importers will prefer a higher value.

EXCHANGE RATES AFFECT AGRICULTURAL MARKETS

The exchange rate between two currencies specifies how much one currency is worth in terms of the other. The Canadian exchange rate impacts the competitiveness of the agriculture sector by affecting prices of agriculture products and inputs and, therefore, farms' profits.

In this section you will learn:

- More what an exchange rate is
- What factors determine the exchange rate
- The effects of changes in exchange rates on agricultural markets
- How to manage the risk of currency exchange fluctuation

Although the major market for currency in the world is Forex, other markets like Chicago Mercantile Exchange (CME) or Chicago Board Options Exchange (CBOE) offer currency exchange rate products.

The currency abbreviation or currency symbol for the Canadian dollar is CAD or C$, and the United States dollar is USD or US$.

Influencing Factors on Exchange

In the short-term, the exchange rate is determined by the flow of a currency between two countries. Currency flow is affected by interest rates, trade balance, investors' confidence and issues or expectations in one country relative to another country.

The Canadian trade balance affects the value of the CAD. When Canada earns more from sales of exports than it pays for imports, it has a trade surplus. A trade surplus increases the demand for the CAD and usually results in a rising CAD. On the other hand, a trade deficit will lower the demand for CAD and cause a decrease of the CAD exchange rate.

Foreign investors' confidence and expectations will also influence the exchange rate. If investors are confident in the political and economic stability of Canada, they are more likely to purchase Canadian assets. This may push up the value of the CAD.

Exchange Rate and Farm Business

Exchange rate changes impact Canadian export prices, the price of imported inputs, and the competitiveness of the Canadian agriculture industry. The Canadian exchange rate versus the USD is arguably the most important as nearly 40% of Alberta's total agri-food export sales were to the United States in recent years.

Changes in the exchange rate affect the competitiveness of Canadian exports in the international market. An increase in the CAD will influence the agriculture industry by making Canadian products more expensive for importers, unless Canadian producers accept a lower price for their product. A decrease in the CAD will make producers more competitive and generally would increase exports. The exchange rate will also affect Canadian commodities that are priced in the United States futures market.

As an example, a Canadian hog producer signs a contract to sell hogs in the United States in USD. The CAD increased in value from US$0.95 per C$ to US$1.05 per C$. If the price of lean hogs on the United States contract is US$135 per hundredweight (cwt), the price the Alberta farmer would receive at the US$0.95 exchange rate would be C$142.10 per cwt (which is US$135 divided by 0.95). At the US$1.05 rate, the farmer would receive C$128.57 per cwt (which is US$135 divided by 1.05). The price of the hogs in the United States had not changed, but the revenue that the Alberta farmer received fell as the CAD rose.

In this situation, Canadian hog producers would have to lower their price, look for ways to increase margins or decrease costs to remain competitive.

Even if agricultural products are not destined for the United States, many of these products are priced in USD. If the CAD exchange rate rises and the price of the product remains constant in CAD, Canadian exports will appear more expensive to buyers.

When these exports compete with United States products directly, the increase in Canadian exchange rates will result in a competitive disadvantage for Canadian exports. When Canada competes against other exporters, such as European Union and Australia, the competition depends on the direction and magnitude of the competitor's currencies against the USD compared to ours.

As a large amount of farm inputs, such as machinery and pesticides are imported, exchange rates will affect those costs. An increase in the CAD will decrease the cost of imported products and a decrease in the CAD will increase the cost of imported inputs. However, the price change on imported inputs depends on the willingness or ability of the suppliers to pass on the exchange rate changes to producers.

In the long-term, exchange rate changes influence the investment and production of the agriculture sector. The agri-food industry needs to improve productivity and efficiency in order to remain competitive in the international market if the CAD remains high.

Manage the Exchange Rate Risk

Exchange rate risk may be managed in 2 ways:

1. By hedging transactions on the futures or options markets
2. Through an exchange forward or options contract with a bank

When a Canadian producer plans to sell a product at a price that is originally set in the United States market, the risk is that the cash price the producer receives in CAD will fall if the CAD rises. The exchange rate risk can be hedged by taking a long (buy) position on the CAD futures market. Loss in the cash value of the product resulting from the rising CAD will be offset by the gain on the long position of the CAD futures. The product seller reverses the futures hedge by selling back the long CAD position when the product is actually sold.

Alternately, if a processor or producer needs to buy a product in the United States, the risk would be that they must pay a higher commodity price if the CAD falls. In this case, the processor or producer would take a short (sell) hedge CAD futures position. If the value of the CAD drops, the higher price in CAD paid for the product would be offset by a profit on the CAD futures position. When the product purchase is made, the product buyer reverses the futures hedge by buying back the short position.

An exchange forward contract allows the producer or processor to buy or sell one currency against another for settlement on the day that the contract expires. A forward contract eliminates the risk of fluctuation of the exchange rate by locking in a price today for a transaction that will take place in the future.

The producer or processor can arrange a forward contract or option with a bank. However, the producer or processor needs to be aware of bank specific credit requirements as well as costs associated with these transactions. Local bank representatives are the first contact for anyone considering an exchange forward contract.

6

Policy Frameworks for Agricultural Economics and Development

Price policy for agricultural commodities constitutes an important element of overall agricultural economic policy. Minimum Support Prices (MSPs) for important cereals, pulses, oilseeds, and other commercial crops, namely, cotton, jute and sugarcane, are fixed by the Government every year on the basis of the recommendations made by the Commission for Agricultural Costs and Prices (CACP). The list of 25 crops for which MSPs are recommended by CACP and announced by the Government is at Statement I annexed to this Note. The most important factor considered by the CACP in making its recommendations on MSPs for different crops is the cost of cultivation/production for which the database is provided by the DES through its plan scheme for study on cost of cultivation. Analysis of various price policy issues in the emerging socio-economic environment requires advance information on the production of different crops, supply-demand scenario, as well as regular monitoring of price movements in both the domestic and international markets.

The effectiveness of price policy in boosting production and productivity of agriculture in tune with domestic as well as external demand cannot be assessed in the absence of regular data on area, production and yield of different crops. Similarly, data on domestic and international prices for various agricultural commodities, trends in procurement, offtake and stocks of foodgrains, consumption of different agricultural commodities, their exports and imports, *etc.*, assume immense significance in the emerging external economic environment, which is increasingly influenced by the World Trade Organization.

The importance of a sound data/information base on different facets of agriculture cannot therefore be overemphasized. The Plan Schemes of DES seek to serve this purpose.

In keeping with the need to adopt a holistic approach to the implementation of individual schemes with inter-related objectives, it has been proposed/decided to merge the on-going plan schemes into three broad umbrella schemes.

Comprehensive Scheme for Studying the Cost of Cultivation of Principal crops in India: The Comprehensive Scheme for Studying the Cost of Cultivation of Principal Crops in India is being implemented since 1970-71 as a Central Sector Plan Scheme on the basis of recommendations made by the Standing Technical Committee on Indices of Input Costs constituted under the Chairmanship of Dr. Ashok Mitra in 1967.

The main objectives of the scheme are as follows:

- Collection and compilation of field data on cost of cultivation and cost of production in respect of 28 crops;
- Generation of estimates of cost of cultivation and cost of production of various crops in different States covered under the scheme; and
- Construction of the indices of terms of trade between agriculture and non-agriculture sectors.

The estimates of cost of cultivation of principal crops are used by the Commission for Agricultural Costs and Prices (CACP) for recommending Minimum Support Prices (MSPs) of 25 crops, including sugarcane for which the support price is termed "Statutory Minimum Price (SMP)." The Directorate of Economics & Statistics (DES) in the Ministry of Agriculture gets this study conducted through 16 Agricultural/General Universities/College besides the Directorate of Tobacco Development. Under the scheme, the field data pertaining to the cost of cultivation/cost of production are collected, compiled and analysed. The estimates of cost of cultivation/production furnished to the CACP forms an important basis for recommending the MSPs of various agricultural commodities to the Government of India. The cost estimates generated under the scheme are also used by State Governments, Agricultural/General Universities, Government/ Non-Government Research Organizations and individual researchers. The data are also used for working out the Index Numbers of Terms of Trade between agricultural and non-agricultural sectors. Besides, the database on a number of items under the scheme is used by the Central Statistical Organization in connection with the compilation of national income estimates.

The scheme is implemented in 19 states, namely, Andhra Pradesh, Assam, Bihar, Chattisgarh, Gujarat, Haryana, Himachal Pradesh, Jharkhand, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Orissa, Punjab, Rajasthan, Tamil Nadu, Uttar Pradesh, Uttaranchal and West Bengal. The studies in the States, except newly created States of Chattisgarh, Jharkhand, Uttaranchal are undertaken by the Agricultural Universities/colleges located in their respective States. As far as the three newly created States are concerned, their parent institutions undertake these studies. At present, the scheme covers 28 crops *i.e.*, paddy, wheat, jowar,

bajra, maize, ragi, barley, moong, urad, arhar, gram, masur, peas, groundnut, rapeseed and mustard, nigerseed, soyabean, sunflower, safflower, sesamum, cotton, jute, sugarcane, VFC tobacco, onion, potato, coconut and black pepper.

