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Food Security in India: The Challenge of Food Production and Distribution

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Food security in India is adversely affected by several abiotic, biotic, and sociopolitical situations. The current position may worsen in the future if timely and appropriate actions are not planned and executed. The pressure of human population and land for cultivation, climate change, government policies of public distribution and marketing of food grains, and lack of a participatory approach—all are contributing to slow down the availability of foods. Also, crop productivity seems to be very much unsustainable. The situation has to be remedied by all possible means and citizens must be assured of food security. This review summarizes several strategies for crop production and food distribution and emphasizes the need for a second Green Revolution.

KEYTERMS *crop productivity, food distribution, food production, food security, India*

CURRENT FOOD SECURITY SITUATION

Food security means that all people at all times have access to sufficient, safe, and nutritious food to maintain a healthy and active life. In 1948 the United Nations General Assembly adopted and proclaimed the Universal Declaration of Human Rights and, according to Article 25(1), everyone has the right to a standard of living adequate for the health and well-being of himself and his family—including food, clothing, and housing (United Nations, n.d.). Security is best assured when food is locally produced and made available on a continuous basis at an affordable price (maximizing stability in flow of

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supplies), regardless of climate and other variations. Food security includes freedom from both famine and chronic malnutrition. Nevertheless, it is very much linked with increased agricultural production, management of natural resources, environmental protection, and trade policies. Farmers should receive a fair income from sustainable agriculture and community buffer stocks of food should be maintained (Gahukar, 2004b). Thus, concerted efforts to promote a better understanding of and sensitization to poverty, population increase, agricultural transformation, and environmental degradation are urgently needed.

In India, 65–70% of the population holds 0.5–1 hectares (ha) of land. Of the cultivable land of 180 million hectares (m ha), 65% is under rain-fed cultivation (Gahukar, 2007b). After the first 5-year plan (1951–1956), there had been an increase in cropped area, irrigation, mechanization, and major farm inputs (hybrid cultivars, synthetic fertilizers, and pesticides), and food grain production increased four-fold from 50.8 million tons (m t) in 1950–1951 to 212 m t in 2005 (Gahukar, 2007b). India's human population is growing at 1.9% annually, as against the 1.5% growth in food production, which contributes 27% to the national Gross Domestic Product (GDP) and accounts for 21% of exports. However, the compound growth rate of food grain production has constantly decreased from 3.22% during 1950–1959 to 1.22% in 2000–2007 (Arivazhagan & Ramanujam, 2009). Therefore, the per capita net availability of food grains decreased to 442.8 g/day in 2007 from 494.1 g in 2002 (Arivazhagan & Ramanujam, 2009). At present, 230 million people in rural areas are undernourished; 40% of children below 3 years of age are underweight and 45% are stunted in growth; the incidence of anemia has risen to the extent of 79% in children below 5 years and 56% in young women (Jose & Navaneetham, 2010).

With drought and war, India faced serious food insecurity in the early 1960s. To overcome this problem, the Green Revolution (GR) was introduced in the late 1960s, which filled some gaps in food production, but the intensive farming practices put significant pressure on agro-ecosystems and small farmers were left out because they could not cope with natural calamities that resulted in crop losses. By 2020, India's total food production requirement is projected to be around 253.3 m t; however, the future food supply will be insufficient due to population increase (present population estimated to be >1.1 billion) and stagnant crop production (Kumar, Joshi, & BIRTHAL, 2009). Obviously, per unit production vis-à-vis agricultural growth in India is comparatively lower than other countries in the region. This situation may lead to widespread hunger and starvation. About 48% of the income of the poor is spent on purchasing food. It is therefore estimated that India's hungry population will increase by 1% for every 2–2.5% increase in prices (Gahukar, 2009a). In addition, food inflation is 10–20% since prices have risen highly. Thus, availability of food is further aggravated by the purchasing power of the consumers. The National Survey Sampling data showed

that the proportion of rural households having two square meals a day was 81% in 1983, which rose to 93% in 1993 (Rao & Krishna, 2009). In fact, the number of persons Below the Poverty Line (BPL) is on the increase, though the trend may differ from one state to another (25% of the population in Maharashtra and 5% in Punjab; Gabukar, 2009a). To overcome this situation, the Indian government launched centrally sponsored schemes in 2007–2008; for example, the National Food Security Mission, pursuant to the resolution of the National Development Council on May 29, 2007, aimed to increase the production of cereals and pulses and to introduce new schemes and policies and credit facilities and insurances (National Informatics Centre, 2011, para. 1). Similarly, the National Food Security Bill, the Green India Mission, and the Right to Food Act are under consideration by the Parliament to promote food security.