The field data under the scheme are collected on the Cost Accounting Method under which daily entries of debit/credit for the expenditure/income are made in order to assess the total cost incurred/benefit accrued by/to each farmer covered under the scheme. The field data are collected by the field-men. The detailed questionnaire is filled up/updated on monthly/annual basis after making enquiries on daily basis from 10 farm holdings which consists of 2 each from 5 different size classes viz. up to 1 hectare, 1-2 hectares, 2-4 hectares, 4-6 hectares and above 6 hectares allotted to each field-man.

AGRO-ECONOMIC RESEARCH SCHEME

The Agro-Economic Research Scheme is an old Scheme started in 1954-55 for undertaking research studies on agro economic problems of the country. The Scheme is being implemented through 12 Agro-Economic Research Centres and 3 Units which are fully funded by the Government through Central Sector plan Scheme. These Centres have been established to take up problem oriented studies on regional basis with a view to generate the requisite feedback from the grass-root level, to facilitate effective monitoring of various programmes/ schemes implemented in the entire country. While the Units mainly undertake inter-regional and all India level studies, the Centres conduct studies at the state level. On an average 40-45 research studies are completed annually by these Centres, which relate to various economic problems in agriculture, animal husbandry, water management and allied areas.

PRODUCTION AND PRODUCTIVITY GROWTH IN AGRICULTURE

When evaluating the performance of a production unit or the agricultural sector, it is common to use production (the level of output), productivity (output per unit of input) or efficiency (actual output relative to the potential output or best practices) as indicators. Although these measures are closely related, they can yield different rankings in measuring performance. In general, productivity is the most commonly used measure, be it measured in terms of total factor productivity (TFP) or in partial terms such as labour productivity (output per labour) and yield (output per hectare) for its relative ease in calculation and interpretation.

In the following sections, changes over time in output and productivity growth in different regions are compared and the causes for variations are discussed.

AGRICULTURAL DEVELOPMENT AND INPUT USE

Agricultural output and productivity vary greatly with the stage of economic development, resource endowments, government policy and agronomic-

ecological conditions. However, there is a similar path in agricultural development over time and across countries. Pingali and Heisey (1996) categorized the technological transformation of cereal crop production system into three distinct phases:

i. The land-augmentation phase;
ii. The labour-substitution phase; and
iii. The knowledge-and management-intensity phase.

The basic assumption is that the transition from one phase to another is determined by growing factor scarcity, first for land, then for labour and finally for other factors of production, such as machinery and management skills.

The first phase is characterized by area expansion being the main source of output growth, as was seen during the pre-Green Revolution era of the 1950s and 1960s. However, as opportunities for area expansion decline over time, cropping intensity is increased, along with increasing use of water, fertilizers, pesticides and high yielding varieties. This was indeed the case during the Green-Revolution period in the 1970s and early 1980s. Such intensive production results in an increased demand for labour and mechanization, as the production system moves from single-cropping to double-and triple-cropping with increased application of purchased inputs. Eventually, production reaches the point of diminishing marginal returns to further intensification, as was the case in the late 1980s, the post-Green Revolution phase. Here, better technical knowledge and management skills are used to substitute for traditional inputs. Variety selection, fertilizer timing and placement, water management and pesticide application are some areas in which productivity has improved with reduction in unit cost of production. The model just outlined is used in the following analysis as the basic framework to explain the changes in input use and in productivity between the 1960s and the 1990s. First, it is applied to various regions in the world, then to the developing and developed countries, and finally to the selected countries in Asia and the Pacific.

FACTORS AFFECTING PRODUCTIVITY GROWTH

In explaining productivity growth, economists originally limited themselves to the role of conventional inputs such as land, labour, physical capital, water and chemical inputs. However, the failure to explain productivity growth adequately led them to examine the role of human capital and public goods, such as education, agricultural research and extension and publicly provided infrastructure (Griliches, 1963; Mankiw, Romer and Weil, 1992; Nelson, 1964 and 1981; Solow, 1957). Public policies that have a strong link to agricultural productivity such as policy reforms were also examined.

The rationale for considering research is the belief that investments in research result in increases in the stock of knowledge, which, in turn, either facilitate the use of existing knowledge or generate new technology. Technological advances, whether resulting from changes in input quality or how inputs are combined,

lead to productivity gains. Education, training and extension also increase productivity by increasing people's knowledge and skill base, which are essential for technology adoption and efficient use of inputs. Public infrastructure, on the other hand, increases productivity by facilitating the exchange of goods and services.

AGRICULTURAL RESEARCH AND EXTENSION

Many researchers have explored the roles of research and extension in promoting agricultural growth. Rosegrant and Evenson (1992) found that in South Asia, public research accounted for 30 percent of the output growth, and extension for about 25 percent, with corresponding rates of return being 63 percent and 52 percent, respectively. Pray and Evenson's (1991) survey of Asia found the rates of return to national research investment ranged from 19 to 218 percent, returns to national extension investment from 15 to 215 percent, and returns to international research investment from 68 to 108 percent.

Evenson and McKinsey (1991) found that public investment in research accounted for over half of the output growth in India and extension contributed about one-third. The calculated internal rates of return were 218 percent for public research and 177 percent for extension. However, they found that little output growth was attributable to infrastructure. Jamison and Lau (1982) also found that physical capital had little impact on production or profits, as compared to farmer's education and extension services.

Fan (1996) found that public research expenditures accounted for about 20 percent of total production growth in Chinese agriculture during the period 1965 to 1994. The annual rates of return to agricultural research investment in China ranged from 44 percent to 83 percent.

Fan (1996) concluded that the rapid growth in agricultural output in China during the 1980s and 1990s was the result of public investments in R&D as well as the institutional and market reforms that began in 1979. He concluded that increases in agricultural research were justifiable; not only did they stimulate additional output growth, but the rate of return to agricultural research was much higher than commercial interest rates.

Despite the high rates of returns from public research investments, agricultural research intensity (ARI), measured as a percentage of Chinese agricultural GDP, was found to have declined from 0.56 percent for the period 1958-1965 to 0.43, 0.44, 0.39 and 0.40 percent, respectively, for 1966-1976, 1977-1985, 1986-1990 and 1991-1993 (Fan, 1996). Lin (1998) reported that, as part of the overall market reform, the Chinese Government had reduced its fiscal appropriation for agricultural research, shifting funding from institutional supports to competitive grants and cost recovery. As such, it can be expected that an increasing proportion of research activities will move from the public to the private domain.

Other studies on output growth have also shown a high payoff from agricultural research and extension. The results indicate that the rate of return

on research, in most cases, ranged from 15 to 50 percent for both developed and developing countries, but some estimates were as high as 218 percent. The wide disparity among the estimates raises questions regarding the sensitivity of these estimates to the commodity of interest and the use of different time periods and methodologies.

Estimates for Asian countries appear to be higher and show a much wider variation than those of studies in the United States. This could be due to the diverse nature of Asian agriculture, which differs from country to country in economic, social and agronomic-ecological conditions. Because of inconsistency in the data and methodology used, it is not possible to make direct comparisons across countries or over time. Nevertheless, the general conclusion that R&D yields relatively high returns seems indisputable.

TECHNOLOGICAL CHANGE

Technological change is recognized by many as one of the most important sources of productivity growth (Antle and Capalbo, 1988). It refers to the changes in the production process that come about from the application of innovation and newly acquired scientific knowledge and technical and management skills. Technological change increases agricultural productivity either by shifting the production frontier upward so that more measured output can be produced with the same amount of inputs or by moving closer to the production frontier so that the same amount of output can be produced with a smaller amount of inputs. Better organizational and management skills not only improve input-output combinations but enable producers to respond more quickly to changing market circumstances.

While generation of new technology or knowledge comes from investments in research and development, adoption of technology involves investments by the potential users in both physical and human capital. Therefore, adoption of technology depends principally on their applicability and expected returns of the innovation. However, there may be a long lag between development, adoption and productivity gains. Chavas and Cox (1992) found the lag to be up to 15 years between making an investment in research and having an effect on productivity. However, after taking effect, the benefits from an innovation may persist for thirty years or more.

The lag between generation of new technology and its widespread adoption by farmers has important policy implications. First, the adverse effects of reduced public funding to agricultural research and extension on productivity may be under-estimated if the lagged effects are not accounted for. Secondly, the complementarity between research and extension should be taken into account. The former helps the development of new technology, while the latter helps speed up the rate of diffusion and adoption of new technology. Extension can be done more effectively by identifying factors that contribute to technology adoption. As an example, innovators in a farming community can be identified and targeted for extension services.

Since better-educated farmers are found to be more likely to adopt new technology, human capital is a pre-condition for technology adoption and hence productivity growth. Further, if adoption of new technology requires additional investments, lack of access to credit and additional inputs may prevent or slow down technology adoption. Finally, because potential users of new technology often differ in the agronomic-ecological conditions in which they operate, new technology may require adaptive research before it can be transferred successfully to different locations. These impediments to technology adoption mean careful planning and provision of necessary infrastructure are essential to capture the full benefits of new technology.