MAJOR CONSTRAINTS TO SUSTAINABLE FOOD PRODUCTION

Land Use

The regulations for land tenure and land rights remain basically the same since independence, thereby allowing small farmers to fall prey to the tactics of landlords or moneylenders. Presently, there is a big shift in land use. Areas previously under crop cultivation are being used for infrastructure, housing, and roads; and land around cities is allotted to resorts, hotels, etc. Land cultivated for food grains is being converted to fruit crops. Fertile land is proposed for biofuel crops, including jatropha (*Jatropha curcas*). Therefore, facilities and infrastructure (including irrigation water, electricity, roads, and market access), in place of subsidies, could be a viable and effective strategy which needs recognition to design farmer-oriented policies.

Soil degradation is severe throughout the country, indirectly affecting food security (Lal, 2008). This degradation is mainly driven by poor soil and water management practices. Farmers prefer cash crops (e.g., sugarcane, cotton), due to better productivity and a higher Minimum Support Price (MSP). In order to boost production, several pesticides are sprayed on food crops which kill beneficial fauna (predators, parasitoids, entomopathogens, parasitic nematodes). Double- and triple-cropping practices recommended in the GR period resulted in land overuse/unbalanced use, with a subsequent decline in soil fertility. Due to deficient rains, many farmers shifted from paddy to pulses and oilseeds, which are less water intensive. Acreage under high-value *Basmati* rice in northern states has increased, while in Andhra Pradesh, more area is under groundnut cultivation.

The increase in population led to a decrease in per capita landholding—e.g., 0.15 ha in 2000 to 0.136 ha in 2010; the projection for 2050 is 0.1 ha (Lal, 2008). The Indian government supported land reform through the “Bhoodan Movement” in 1960, through which land was distributed

to poor people, huge tracts were converted into croplands, and permanent pastures were reduced to <20% of their size in 1947. India has 20% of the world's livestock population, amounting to 450 m animals, but only 13 m ha of grazing land is available (Gahukar, 2009b). Loss of grazing land leads to overgrazing on existing land, resulting in meager fodder during times of scarcity. In villages, there is a decreasing number of cattle herds because of increased use of chemical fertilizers and less and less application of farmyard manure for crop cultivation.

Crop Productivity

The growth rate in agriculture fell from 3.25% (1981–1985) to 1.5% (1996–2003) due to low yields. The stagnated production adversely affected the standard of living of the rural population (Dhillon, Kataria, & Dhillon, 2010). In fact, crop productivity is lower in India in comparison with other countries in Asia. Yields of some food crops (vegetables, millet, sorghum, wheat, soybean, potato, maize) are the lowest in the world. One ton of soybean degrades about 10 ha of land (Joshi, 2008). Irrigation has been a major factor in enhancing food production and the area under irrigation increased from 34 m ha in 1975 to 60 m ha in 2007 (Lal, 2008). The rapid depletion of ground and sub-groundwater associated with use of electric pumps for irrigation is common.

Production varies according to texture and inherent fertility of soil, farm inputs, and cultivation methods. There was a sudden increase in the use of chemical fertilizer during the GR era and crops responded positively in productivity. Moreover, 20–70 m t of crop residues and 36–108 m t of animal dung are used as household fuel rather than as soil amendment (Venkataraman, Habib, Eiguren-Fernandez, Miguel, & Friedlander, 2005).

It is difficult to cultivate smallholdings, and smallholder farmers in dry land zones cannot adopt modern cultivation practices, and cannot cope with losses and natural calamities. Whenever the landholding is large, parts of it remain uncultivated due to nonavailability of labor. Therefore, the impact of the GR on the quality of life of the rural masses can not be perceived (Gahukar, 2007a). Future crop production must be compatible with improving the environment, reducing greenhouse gases (GHG), and improving water quality. Therefore, the challenge is to increase food production without jeopardizing natural resources.