AGRICULTURAL ADVISORY SERVICES AND THE MARKET

Promoting market orientation in agricultural advisory services aims to provide for the sustainable enhancement of the capabilities of the rural poor to enable them to benefit from agricultural markets and help them to adapt to factors which impact upon these. As a study by the Overseas Development Institute demonstrates, a value chain approach to advisory services indicates that the range of clients serviced should go beyond farmers to include input providers, producers, producer organisations and processors and traders.

MARKET INFORMATION

Efficient market information can be shown to have positive benefits for farmers and traders. Up-to-date information on prices and other market factors enables farmers to negotiate with traders and also facilitates spatial distribution of products from rural areas to towns and between markets. Most governments in developing countries have tried to provide market information services to farmers, but these have tended to experience problems of sustainability. Moreover, even when they function, the service provided is often insufficient to allow commercial decisions to be made because of time lags between data collection and dissemination. Modern communications technologies open up the possibility for market information services to improve information delivery through SMS on cell phones and the rapid growth of FM radio stations in many developing countries offers the possibility of more localised information services. In the longer run, the internet may become an effective way of delivering information to farmers. However, problems associated with the cost and accuracy of data collection still remain to be addressed. Even when they have access to market information, farmers often require assistance in interpreting that information. For example, the market price quoted on the radio may refer to a wholesale selling price and farmers may have difficulty in translating this into a realistic price at their local assembly market. Various attempts have been made in developing countries to introduce commercial market information services but these have largely been targeted at traders, commercial farmers or exporters. It is not easy to see how small, poor farmers can generate sufficient

income for a commercial service to be profitable although in India a new service introduced by Thompson Reuters was reportedly used by over 100,000 farmers in its first year of operation. Esoko in West Africa attempts to subsidize the cost of such services to farmers by charging access to a more advanced feature set of mobile-based tools to businesses.

MARKET INFRASTRUCTURE

Efficient marketing infrastructure such as wholesale, retail and assembly markets and storage facilities is essential for cost-effective marketing, to minimise post-harvest losses and to reduce health risks. Markets play an important role in rural development, income generation, food security, developing rural-market linkages and gender issues. Planners need to be aware of how to design markets that meet a community's social and economic needs and how to choose a suitable site for a new market. In many cases sites are chosen that are inappropriate and result in under-use or even no use of the infrastructure constructed. It is also not sufficient just to build a market: attention needs to be paid to how that market will be managed, operated and maintained. In most cases, where market improvements were only aimed at infrastructure upgrading and did not guarantee maintenance and management, most failed within a few years.

Rural assembly markets are located in production areas and primarily serve as places where farmers can meet with traders to sell their products. These may be occasional (perhaps weekly) markets, such as haat bazaars in India and Nepal, or permanent.

Terminal wholesale markets are located in major metropolitan areas, where produce is finally channelled to consumers through trade between wholesalers and retailers, caterers, *etc.* The characteristics of wholesale markets have changed considerably as retailing changes in response to urban growth, the increasing role of supermarkets and increased consumer spending capacity. These changes require responses in the way in which traditional wholesale markets are organized and managed.

Retail marketing systems in western countries have broadly evolved from traditional street markets through to the modern hypermarket or out-of-town shopping centre. Despite the growth of supermarkets there remains considerable scope to improve agricultural marketing in developing countries by constructing new retail markets.

However, there is little point in undertaking market development improvements unless they result in a positive socio-economic impact. Effective regulation of markets is essential. Inside the market, both hygiene rules and revenue collection activities have to be enforced. Of equal importance, however, is the maintenance of order outside the market. Licensed traders in a market will not be willing to cooperate in raising standards if they face competition from unlicensed operators outside who do not pay any of the costs involved in providing a proper service.

MARKETING TRAINING

Farmers frequently consider marketing as being their major problem. However, while they are able to identify such problems as poor prices, lack of transport and high post-harvest losses, they are often poorly equipped to identify potential solutions.

Successful marketing requires learning new skills, new techniques and new ways of obtaining information. Extension officers working with ministries of agriculture or NGOs are often well-trained in horticultural production techniques but usually lack knowledge of marketing or post-harvest handling. Ways of helping them develop their knowledge of these areas, in order to be better able to advise farmers about market-oriented horticulture, need to be explored. While there is a range of generic guides and other training materials available from FAO and others, these should ideally be tailored to national circumstances to have maximum effect.

RECENT DEVELOPMENTS

New marketing linkages between agribusiness, large retailers and farmers are gradually being developed, *e.g.*, through contract farming, group marketing and other forms of collective action.

Donors and NGOs are paying increasing attention to ways of promoting direct linkages between farmers and buyers. The growth of supermarkets, particularly in Latin America and East and South East Asia, is having a significant impact on marketing channels for horticultural, dairy and livestock products Nevertheless, "spot" markets will continue to be important for many years, necessitating attention to infrastructure improvement such as for retail and wholesale markets.

ENABLING ENVIRONMENTS

Agricultural marketing needs to be conducted within a supportive policy, legal, institutional, macro-economic, infrastructural and bureaucratic environment. Traders and others cannot make investments in a climate of arbitrary government policy changes, such as those that restrict imports and exports or internal produce movement. Those in business cannot function if their trading activities are hampered by excessive bureaucracy and form filling. Inappropriate law can distort and reduce the efficiency of the market, increase the costs of doing business and retard the development of a competitive private sector.

Poor support institutions, such as agricultural extension services, municipalities that operate markets inefficiently and export promotion bodies, can be particularly damaging. Poor roads increase the cost of doing business, reduce payments to farmers and increase prices to consumers. Finally, the ever-present problem of corruption can seriously impact on agricultural marketing efficiency in many countries.

ARGUMENTS AGAINST MARKET INTERVENTION

In international trade parlance, when a company from country A sells a commodity below the cost of production into country B, this is called "dumping". A number of countries that are signatories to multilateral trade agreements have provisions that prohibit this practice. When rich countries subsidize domestic production, excess output is often given to the developing world as foreign aid. This process eliminates the domestic market for agricultural products in the developing world, because the products can be obtained for free from western aid agencies. In developing nations where these effects are most severe, small farmers could no longer afford basic inputs and were forced to sell their land.

"Consider a farmer in Ghana who used to be able to make a living growing rice. Several years ago, Ghana was able to feed and export their surplus. Now, it imports rice. From where? Developed countries. Why? Because it's cheaper. Even if it costs the rice producer in the developed world much more to produce the rice, he doesn't have to make a profit from his crop. The government pays him to grow it, so he can sell it more cheaply to Ghana than the farmer in Ghana can. And that farmer in Ghana? He can't feed his family anymore."(Lyle Vanclief, Former Canadian Minister of Agriculture [1997-2003])

According to The Institute for Agriculture and Trade Policy, corn, sawbones, cotton, wheat and rice are sold below the cost of production, or dumped. Dumping rates are approximately forty percent for wheat, between twenty-five and thirty percent for corn (maize), approximately thirty percent for sawbones, fifty-seven percent for cotton, and approximately twenty percent for rice. For example, wheat is sold for forty percent below cost.

According to Oxfam, "If developed nations eliminated subsidy programs, the export value of agriculture in lesser developed nations would increase by 24 %, plus a further 5.5 % from tariff equilibrium.... exporters can offer US surpluses for sale at prices around half the cost of production; destroying local agriculture and creating a captive market in the process." Free trade advocates desire the elimination of all market distorting mechanisms (subsidies, tariffs, regulations) and argue that, as with free trade in all areas, this will result in aggregate benefit for all. This position is particularly popular in competitive agricultural exporting nations in both the developed and developing world, some of whom have banded together in the Cairns Group lobby. Canada's Department of Agriculture estimates that developing nations would benefit by about $4 billion annually if subsidies in the developed world were halved.

AGRICULTURAL INDEPENDENCE

Many developing countries do not grow enough food to feed their own populations. These nations must buy food from other countries. Lower prices and free food save the lives of millions of starving people, despite the drop in food sales of the local farmers. A developing nation could use new improved farming methods to grow more food, with the ultimate goal of feeding their

nation without outside help. New greenhouse methods, hydroponics, fertilizers, R/O Water Processors, hybrid crops, fast-growing hybrid trees for quick shade, interior temperature control, greenhouse or tent insulation, autonomous building gardens, sun lamps, mylar, fans, and other cheap tech can be used to grow crops on previously unarable land, such as rocky, mountainous, desert, and even Arctic lands. More food can be grown, reducing dependency on other countries for food.

Replacement crops can also make nations agriculturally independent. Sugar, for example, comes from sugar cane imported from Polynesia. Instead of buying the sugar from Polynesia, a nation can make sugar from sugar beets, maple sap, or sweetener from stevia plant, keeping the profits circulating within the nation's economy. Paper and clothes can be made of hemp instead of trees and cotton.

Tropical foods won't grow in many places in Europe, but they will grow in insulated greenhouses or tents in Europe. Soybean plant cellulose can replace plastic (made from oil). Ethanol from farm waste or hempseed oil can replace gasoline. Rainforest medicine plants grown locally can replace many imported medicines. Alternates of cash crops, like sugar and oil replacements can reducing the farmer's dependency on subsidies in both developed and developing nations.

Market interventions may increase the cost to consumers for agricultural products, either via hidden wealth transfers via the government, or increased prices at the consumer level, such as for sugar and peanuts in the US.

This has led to market distortions, such as food processors using high fructose corn syrup as a replacement for sugar. High fructose corn syrup may be an unhealthy food additive, and, were sugar prices not inflated by government fiat, sugar might be preferred over high fructose corn syrup in the marketplace.

OBJECTIVES OF MARKET INTERVENTION

Some argue that nations have an interest in assuring there is sufficient domestic production capability to meet domestic needs in the event of a global supply disruption. Significant dependence on foreign food producers makes a country strategically vulnerable in the event of war, blockade or embargo. Maintaining adequate domestic capability allows for food self-sufficiency that lessens the risk of supply shocks due to geopolitical events. Agricultural policies may be used to support domestic producers as they gain domestic and international market share. This may be a short term way of encouraging an industry until it is large enough to thrive without aid. Or it may be an ongoing subsidy designed to allow a product to compete with or undercut foreign competition. This may produce a net gain for a government despite the cost of interventions because it allows a country to build up an export industry or reduce imports.It also helps to form the nations supply and demand market.

RURAL POVERTY AND POVERTY RELIEF

Subsidising farming may encourage people to remain on the land and obtain some income. This might be relevant to a third world country with many peasant

farmers, but it may also be a consideration to more developed countries such as Poland. They have a very high unemployment rate, much farmland and retain a large rural population growing food for their own use. Price controls may also be used to assist poor citizens. Many countries have used this method of welfare support as it delivers cheap food to the poorest without the need to assess people to give them financial aid.

ENVIRONMENTAL PROTECTION AND LAND MANAGEMENT

Farm or undeveloped land composes the majority of land in most countries. Policies may encourage some land uses rather than others in the interest of protecting the environment. For instance, subsidies may be given for particular farming methods, forestation, land clearance, or pollution abatement.

ORGANIC FARMING ASSISTANCE

Welfare economics theory holds that sometimes private activities can impose social costs upon others. Industrial agriculture is widely considered to impose social costs through pesticide pollution and nitrate pollution. Further, agriculture uses large amounts of water, a scarce resource. Some economists argue that taxes should be levied on agriculture, or that organic agriculture, which uses little pesticides and experiences relatively little nitrate runoff, should be encouraged with subsidies. In the United States, 65% of the approximately $16.5 billion in annual subsidies went to the top 10% of farmers in 2002 because subsidies are linked to certain commodities. On the other hand, organic farming received $5 million for help in certification and $15 million for research over a 5-year time period.

FAIR TRADE

Some advocate Fair Trade rules to ensure that poor farmers in developing nations that produce crops primarily for export are not exploited or outcompeted-which advocates consider a dangerous "race to the bottom" in agricultural labour and safety standards. Opponents point out that most agriculture in developed nations is produced by industrial corporations (agribusiness) which are hardly deserving of sympathy, and that the alternative to exploitation is poverty.

FACTORS INFLUENCING GROWTH IN AGRICULTURE

Economists originally limited themselves to examining the roles of labour and physical capital in economic growth. The failure to adequately explain growth led them to examine the roles of other factors and to develop endogenous growth theory. Investment in infrastructure has been cited as an important source of growth in agriculture. However, Ferreira and Khatami (1996) claim that economic literature has not reached a consensus on the direction of causality between infrastructure and development. Nor can investment be viewed in

isolation of policy reform which has been shown to be a vital stimulus of production; as have institutions (North, 1994). Public investment in forms of human capital: education, extension, training and technology research have also been shown to increase productivity.

Nelson (1964 and 1981) recognized that there are important interactions between capital formation, labour allocation, technical progress and productivity. This calls into question whether the growth due to physical capital can be separated from growth attributed to other inputs. Unless a production technology is a fixed Leontief process, there is always some degree of substitutability among categories of inputs. However, since inputs are not perfect substitutes, the lack of adequate investment can slow down production growth. Estimates of the elasticity of substitution in agriculture between hired labour and capital equipment vary from 0.32 in the short run to 1.78 percent (Lopez, 1980) in the long run.

Most measures of TFP incorporate inputs and physical capital, leaving human and social capital, technology, institutions, infrastructure and policy to "explain" growth in TFP. Social and human capital are the on-farm human elements that mediate how policy, technology, institutions and infrastructure affect input and physical capital use. Human capital directly affects whether and how technology will be adopted. Technology choice in turn, affects the inputs and physical capital used. That is, technology is embodied in the types of inputs and how they are used. Social capital affects access to physical capital (*e.g.*, land directly or through land titling and loans) and variable inputs (*e.g.*, through credit or cooperatives).

In general, researchers have estimated TFP and then focused on how one or several of these factors might be driving its growth. Usually, they have done so using the change in TFP as a dependent variable in a regression with explanatory variables that represent measures of technology, human capital and policy (which are not easily quantifiable or assignable in constructing the production indices). In the following sections, policy is divided between budgetary policies that affect investment in R&D and infrastructure, political and economic policies and political stability.

HUMAN CAPITAL

Human capital directly influences agricultural productivity by affecting the way in which inputs are used and combined by farmers. Improvements in human capital affect acquisition, assimilation and implementation of information and technology. Human capital also affects one's ability to adapt technology to a particular situation or to changing needs.

Schultz's (1963) classic work attributed between 21 to 23 percent of the growth in U.S., income, between 1929 and 1957, to education of the labour force. Contemporaneously, Griliches (1963) focused on minimizing the unexplained portion of growth in U.S., agriculture by adjusting labour for quality, using education. When he included research and extension expenditure as an input to production, he found that virtually all the "unexplained" growth could

be explained by economies of scale, R&D and labour quality changes. Romer (1986) and Lucas (1988) provide theoretical grounds for human capital being the driving force behind economic growth.

Jamison and Lau (1982) explored the role of farmer education and extension on farm efficiency. They found that farmer education and extension were not only important to enhancing production on Thai, Korean and Malaysian farms, but that there was an interaction effect between education and extension. In contrast, they found physical capital had an insignificant impact on production and profits. On the other hand, some researchers are finding evidence that returns to education are low, especially for those who stay in agriculture. In their summary of the findings on the determinants of rural poverty for six country studies based on econometrically estimated income equations, Lopez and Valdes (2000) conclude that the return to education in farming is surprisingly small in most cases. An increase in one year in the average level of schooling raises per capita annual income of the family by less than US$ 20 per person in most cases. The main contribution of education in rural areas appears to be to prepare young people to emigrate to urban areas and towns.

Using an econometric approach, Nehru and Dhareshwar (1994) examined sources of TFP growth in 83 industrial and developing countries for the period 1960-1990. They found that human capital formation was three to four times more important than raw labour in explaining output growth. Using human capital as a separate variable, they found that the countries with the fastest growing economies have based their growth on factor accumulation (human capital, labour and physical capital), not growth in efficiency or technology.

PUBLIC INVESTMENT AND POLICY

Public policy and budgetary decisions regarding infrastructure also have a profound effect on agricultural production. The financing aspects of public R&D and human capital development, but both physical and institutional infrastructure affect the development and transfer of technology. For example, irrigation systems and roads may be required to make a technology profitable to implement. Reforms in pricing policy or the marketing system may be needed to provide incentives.

A serious conflict arises with structural adjustment reforms. Budget cuts in public services often accompany market reforms. While fiscal restraint may be required to stabilize the economy in the short run, cuts in human capital development, public R&D, and infrastructure have a detrimental long-term effect on productivity growth. Policy makers need to choose carefully to mitigate the deleterious impacts of budget cuts on future growth.

Using an econometric approach, Jayne *et al*. (1994) demonstrated the complementarity of public policies and public investments in facilitating the use of new technology. They point to the sharp decline in public investments and growth in Zimbabwe during the 1980s. Pal (1985) underscores the complementarity of public policy towards investment in irrigation technology and private variable input use.

The importance of policy reform is increasingly viewed as fundamental for agricultural productivity gains. Liberalizing markets so prices can send proper signals to producers is the fundamental objective of structural adjustment programs in developing countries and policy reform in economies in transition. Assigning property rights is viewed as a means of promoting development through the efficient and responsible use of resources (North, 1994) and therefore underlies the distribution of capital in economies in transition, land reform and most land policy. Block (1994) discusses the complementarity of economic reform and technical change, but cautions that policy reform offers a one-time effect.

An example of the relation between policy reform and productivity is the implementation of China's "responsibility system" (RS) in 1980-81, which linked productivity to material reward, resulted in increased crop yields "for every major crop" (Wiens, 1983). McMillan, Whalley and Zhu (1989) calculated that in response to the RS and price reforms, output in the Chinese agricultural sector increased by over 61 percent between 1978 and 1984. They attribute 78 percent of the increase to the RS and 22 percent to higher prices for crops. They calculate the RS increased productivity in agriculture by 32 percent. Lin (1992) calculated that 42 to 47 percent of the growth in agricultural output was attributable to the RS during the same period.