Biological Factors

Pests (insects, noninsect pests, wild animals), plant diseases (caused by bacteria, fungi, viruses, and nematodes), and weeds (annual, biannual, and

perennial) all damage crops at any of their growth stages and cause economic loss in both production and quality of grains. Pest management strategies have been changed to suit consumers and the main components of Integrated Pest Management—such as plant products, cultural practices, biopesticides, and biological control agents—have not been exploited. On the contrary, synthetic pesticides (insecticides, fungicides, weedicides, nematocides, etc.) have been overused or wrongly used. Moreover, several formulations of plant hormones and micronutrients are recommended regularly, which change the plant physiology, making plants more susceptible to natural disasters, pests, and diseases.

There is a reasonable decrease in natural vegetation in the landscape as crop cultivars of high genetic diversity disappear. This decreasing biodiversity above the soil also decreases biodiversity in the soil. The demand for natural resources now exceeds its regenerative capacity by a wide margin. It is speculated that conservation of unmanaged/disturbed habitats can help maintain biodiversity.

Farm Inputs and Labor Supply

Currently, the availability of affordable labor is one of the major problems in crop cultivation. There is migration from rural to urban areas for jobs and the labor scarcity is felt, particularly at the time of planting and harvesting operations. Some members of the household often earn a living outside agriculture.

Farm inputs must be used judiciously and efficiently—particularly seed, irrigation, fertilizers, and pesticides that are needed at crucial crop growth stages. These inputs are typically unavailable in local markets when demand is high. Consequently, farmers have to pay higher rates than normal. The prices of farm inputs and labor have gone up tremendously in the past decade and self-sufficiency has changed into dependency, as farmers have no choice other than purchasing market goods at the price decided by companies and traders. The Indian Government, in an effort to increase crop production, provided support to the extent that some inputs (especially urea) were distributed to farmers at subsidized rates. However, overuse of common N-fertilizers (urea accounts for 82% of the total fertilizers) has decreased the availability of micronutrients. Thus, the effect of synthetic fertilizers is fading away and land is degrading day by day (Gahukar, 2009b). Moreover, the lack of ecological farming (eco-zones) and precision farming to save soil and water has resulted in unbalanced crop production.

Socioeconomic, Political, and Cultural Factors

Factors influencing land or labor allocations are closely tied to politico-economic forces, especially government policies and market conditions.

Politico-economic factors involve world markets and increase foreign exchange land valuations. People are still plagued by the worst forms of poverty and hunger, because the gap between rich and poor is widening due to income inequities, and there is widespread discontent and social alienation. In the GR regime, only rich farmers benefited; poor farmers were excluded from several schemes and subsidies. Smallholder farmers have no money for farm operations, due to debt burden, higher prices of farm inputs, decreased farm income, etc. Social exclusion also prevails due to illiteracy, caste, poor economic and social status, low political influence, etc. (Sen, 2000). Active exclusion occurs when government or other external agencies intervene deliberately through policies, whereas passive exclusion works through social processes.

MAJOR FUTURE STEPS

Conservation and Sustainable Agriculture

Sustainable agriculture is cost effective, productive, and eco-friendly. Revival of agriculture through sustainable growth measures should be undertaken to manage food insecurity. Conservation practices help fight against climate change, since they reduce water use, carbon sequestration, and GHG emission and increase tolerance to heat stress (Aggarwal & Pathak, 2009). In the sustainable system, soil temperature is lowered and soil density, porosity, organic matter and, ultimately, soil fertility are improved. Minimum tillage helps conserve soil moisture from the first heavy rains; top soil is least disturbed; soil microbial biomass increases; and there is less investment, except in seed and labor which comes from the household. In the case of organic cultivation, the cost of farm inputs is significantly reduced. However, organic production systems have not yet received due attention from policy makers. For example, in 2005, the area under zero-tillage cultivation was 1.9 m ha in India, against 25 m ha in the United States (Joshi, 2008).

Crop selection should be based on rainfall pattern, family needs, soil type, field slope, etc. (Gahukar, 2009b). Pigeon pea/red gram crop was unknown in China in the 19th century, but this crop is now planted in over 0.15 m ha of waste and barren land to achieve food self-sufficiency (Anonymous, 2007). Why can't this be done in India? There is certainly a lack of government initiative, people motivation, and villager participation. Synthetic fertilizers should be minimized or replaced by organic manures (compost, vermicompost, farmyard manure), biofertilizers (azolla, rhizobium, azotobacter, phosphate solubilizing bacteria, etc.), and green manuring with gliricidia or sesbania. In rainfed areas, interventions are needed for developing early maturing genotypes, timely sowing with proper plant spacing, genotype selection based on soil type, reducing the interval between harvest of previous crop and planting of next crop, etc. For example, the System of Rice Intensification (SRI) has resulted in improvements in terms of ecological and economic stability.

There are about 200 factors that affect crop yield but rainfall and soil acidity are the major ones (Lal, 2008). More than 50% of India's irrigated land is fed by electric pumps that extract groundwater, resulting in groundwater depletion at the rate of around 10 cm every year (Lal, 2008). A focus on saving, conservation, and proper utilization of every drop of water is needed through proper devices and methods—such as field ponds, water tanks, and watershed techniques. Mulching with weeds or polythene/plastic helps in moisture conservation, in weed eradication, and in stopping soil erosion. In Uttar Pradesh, farmers adopted the cultivation practices of crop rotation, mixed cropping, integration of leguminous crops, bund plantation, and kitchen gardens. In this way, even small farmers could become self-sustainable by adopting integrated sustainable agriculture using local resources (Singh, 2009). Another way may be the introduction of agroforestry, silviculture, or horticultural crops that need less water. Surplus land due to high productivity should be used for diversified economic activity, utilizing renewable raw materials (food, feed, fiber, fuel). For precision farming, improvement in irrigation use is possible. For example, broad beds (120-cm wide $\times$ 30-cm deep), in fields having a 1–2% slope, act as a barrier against run-off and furrows as drainage channels during the time of high rainfall; compartmental beds (5-m wide $\times$ 8-m deep) serve as minitanks in fields with a 1.5% slope and the compartmental beds also help to reduce soil cracking; basins (2-m radius), in fields with a 5% slope, are a better choice for tree plantation. The investment in irrigation structures of all types needs to be doubled or tripled; otherwise water stress, coupled with higher food prices, will worsen food security.

India cannot ignore biotechnology options to increase agricultural productivity as they hold promise for a second GR. At present, 169 Genetically Modified (GM) food crops are in various stages of field trials at different private and public institutes. These include maize (tolerance to cold), paddy (nutritional quality), soybean (resistance to weeds), papaya (tolerance to viral diseases), tomato (delay in ripening), and brinjal/aubergine (pest resistance; Gahukar, 2004a). There is controversy about these crops concerning risks to human health and the environment. The monopoly of multinational companies is another major concern, since seeds are considered for intellectual property rights. In order to solve this problem to some extent, a new system of compensation termed “Substantial Equivalence” has been recently introduced in Europe.

Mitigation of Climate Changes

Agriculture is seasonal in nature and depends mainly on weather and climatic changes. Climate changes affect crop productivity adversely (Gahukar, 2009a). According to the Centre for Monitoring Indian Economy, rice

productivity was 1,744 kg/ha and 1,984 kg/ha in the 2002–2003 and 2004–2005 seasons, respectively, against an average of >2,000 kg/ha. This reduction was due to a bad monsoon which is variable and less predictable. Frequent floods will destroy crops, and droughts and forest fires will affect plant growth. Shortages in food production from temperature alone are going to be huge. The minimum temperature will increase by the year 2100 and will affect crop growth and physiology. The planting of albedo-high crops (those reflecting sun rays) can reduce the temperature by 1°C in summer, though light reflection depends upon the shape, size, and waxy layer of the leaf, etc. Similarly, diversified farming can improve livelihood and offer advantages in terms of planting schedule and marketing. A diversified strategy can thus augment the net income of small farmers (Singh, 2009).