In another example, price reforms in Egypt implemented in 1986 resulted in increased wheat and maize yields from 1987 to 1993. Rice production increased by 62 percent, while yields increased by 42 percent. Bevan, Collier and Gunning (1993) contrast the performance of agriculture in Kenya and Tanzania. In Kenya where there was little intervention production of food and cash crops increased by 4.6 and 5.5 percent per annum, respectively. In Tanzania, where policies controlled prices and taxed export crops, agricultural production stagnated until policy reforms were instituted in 1984.

Using an econometric approach to estimate TFP for the United States dairy industry 1972-1992, Lachaal (1994) examined how protectionist policies in the form of direct subsidies to agriculture reduced productivity growth in the United States dairy industry. Lachaal showed that government subsidies encouraged using materials at the expense of feed and raised the cost of production by 1.8 percent for each 10 percent increase in subsidy. The subsidy policy was the source of technical inefficiency, creating biases that distorted factor usage.

RESEARCH AND TECHNOLOGY TRANSFER

Research increases the set of available technologies, hence agricultural R&D expenditures are used as a proxy for agricultural technological change. However, the development of technology does not always result in its adoption. In some cases this may be because the technology being developed is not appropriate, that is, it does not meet the needs of agricultural producers. Hence, researchers focus on public expenditure as an explanatory variable in TFP growth. Additionally public research has been shown to lead private research.

Several caveats arise in focusing on public R&D to explain growth in agricultural TFP. Public R&D expenditures are used as proxy for R&D results, yet there is not an exact correspondence between expenditures and technology. Even when technology is produced, researchers may have different goals than farmers, *e.g.*, yield maximization rather than profit maximization or risk minimization or improvement in commercial crops rather than staple crops. Additionally, when an appropriate technology does result, the process of technology adoption in agriculture is widely recognized as one that occurs over many years in which some adopt quickly and others wait for extension or the results of their neighbours to convince them to adopt.

PLANNING AND MANAGEMENT OF AGRICULTURE

In order to facilitate a systematic assessment of the impact of these changes on the farm economy with focus on the state of Indian farmers, a Central Sector Scheme-Planning and Management of Agriculture-was formulated in 1998-99. This envisages conferences and workshops/seminars involving eminent economists/agricultural scientists/experts, and short term studies, consultancy services for preparation of new decentralized strategy for development of crops, animals, dairy, poultry, irrigation, soil and water conservation, *etc.*, preparation of papers/reports based on the recommendations of the workshops/seminars, *etc.*.

The scheme also includes the provision for Millennium Study on the state of Indian Farmers, which provide inputs for policy formulation from a long-term perspective. With a view to assessing the impact of past policies and programmes on the economic well-being of the farmers, which has generally escaped attention of researchers, a mega study entitled "State of the Indian Farmer – A Millennium Study" was taken up by the Department of Agriculture and Cooperation during the Ninth plan.

Phase – I of this study pertained to a retrospective analysis of the agricultural development experience in the post-independence era. Work on Phase-I was completed and reports were published in 27 volumes.

The Situation Assessment Survey (SAS) of Farmers, which constitutes Phase – II of the Millennium Study, has been entrusted to the NSSO in the Ministry of Statistics and Programme Implementation. The major areas covered under SAS include consumer expenditure, income and assets, indebtedness, farming practices and preferences, their awareness of technological developments, educational level and access to modern technology. Out of the five Reports on the findings of the Survey, three, viz. Indebtedness of Farmer Households, Some Aspects of Farming and Access to Modern Technology of Farming have been released. The remaining two, viz. Household Consumption Expenditure for Farmers and Income, Expenditure & Productive Assets of Farmer Households are expected in the near future.

AGRICULTURAL STATISTICS AND AGRICULTURAL POLICY FORMULATION

This is a Central Sector Plan-Scheme. The objective of this scheme is to strengthen the system of agricultural statistics and policy formulation by strengthening the research techniques and upgrading of skills of personnel involved in the compilation and analysis of data. Towards this end, a National Workshop is held every year in which a large number of representatives from Ministry of Agriculture, Central Statistical Organization. National Sample Survey Organization, Department of Space, Commission for Agricultural Costs and Prices, State governments, Research Institutions like Indian Agricultural Statistics Research Institute (IASRI) and State Agricultural Universities participate.

An international conference, namely, the 20th session of Asia and Pacific Commission on Agricultural Statistics (APCAS) was organized in the month of September 2004 with the objective of improving Agricultural Statistics in member nations. APCAS advises member nations on the development and standardization of agricultural statistics within the general framework of FAO's work in the field of food and agricultural statistics. APCAS, which holds its session every two years, reviews current development in the compilation, analysis and dissemination of data on different facets of food and agriculture. The discussions in the 20th Session focussed on agriculture in its broad sense covering crop production, livestock, forestry and fishing in the member countries. The subjects on the agenda included application of remote sensing in the forecast of crop area and production, forestry and fisheries, use of trade flow data in agriculture policy formulation, development of country STAT as a vehicle for organising national agriculture sector data, strengthening regional data exchange system in food and agriculture statistics in Asia and Pacific countries, analysis of agricultural census and surveys, including livestock census data and plan for forthcoming world census of agriculture in 2010.

IMPROVEMENT OF AGRICULTURAL STATISTICS

Agriculture Statistics Improvement (ASI) Division in the DES deals with implementation of Plan scheme viz. "Improvement of Agricultural Statistics". The basic objective of the Scheme is to collect and improve agricultural statistics of Principal Agricultural Crops and selected Horticultural Crops.

The Scheme has four components namely:

- Timely Reporting Scheme,
- Improvement of Crop Statistics,

AGENCY FOR REPORTING OF AGRICULTURAL STATISTICS

The objective of this component is to obtain estimates of area of principal crops, in each season, with break up of area under irrigated/unirrigated and

traditional/high yielding varieties of crops on the basis of priority enumeration conducted on the basis of random sample of 20% of villages by a specific date. The States are required to furnish these estimates by 30th November for Kharif Crops and by 30th April for Rabi crops. These estimates are used for generating advance estimates of production of principal crops. This component is being implemented in 16 land record States and also Union Territories of Delhi and Pondicherry. This component has funding pattern on 50:50 basis between the Central Government and State Governments.

ESTABLISHMENT OF AN AGENCY FOR REPORTING OF AGRICULTURAL STATISTICS (EARAS)

This component is being implemented in the permanently settled States of West Bengal, Kerala, Orissa and North Eastern States of Nagaland, Sikkim, Arunachal Pradesh and Tripura. Under this component, an agency has been established in these States for generating estimates of area and production of principal crops and land use statistics, on the basis of complete enumeration of 20% villages in each year. The performance of the implementation of the component is being closely monitored through Quarterly and Seasonal Progress Reports.

IMPROVEMENT OF CROP STATISTICS (ICS)

The objective of this component is to improve the quality of statistics of area and production of crops through supervision and monitoring. Under this component, a sample check of area enumeration and crop cutting experiments of 10,000 villages and approximately 31,000 experiments at harvest stage are undertaken. These samples are equally shared by the Central Agency, *i.e.*, National Sample Survey Organization and the State Agricultural Authorities.

These checks specifically relate to (i) Enumeration of crop-wise area covered in the selected villages as recorded by the Patwari. (ii) Total of the area under each crop recorded in Khasra Register of villages and (iii) Supervision of crop cutting experiments at the harvest stage. This component is being implemented in all TRS States and the Union Territory of Pondicherry. The performance of the implementation of this component also is being closely monitored through Quarterly and Seasonal progress Reports.

CROP ESTIMATION SURVEY OF FRUITS, VEGETABLES AND MINOR CROPS (CES-F&V)

This component is implemented to generate estimates of area and production of fruits and vegetables in the country. The component is being implemented in 11 States and a total of 14 crops are covered (7 fruits and 7 vegetables). The methodology developed by the Indian Agricultural Statistics Research Institute (IASRI) is being used for generation of these estimates. The different fruit and vegetable crops covered are: apple, mango, citrus, pineapple, grape, banana, guava, potato, onion, cabbage, cauliflower, tomato, ginger and turmeric. The

States of Andhra Pradesh, Gujarat, Haryana, Himachal Pradesh, Karnataka, Maharashtra, Orissa, Punjab, Rajasthan, Tamil Nadu and Uttar Pradesh are covered under the component.

The National Statistical Commission (NSC) has recommended that the present methodology being followed for CES-F&V should be replaced by an alternative cost effective methodology. Accordingly, the IASRI has submitted a proposal for conducting study in two States for testing the alternative methodology suggested by them on the lines recommended by the NSC. Work on this is in progress.

7

The process of Economic Reform in the Agricultural Sector

The process of economic reform in the agricultural sector involves a series of systematic changes aimed at improving the efficiency, productivity, and sustainability of agricultural activities. These reforms often entail modifications to policies, regulations, and institutional frameworks governing agricultural production, marketing, and trade.

One aspect of economic reform in the agricultural sector involves liberalizing markets and reducing government intervention. This may include dismantling price controls, subsidies, and trade barriers, allowing market forces to determine prices and allocate resources more efficiently. By reducing government interference, these reforms aim to promote competition, innovation, and investment in the agricultural sector.

Additionally, economic reforms in the agricultural sector often involve modernizing agricultural practices and technologies. This may include promoting the adoption of advanced farming techniques, machinery, and inputs to enhance productivity and reduce costs. Embracing technological innovations can help farmers increase yields, improve quality, and adapt to changing market demands.

Moreover, economic reform in the agricultural sector may entail restructuring agricultural institutions and governance systems. This could involve decentralizing decision-making, empowering local communities, and strengthening farmer organizations and cooperatives. By promoting participatory approaches to agricultural management, these reforms aim to enhance transparency, accountability, and inclusivity in the sector.

Furthermore, economic reforms in the agricultural sector often prioritize sustainable and environmentally friendly practices. This may involve promoting organic farming, conservation agriculture, and agroecological approaches that minimize environmental degradation, conserve natural resources, and mitigate climate change.

By prioritizing sustainability, these reforms aim to ensure the long-term viability of agricultural production systems.

The process of economic reform in the agricultural sector is a complex and ongoing endeavor that requires careful planning, stakeholder engagement, and policy coordination. By fostering an enabling environment for agricultural development, these reforms aim to unlock the sector's potential to contribute to economic growth, food security, and rural livelihoods.

Agricultural sector is the mainstay of the rural Indian economy around which socioeconomic privileges and deprivations revolve, and any change in its structure is likely to have a corresponding impact on the existing pattern of social equality.

No strategy of economic reform can succeed without sustained and broad based agricultural development, which is critical for:

- Raising living standards,
- Alleviating poverty,
- Assuring food security,
- Generating buoyant market for expansion of industry and services, and
- Making substantial contribution to the national economic growth.

Studies also show that the economic liberalization and reforms process have impacted on agricultural and rural sectors very much.

According to [Bhalla 97], of the three sectors of economy in India, the tertiary sector has diversified the fastest, the secondary sector the second fastest, while the primary sector, taken as whole, has scarcely diversified at all. Since agriculture continues to be a tradable sector, this economic liberalization and reform policy has far reaching effects on (I) agricultural exports and imports, (ii) investment in new technologies and on rural infrastructure (iii) patterns of agricultural growth, (iv) agriculture income and employment, (v) agricultural prices and (vi) food security [Bhalla 93]. Reduction in Commercial Bank credit to agriculture, in lieu of this reforms process and recommendations of Khusrao Committee and Narasingham Committee, might lead to a fall in farm investment and impaired agricultural growth. Infrastructure development requires public expenditure which is getting affected due to the new policies of fiscal compression.

Liberalization of agriculture and open market operations will enhance competition in "resource use" and "marketing of agricultural production", which will force the small and marginal farmers (who constitute 76.3% of total farmers) to resort to "distress sale" and seek for off-farm employment for supplementing income.

AGRICULTURAL RESOURCES INFORMATION SYSTEM

It is clear that sustainable agricultural production depends on the judicious mix of natural resources (soil, water, livestock, plant genetic, fisheries, forests, climate, rainfall, and topography) in an acceptable technology management under the prevailing socioeconomic infrastructure. In addition to the natural resources components, it is also essential to combine natural resources with capital resources, institutional resources, and human resources for sustainable agricultural development.

Agricultural Resources components include:

- Animal Resources
- Capital resources
- Climate resources
- Environment data
- Fisheries Resources
- Forestry Resources
- Institutional resources
- Land owners data
- Plant Resources
- Socioeconomic & Infrastructure data
- Soil resources
- Water Resources.

For increasing production at micro level, an inventory of currently used, potentially available, and an evaluation of the quantity and quality of these resources is required. This requires design and development of agricultural resources information system using state-of-the-art IT Tools, as given below, to facilitate effective agricultural planning and development:-

- Data warehousing (Data Bases & Model Bases)
- Expert Systems & Knowledge Bases
- Networking (Internet, Intranet and Extranet)
- Geographical Information System (GIS)
- Application of Remote Sensing Data
- Multimedia Information System
- Decision Technology System
- E-Commerce & E-Governance, and
- Digital Library.

Agricultural planning and development [Mollet84] require (a) knowledge about recent progress in agriculture, (b) the existing situation (especially the main problems impeding development), and (c) the potentialities for achieving agricultural objectives. This information is needed for reassessing current investment and other development activities as well as for planning new measures, setting benchmarks against which to monitor progress.

Proper analysis of the agricultural sector requires that it is seen as a system of functionality interrelated and interdependent elements, each of which contributes to the existing and potential level of performance of the sector. A

stock taking and diagnostic survey is needed early in the planning process to provide information about the wide range of factors influencing agricultural performance. Both the Ministry of Agriculture and Ministry of Rural Development implement, through corresponding State departments, various central sector and centrally sponsored schemes related to agricultural and rural development, on watershed basis. The landscape, climate, and agronomic characteristics of each watershed vary considerably. Each watershed contains a complex mixture of;

- Soil types,
- Landscapes,
- Climatic regimes,
- Land use characteristics, and
- Agricultural systems.

Each watershed can be subdivided into agro-eco-regions having similar soil types, landscapes, climatic regimes, crop and animal productivity, and hydrologic characteristics. Integrated Watershed Development and Management has been recognized as an effective strategy for sustainable agricultural development in the country.

SOURCES OF AGRICULTURAL RESOURCES INFORMATION AND DESIGN OF SYSTEM

Remote Sensing has provided a new impetus for the earth resource and environmental scientists. Increasing population and diminishing resources have compelled us to consider better ways for management of natural resources. Soil survey and preparation of soil maps are being carried out by NBSS&LUP, AISLUS, CAZRI, CSSRI, CSWCRTI, NRSA, RRSSC, IIRS, State Departments of Agriculture, State Soil Survey Units, State Agricultural Universities, State Remote Sensing Application Centres, *etc.*

A review of the soil mapping and land degradation mapping was conducted by an Inter-Agency Expert Committee constituted by the Ministry of Agriculture and the Department of Space, and on the basis of the recommendations, a National Mission on "Mapping of Soils and Land Degradation at 1:50,000 Scale" with the major objective of creation of uniform soil and land degradation database for the entire country is being contemplated. Forestry Survey of India, Geological Survey of India, Fisheries Survey of India, Botanical Survey of India, National Remote Sensing Agency, Survey of India, National Atlas and Thematic Mapping Organization, National Sample Survey Organization, Central Ground Water Board, *etc.*, conducts resources surveys and develop "resources databases" using ground truths and applications of remote sensing data.

The Report of the Committee on "Natural Resources Information System (NRIS)-Linkage and Networking Project", constituted by the Department of Space in early 1990s, envisaged about 435 district level NRIS nodes in conjunction with DISNIC nodes of NIC, 26 state level NRIS nodes, 182 NRIS project nodes (7 Themes and 26 States), and 42 NRIS Regional nodes (7 themes

and 6 regions). Development of "Natural Resources Information System (NRIS)-Linkage and Networking Project" was initiated by NIC in its pilot project districts. Department of Land Resources through its land resources development programmes, Department of Agriculture & Cooperation through its NWDPRA Projects, and Department of Science & Technology through its NRDMS Projects, have been involved in the implementation/development of Natural Resources Information System (NRIS) to strengthen their schemes through their implementing agencies. The existing data available from the following reports can facilitate strengthening resources databases:-

a. Soil survey
b. Geological survey
c. Forest inventories
d. Hydro-meteorological studies
e. Aerial photographs and contour maps
f. Ownership data and infrastructure information
g. Rainfall and stream flow data
h. Land use details
i. Development plans.

Development of metadata is required as the overall rate of collection of data increases rapidly with advances in technologies such as high resolution satellite-borne imaging systems and global positioning system, and with growing number of people and organizations who are collecting and using data (spatial and non-spatial). Metadata standards on soil geographic data, vegetation geographic data, developed by [FCDC98], provide a systematic way to collect metadata.

Agricultural Resources Information System will have data and information on basic resources such as (i) soil resources, (ii) water resources, (iii) climate resources, and other data sets (collated from Remote Sensing as well as conventional means) such as (iv) basic data on crops, (v) animal husbandry and fisheries, (vi) genetic (plant, animal & fisheries) materials, (vii) land ownership, (viii) Socioeconomic data, (viii) infrastructure for agricultural development.

The data sets are as follows:-

a. Basic Data on Crops;
   — Production of major crops
   — Area cultivated under each major crop
   — Yields per Unit of Area for each crop
   — Areas sown but not harvested
   — Areas of fallow, double cropped, irrigation and inter-cropped land.
b. Information on livestock numbers, production and Yield per unit
c. Trade statistics on agricultural commodities and the extent to which imports/exports are involved
d. Information on size, character, technology and organization of farms, by groups.

The inventory and appraisal should cover natural, capital, institutional and human (manpower) resources.