Establishment of weather stations; provision of irrigation water and power supply; crop insurance against natural calamities; weather forecasting by GIS and LANDSAT; and monsoon management, including critical analysis of rainfall through modeling, are some of the priorities that should be considered by the Planning Commission. Nano-sensors dropped in remote areas can transmit weather information on time to farmers carrying out cultural operations. Hence, the government has launched a program, Indian Network for Climate Change Assessment (INCCA), which will study the impact of global warming on communities and their economy and will create an indigenous knowledge-base on climate change and the environment. The INCCA undertook rigorous scientific assessments and designed adaptation strategies, particularly for changes in water yield and other hydrologic budget components such as evapotranspiration, sedimentation, soil moisture index, etc. These studies will help bridge the gap between policy and science (INCCA, 2010).

For assessment of climate change, crop simulation models are yet to be confirmed. Though carbon dioxide enriches crop yields, the impact of warming temperature is not fully understood with reference to the interactive effect of temperature and plant protein content on plant respiration. The new method developed by Tata Consultancy Services for detection of water and micronutrient content in the soil should be studied in detail for possible application. Increasing demands by 2050 in developing countries for water, particularly in municipal and industrial sectors, and potential impacts of climate change pose threats to food systems. According to recent models proposed by Strzepek and Boehlert (2010), the changing water supply systems will cause an 18% reduction in the availability of worldwide water for agriculture by 2050.

For mitigation of aftereffects of climate change, immediate steps should include greening for offsetting negative effects of carbon dioxide and developing heat-tolerant crops; shifting cultivation, mixed cropping and organic cultivation can be introduced in some areas. Increasing crop productivity through sustainable agriculture, which requires extension services and

technical support to regenerate and enrich land fertility, may lead to better use of water resources and adoption of the best crop management techniques (Dhillon et al., 2010).

Agricultural Policies

The current investment in agriculture is only 1.3% of India's total GDP, though agriculture accounts for 22% of GDP and provides a livelihood for 58% of its population (Gahukar, 2004b). Schemes of the Small Farmers' Agri-Business Consortium, agri-clinics, etc., should be revamped, revitalized, and made effective. The supporting facilities and services critical to a comprehensive and integrated food security program are essential for livelihood security for farmers (Swaminathan, 2009). Therefore, the Indian government should enact and enable to reform food and agricultural policies whenever there is an urgency to systematically assess economic and social issues and their implications relevant to local needs, conditions, and resources. Although the government introduced a Right to Food Act in 2001, the gap between potential and actual yields in all major farming systems should be bridged at the earliest opportunity. Food needs cannot be fulfilled if people have to depend on imported wheat or rice. Thus, there is a need for convergence and synergy among all ongoing programs.

The MSP for food crops is a major concern. First, it is declared late; it should be announced before the crop season and procurement must be timely. Second, the MSP only applies to a few staple foods, so farmers growing other crops are left to the mercy of the markets. Third, the MSP is mostly based on wholesale price, and farmers get only 20% of the final product price because consumers and producers are working independently. Because of this, remunerative marketing of agricultural produce must be linked. A price stability fund should be considered in government policies and budget allocations. Computer programs may effectively be used to analyze, diagnose, and design an integrated food security system—namely, an Internet network, market information centers, and marketing infrastructure (storage area, quality determination, transportation, credit facilities, and registration of goods).

Credit facilities instead of loan waiving and timely availability of soft loans with less official formalities may be appropriate policies for implementation. The crop subsidy is very low (4–5%) as compared to developed countries (up to 90%). Due to commercialization, the need for agricultural credit increased but agricultural credit accounted for only 11.85% of total bank credit extended in 2003–2004 (Panda & Ganesh-Kumar, 2008). The World Trade Organization (WTO) insists on imports rather than local cultivation. For example, a few years ago, wheat was imported from Australia instead of Punjab, due to subsidy and transport. In the era of globalization, the privatization and liberalization policies of the WTO, with whom the Indian government approves terms and conditions, may offer the possibility for

integrated markets for agricultural goods and services and capital to facilitate the expansion of production, trade, and financial flows on a worldwide scale.

Extension

No capacity building for innovation at the farmer level or development of human resources are being executed and they do not take place in tune with “ground reality.” Only 0.9% of farms have access to information diffused by Krishi Vidyan Kendras, extension centers that demonstrate the benefits of improved technology in agriculture and allied sectors (horticulture, animal husbandry, dairy, poultry). The main approach is to leverage results from laboratory to field, since the difference in crop production efficiency noticed among research stations, demonstration plots, and farmers’ fields is quite large and generally, only certain categories of farmers have knowledge of improved technology (Gahukar, 2007a). To reduce this gap, the National Agricultural Development Program (Rashtriya Krishi Vikas Yojana) was designed in 2008 to develop plans to orient various agricultural strategies toward achieving the target growth of 4% and to incentivize the states to allocate more resources to agriculture.

Extension services strengthen the institute-village linkage program. Therefore, extension services should be an object of reform and an engine for innovation, rather than merely doing routine extension services. The mindset of farmers has to be attuned to modernization and globalization. Educative programs at the village level encourage farmers to adopt economical and practical means of farming and earning a livelihood.

Small landholders do not have any access to export markets through cooperative farming or participatory management, but when these farmers are organized into groups or associations such as self-help groups, their capacity for better production is enhanced and bargaining power through infrastructure support and collective action is increased. Farmers’ associations can help find new/alternative markets, linking farmers with end-users and processors and providing market information, etc., as market-driven crop production is a necessity today. However, efforts to increase crop productivity are effective only if they are linked to an appreciation of market potential. Building social capital through learning situations based on extensive interactions and forging durable linkages among stakeholders that lead to tangible, beneficial outcomes for farming communities are possible measures.

Local government agencies, nongovernmental organizations (NGOs), and cooperatives have to give priority to integrating women into mainstream agricultural development and to empowering them by ensuring access to locally available resources such as land, credit, technology, and education. As women play an important role in agricultural operations, their active

participation is a must; women can efficiently perform seed-based activities and bulking, storing, and marketing of produce at the village level.

Food Distribution System

In India, the present Public Distribution System (PDS) is formal and comprehensive, and food security is supported by setting the PDS to supply food grains at affordable prices. The global economic crisis affected the national economy and the current situation is aggravated by the soaring food prices. The crisis is stalking the small-scale farms and rural areas where 70% of the country's hungry live and work. Linking growth of food markets to farms is actually the biggest challenge. People movement can be initiated so that farmers feel assured about the dependability of future markets, and they would develop their own mechanism for large-scale participation of other farmers in that market, if flexible credit systems and an increase in institutional credit were provided.

Generally, consumer-price-index-based inflation is positive and wholesale-price-based inflation is negative, due to intermediaries between producer and consumer. Additionally, prices of agricultural commodities are not based on the real cost of crop production and linked with inflation, which is around 16% at present. To increase the financial capacities of groups for grain procurement, farmers are linked to credit institutions. As farmers receive 50% of the price of grains immediately after harvest, they are able to meet immediate/routine family needs. Moreover, bulk marketing is a win-win situation for both producer/farmer and buyer. There are positive economic outcomes when farmers are adaptable and willing to change.

The Food Corporation of India (FCI) is the largest public-sector managed network for distribution of essential commodities. To better target people Below the Poverty Line (BPL) vis-à-vis those above the poverty line, the PDS was revamped into the targeted PDS in 1997. Due to inadequate facilities for storage and distribution of food grains, the FCI reported losses of 25–35% in handling, transport, and storage. In addition to this loss, there is overregulation of domestic trade, because poor governance (Local Public Distribution System, World Food Program aid, imports, etc.), social exclusion, and discrimination in policies (viz., gender, education, tribal, ethnic group, farmers' group) exist at all levels. As a solution, the Indian government recently finalized the draft of the Food Security Act to determine the number of persons living BPL and quantum of food grains to be distributed to the vulnerable communities. The government declared 28.3% of the rural population and 25.7% of the urban population as BPL. The poverty line is a per capita expenditure of 12 Rupees (Rs.)/day (0.3 US\$). However, there is a difference of 41–50% in estimating the rural poor in the country (Jain, 2010). The Indian

government also wants to maintain some flexibility on the price of subsidized food grains and to end the “Antyodaya Anna Yojana”—a government-sponsored assistance program which was meant to provide subsidized food to the destitute, primitive tribes, disabled, and the elderly. Hereafter, the central government will only be responsible for procuring, importing, and maintaining food stocks and will limit the distribution of wheat and rice (two major staple foods), leaving nutritional security at stake.