NATURAL RESOURCES

- Information on physical feature [topography, geology, soils, natural vegetation, and hydrology (surface and sub-surface)] to determine the land's capability for agricultural development;
- Maps depicting differences in physical land characteristics, meteorological, climatological, hydrological, geological, and geo-morphological conditions; population densities, types of land tenure systems used, proximity to markets and urban centres, transportation and other infrastructures;
- Areas of immediate growth potential (where climate, soil and water conditions are favourable for agriculture and where technology needed to substantially increase output of major crops already being grown;
- Areas of future growth potential (where favourable climatic and soil conditions exist but lack one or more elements of (i) adequate & controlled supply of water, (ii) technology required for substantially increasing production of a major crop or crops, currently grown, or capable of being grown, and (iii) transportation needed to bring the areas into national economy);
- Areas of low growth potential (where climatological, soil, topological or other deficiencies without economic means for correcting them, exist) which require technological breakthroughs before substantial increases in output are possible.

CAPITAL RESOURCES

- Investments in agriculture (buildings, water systems, irrigation works, drainage systems
- Agricultural implements and machinery
- Work animals and breeding stock
- Agricultural inputs (seeds, fertilizers, pesticides & insecticides, and credit).

INSTITUTIONAL RESOURCES

- Research
- Extension
- Training
- Provision of short, medium and long-term credits
- Marketing, and
- Development plans.

Human Resources (to find out what extent the human conditions act as a constraint on increased output and can contribute to increased output):

- Labour forces (owner-farmers, sharecroppers, and wage labourers)
- Labour Force (employed, under-employed, and unemployed; seasonal variations)
- Level of literacy, education, nutrition of agricultural population.

MARGINALISATION OF SMALL FARMERS

A central issue in Agricultural Development is the necessity to increase productivity, employment, and income of poor segments of the agricultural population. Among the rural poor, the small farmers constitute a sizeable portion in the developing countries. Studies by FAO have shown that small farms constitute between 60-70% of total farms in developing countries and contribute around 30-35% to total agricultural output.

Liberalisation era (1990-91) began in India when over 40% of rural households were landless or near landless, and over 96% of the owned holdings and 68.53% (over 2/3rd) of owned land belonged to the size groups (marginal, small and semi-medium). The decade of 1981-82 to 1991-92 seems to have witnessed a marked intensification of the marginalisation process-the percentage of small owners increased from 14.70% to 21.75%.

Small farmers emerged as the size group with the largest share of 33.97% in the total land, which is just doubled during this decade. As regards the Large Farmers, they were 1 % of the total owners in 1990-91 but owned nearly 13.83% of the total land. An interesting, but speculative, inference is that the changing position of the large owners represents the other side of the marginalisation process, *i.e.*, the presence, and possibly growing strength, of a small but dominant and influential group in agriculture. Analytical reports reveal that marginalisation process could gather further momentum in the years ahead to become an explosive source of economic and political turbulence, due to the features of prevailing policy-cum-market environment in the country.

Trend towards a greater casualisation (erratic and low-paid work) of the workforce that was witnessed in the 1980s appears to have continued in the 1990s.

Low productivity and inability to absorb the growing labour force make the agricultural sector in India witness to a pervasive process of marginalisation of rural people. This process is likely to get intensified in the coming years, raising formidable problems in achieving sustained development of rural areas and rural people.

Both Information Technology, Genetic Engineering and Bio-Technology, which are the "drivers" of globalization with their complementarities of liberalisation, privatisation and tighter Intellectual Properties Rights, are bound to create new risks of marginalisation and vulnerability. Information Technology is able to produce a penetrating and clinical mapping of the land, encompassing the physical, chemical and biological features, and groundwater resources, and forecast of climatic conditions in a focused manner, that even small geographical segments-the small farms-can be benefited through the guidance provided by the ways in which natural and human resources can be optimally combined with appropriate technologies, inputs and options to enhance and diversify agricultural production [KVS2K]. Information Technology will facilitate dissemination of information on development, education, extension, husbandry, marketing, production, and research, to agricultural farmers.

INDIAN AGRICULTURAL SECTOR

The Indian Agricultural sector provides employment to about 65% of the labour force, accounts for 27% of GDP, contributes 21% of total exports, and raw materials to several industries. The Livestock sector contributes an estimated 8.4 % to the country GDP and 35.85 % of the agricultural output. India is the seventh largest producer of fish in the world and ranks second in the production of inland fish. Fish production has increased from 0.75 million tons in 1950-51 to 5.14 million tons in 1996-97, a cumulative growth rate of 4.2% per annum, which has been the fastest of any item in the food sector, except potatoes, eggs and poultry meat. The future growth in agriculture must come from [GBSingh2K] viz.,

- New technologies which are not only "cost effective" but also "in conformity" with natural climatic regime of the country;
- Technologies relevant to rain-fed areas specifically;
- Continued genetic improvements for better seeds and yields;
- Data improvements for better research, better results, and sustainable planning;
- Bridging the gap between knowledge and practice; and
- Judicious land use resource surveys, efficient management practices and sustainable use of natural resources.

IX PLAN STRATEGY ON AGRICULTURAL DEVELOPMENT

The agricultural development strategy for the Ninth Five Year Plan is essentially based on the policy on food security announced by the Government, to double the food production and make India hunger free in ten years.

The Strategy to ensure food security is as follows:

- Doubling food production
- Increase in employment & incomes
- Supplementary/sustained employment and creation of rural infrastructure through Poverty Alleviation Programmes (PAP)
- Distribution of food grains to the people Below Poverty Line (BPL)

The Ninth Plan Target is to achieve a growth rate of about 4.5% per annum agricultural output and production of 234 MT of food grains by 2001-02. The Policy thrust and key elements of Growth strategy, as proposed in the Ninth Five Year Plan Document (Volume II: PP444), are as follows:-

- Conservation of land, water, and biological resources
- Rural infrastructure development
- Development of rainfed agriculture
- Development of minor irrigation
- Timely and adequate availability of inputs
- Increasing flow of credit
- Enhancing public sector investment

- Enhanced support for research
- Effective transfer of technology
- Support for marketing infrastructure
- Export promotion

The Ninth Five Year Plan Document (1997-2002) reveals that development of the vast rain-fed areas of about 90MH would require over Rs.37,000 Crores. Further, scientific treatment for soil and water conservation for 12 MH of arable and 3 MH of non-arable land would require about Rs.7500 Crores. Development of rain-fed areas require a substantial public investment, which may not be possible due to the new policies of fiscal compression. In the coming millennium, on the basis of current trends in the consumption pattern, the estimated total requirement of food grains is likely to be around 245 Million Tons by 2006-07.

AGRICULTURAL PLANNING AND DEVELOPMENT

India is a vast country with a variety of landforms, climate, geology, physiography, and vegetation India is endowed with regional diversities for its uneven "economic and agricultural" development, on account of (i) Agro-climatic environments (15 Zones/127 regions), (ii) Agro-ecological regions (20) and 60 sub-regions, (iii) Agro-Edephic regions, (iv) Terrain mapping sub-units, (v) Natural resources endowments (geology, geomorphology, soil, ground water, surface water, & infrastructure), (vi) Human resources (Population density), (vii) Level of investments in rural infrastructure, and (viii) Level of investment in technology and its adoption.

India has a total geographical area (TGA) of 329 Million Hectares (MH) out of which, about 265 MH represent varying degrees of potential for biological production. [Dhuruva89] report reveals that more than 50% of TGA is threatened by various types of land degradation, such as soil erosion, gully & ravine formation, salinity, water logging, shifting cultivation, *etc.* Development of irrigation potential is considered as the key factor in the sustenance of "Green Revolution". Despite 50 years of development planning, rainfed agriculture is the largest and the most important sector of crop production in India.

Soil resources are the most precious non-renewable vital resources for growing food, fibre, and fuel wood to meet the human needs. Management of Soil Resources is essential for both the continued agricultural productivity and protection of environment. By considering various factors like population growth rate, diminishing per capita of land and water resources, and increasing land degradation problems, it is estimated that India will be required to produce an additional 5-6 million tons of food grains annually in 21st Century. This will lead to tremendous pressure on soil resources along with competitive demand for it from industrialization and urbanization. However the capacity of soil to produce is limited and its limits to production are set by its inherent characteristics, agro-ecological settings, and its use and management.

Forests are an important natural resources of India, having a moderating influence against floods and also protecting the soil against erosion. About 95% of the forests in India is owned by States and the total area under forests is about 22% of the total geographical area.

Development of livestock has been envisaged as an integral part of sound system of diversified agriculture. In animal production, the major aim is for raising ecologically adapted animals and efficient utilization of locally available feed resource. Dairy development is intimately linked with cattle population, breed improvement, cattle health and disease management, and fodder development, *etc.* Animal Husbandry in India is essentially a endeavour of millions of small holders (Resource-Poor-Farmers) who rear animals on "crop residues" and "common property resources" without generally allowing them to compete with man for food grains. The small holders produces milk, meat, wool, *etc.*, for the community, with virtually no capital, resource, training and at a cost that no modern technology in the world had ever produced. Food and Fodder Resources will be crucial to the future development of "livestock resources" in the Country. There is very little scope for increasing the area under fodder production, keeping in view the priority for food grains, pulses and oil seeds. Development of Fodder Resources is basically an activity based on a multi-disciplinary approach involving the areas of agriculture, animal husbandry, environment & forests, revenue, rural development, and wasteland development.

Water Resources of India contain diverse group of flora and fauna. Agriculture is the greatest user of Water accounting for about 80% of all consumption. Animal Husbandry and Fisheries require abundant water. Development of Water Resources, since Independence, has been undertaken for specific purposes like irrigation, flood control, hydro-power generation, drinking water supply, industrial and various miscellaneous uses. Minor irrigation projects have both surface and ground water as their source, while major and medium projects mostly exploit surface water resources. The break up of the ultimate irrigation potential under the above three categories is,

- 58 M.Ha by major and medium irrigation projects,
- 17 M.Ha by minor surface water schemes, and
- 64 M.Ha by minor ground water schemes.

Fisheries Resources of India are either inland or marine. The principal rivers and the tributaries, canals, ponds, lakes, reservoirs comprise inland fisheries. The river extend about 27,200 kms, and other subsidiary water channel comprise about 112,000 kms. Marine resources comprises of about 2 Million sq.kms of EEZ for deep sea fishing, and 7,250 kms of coastline. With the diverse fish fauna, the development objectives are to judiciously & optimally utilize the resources for [NBFGR2K]:-

- Enhancing production and productivity of fishermen, fish farmers and fishing industry;
- Increasing fish production and thereby, raising nutritional standard of people;

- Earning of foreign exchange from export of marine products;
- Improving Socioeconomic conditions of traditional fishermen;
- Generating employment for coastal and rural poor; and
- Conservation of depleting species of fish.

Good infrastructure helps in raising productivity and lowering the unit cost in the production activities of the economy. "Agricultural Infrastructure" refers to "Rural Infrastructure" whereas "Industrial Infrastructure" refers to "Urban Infrastructure". Agricultural development requires (i) agricultural research and extension, (ii) rural financial institution, (iii) irrigation and drainage, (iv) agricultural inputs (fertilizers, seeds, credits), and (v) marketing and storage facilities.

Agriculture Credit is a crucial input for increasing agricultural production and productivity. Institutional finance for Agricultural credit is disbursed mainly by Commercial banks, Regional Rural Banks, Land Development Banks, and Cooperative banks. Share of commercial banks in total institutional credit to agriculture is about 48%, that of Cooperative banks is about 46%, and Regional Rural Banks account for 6% only. Short-term Credit accounts for 2/3rd of the total institutional lending to the Agriculture.

Drought has multiplier effect on agricultural production during the subsequent year also, due to (i) non-availability of quality seeds for sowing of crops, (ii) inadequate draught power for carrying out agricultural operations as a result of either distress sale of cattle or loss of life, (iii) reduced use of fertilizers as the investment capacity of the farmers decline, (iv) non-availability of raw materials in agro-based industries, and (v) deforestation to meet the energy needs in domestic sector as agricultural waste may not be available in required quantity.

The Central Ministry of Agriculture (MOA) is responsible for implementation and formulation of national policies and programs to achieve agricultural growth through optimum utilization of the land resources, water, soil, plant, fisheries, & livestock resources. Government of India implements the following agricultural related Schemes (whether Watershed based or Agro-climatic region based) in the country, which deal agricultural resources information for Planning and Development:-

- Agro-climatic Regional Planning (ACRP) Project
- Agro-Ecological Mapping Project of the National Bureau of Soil Survey & Land Use Planning (NBSS&LUP)
- All India Soil and Land Use Survey (AISLUS)
- Early Warning System of Agricultural Situation in India
- Forecasting of Agricultural output using Space, Agro-meteorology and Land based observations (FASAL) Project
- Land Records Computerisation Project
- National Agricultural Research Project (NARP)
- National Agricultural Technology Project (NATP) to strengthen research-extension-farmer (r-e-f) linkage
- National Watershed Development Programme for Rain-fed Areas (NWDPRA)

- Soil and Water Conservation Programs
- Drought Prone Area Development programme
- Desert Development Programme
- National Wastelands Development programme
- Integrated Mission on Sustainable Development (IMSD) Programme.

INFORMATION FOR DECISION MAKING

The major objective of Sustainable Agriculture and Rural Development is to increase food production in a sustainable way and enhance food security. The Agenda-21 recommends major adjustments in agricultural, environmental and macroeconomic policy to create the conditions for the Sustainable Agriculture and Rural Development. Recommendations of the United Nations Conference on Environment and Development-Agenda 21 (1992) on "Information for decision making" are as follows:-

- Development of indicators for sustainable development,
- Promotion of global use of indicators for sustainable development,
- Improvement of data collection and use,
- Improvement of methods of data assessment and analysis,
- Establishment of comprehensive information framework,
- Strengthening of capacity for traditional information,
- Production of information usable for decision making,
- Development of documentation about information,
- Establishment of standards and methods for handling information,
- Establishment and strengthening of electronics networking capabilities, and
- Making use of commercial information sources.

An Informatics model will have the knowledge components such as objects, events, know-how, precedence and cause-and-effect relationships and Meta-knowledge. Informatics, which is an IT application, is taking advantage of (i) multi databases (Federated and non-Federated databases), (ii) information system research and development methodology, (iii) relational-object methods, (iv) knowledge base and expert systems, (v) Geographical Information System (GIS) Technology, (vi) model bases, (vii) distributed query capabilities over Internet/Intranet.

Development of Information Systems and utilization of Information Resources over Internet/Intranet is a matter of strategic importance in all countries today. Informatics Network plays an important role in the information flow from the implementation level to the planner at Macro (national) level, Macro-meso (region covering more than one state) level to Meso (state) level, and Micro (District, Block and Village) level.

Metadata standards are simply a common set of terms and definitions that describe geospatial and non-spatial data. Metadata standards provide a way for data users to know:

- What data are available
- Whether the data meet specific needs

- Where to find the data
- How to access the data.

The information needed to create metadata is often readily available, when the data are collected. A small amount of time invested at the beginning of a project may save money in future. The initial expense of documenting data clearly outweighs the potential costs of duplicated or redundant data generation. Metadata organization will facilitate for internet access to distributed sites where data are produced, maintained or used

The OpenGISÒ Model of the Open GIS Consortium Technical Committee [OpenGIS] envisages to synchronize geo-processing technology with the emerging Information Technology standards, based on open systems, distributed processing, and component ware frameworks, and to facilitate interoperability through "common specification" over internet/intranet. The "Pluggable Computing Model" provides a conceptual framework ("reference model") that positions the OpenGIS Specification in the broad context of Information Technology. The Pluggable Tool Services include GIS Tools, Imaging Tools, Expert Tools, and RDBMS Tools. Each Tool has algorithms, data, and interfaces to services in the distributed computing environment. Benefits of the Pluggable Computing Model are as follows:-

- To permit increased resource sharing between organizations and processes
- To facilitate understanding the role of the OpenGIS Specification in the larger context of Information Technology
- To enhance data connectivity among users and applications
- To improve the ability of developers and users to integrate new capabilities into existing environments as well as incorporate legacy systems into new environments.

Informatics for agricultural development requires coordinated inter-sectoral approach and application of appropriate Information Technology (IT) tools, in the areas of:

- Agricultural Research,
- Agro-meteorology,
- Agricultural Marketing,
- Agricultural Engineering and Food processing,
- Agricultural Extension and Transfer of Technology,
- Credit & Cooperation,
- Crop Production and Protection,
- Environment & Forest,
- Fertilizers and Manure,
- Fisheries,
- Irrigation and Drainage Systems,
- Livestock, Dairy Development and Animal Husbandry,
- Rural Development and Planning,
- Soil and Water Management,

- Watershed Development, and
- Wastelands Development.

In view of the recommendations given by ISDA-95 and various sub-Groups for formulation of the Ninth Plan in the Agriculture Sector, MOA is implementing Information Technology Plan, in collaboration with NIC, to implement "NICNET based Agricultural Informatics and Communication (AGRISNET)" in the country, to achieve higher sustainable agricultural productivity and also to make "Indian Agricultural Sector On-line". This is likely to be the largest sharable Internet Portal in the world, for agricultural sector in India, on NICNET having more than 10,000 nodes to government itself.

AGRICULTURAL ECONOMICS

"Agricultural Economics" offers a comprehensive examination of the economic principles and theories that underpin agricultural production, distribution, and consumption. This essential text explores the unique challenges and opportunities facing the agricultural sector, providing readers with a deep understanding of the economic forces shaping agricultural markets and policies. Drawing on both theoretical frameworks and empirical evidence, the book covers a wide range of topics, including farm management, agricultural marketing, rural development, and environmental sustainability. It delves into key issues such as agricultural price analysis, food security, agricultural policy analysis, and the role of technology in modern farming practices. With its interdisciplinary approach, "Agricultural Economics" appeals to students, researchers, policymakers, and practitioners seeking to navigate the complex dynamics of agricultural systems. The book incorporates real-world case studies and examples to illustrate concepts and principles, making it accessible to readers at all levels of expertise. Whether used as a textbook in academic settings or as a reference guide for professionals in the field, "Agricultural Economics" offers valuable insights into the economic dimensions of agriculture and its implications for food production, rural development, and global sustainability.

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