Marketing involves assembling, preparation for consumption, and distribution. Processing is done because consumers want it. The function of distribution is to match the supply with existing demand by wholesaling and retailing at various points in primary, secondary, and terminal markets. In India, several organizations are working in marketing—e.g., the Commission of Costs and Prices, the Food Corporation of India, and corporations for various commodities. There are also specialized marketing bodies for tea, coffee, tobacco, spices, vegetables, etc. At the state level, Agricultural Produce Marketing Boards (APMBs) have been established. The Directorate of Marketing and Inspection provides marketing and inspection services and financial aid down to the village level to help set up commodity grading centers in selected markets. Now, it is time to promote “value-added services” in order to change the agricultural scenario and to opt for global competition by exploiting the available resources to the maximum level.

Suggested Changes in Existing Systems

CONSUMER AWARENESS

Since information technology enhances connectivity, improves linkages with markets, and provides the decision support system, the advantages of the system should be exploited. Internet stations can deliver needed marketing information to farmers concerning the current price of agriculture produce; the purchasing of seeds, fertilizers, pesticides, and other farm inputs; the possibility of value-addition and agri-processing, postharvest technologies, etc. Farmers who engage in sustainable farming should be provided with incentives.

Retail marketing in India is negligible (<2%) compared to China (20%) and the USA (85%). Under the Agricultural Produce (Grading and Marketing) Act of 1973, primary commodities are compulsorily graded for export and voluntarily graded for internal consumption. This action is being performed through governance of the Small Farmers Agribusiness Consortium. An important development is envisaged in the field of regulated markets. Intraregional trade in food products, in both primary and processed forms, is necessary to increase diversification in food production within the country and to improve regional food security. It is equally important to enhance

postharvest management by creating efficient market linkages, building rural infrastructures, and supporting development of the value-added processed food sector.

INFORMATION SHARING

When purchasers/processors are linked with producers/farmers, intermediaries are eliminated. A specific quantity of farm produce is assured at a predetermined price and the demand for particular commodities can be ascertained periodically. This system of contract farming has been recently introduced in some states in India by private firms and found beneficial to farmers growing crops organically (Gahukar, 2007b). The contract system works very well for cotton, floriculture, arboriculture, and some food grains, and there is scope for extending this principle to major food crops. Public-private partnerships can therefore be strengthened for the benefits of farmers.

Private firms and government agencies (Agricultural Produce Marketing Committees, APMCs) are active in the marketing of various food grains. Storage places for farm produce, quality control centers, transportation agencies, service providers, credit facilitators, and registration of commodities ready for marketing can be arranged if the geographic distance between consumers and producers is as narrow as possible. Thus, food security should become a central objective of trade policies, especially in the General Agreement on Tariffs and Trade (GATT).

It is necessary to prevent food-borne illness and improve security from intentional contamination (particularly residue of hazardous pesticides/toxic substances). In the present age of biotechnology, GM crops may have misleading labeling. The sale of only clean and certified food will assure the desired level of food security. Also, the Indian government should establish remunerative marketing links for the sale of certain categories of foods (GM, organic, and chemically treated), so that consumers have choice. Apart from gene erosion and biosafety of GM crops, the socioeconomic impact (cost of seed, monopoly of companies) may lead farmers to nonprofitable cultivation. All these concerns have been raised by farmers, NGOs, and the United Nations.

Intraregional trade in food products in both primary and processed forms will increase diversification in food production and will improve regional food security (Panda & Ganesh-Kumar, 2008). Establishing community buffer stocks of seed and food at the taluka/district level may be one viable strategy. Likewise, the strategy of "our grain our village" proposed by Singh (2010) needs further exploration and proper execution at the village level.

GOVERNMENT POLICIES

In India, agriculture is a state responsibility and the central government helps in accelerating the pace of progress in improving crop productivity

and profitability of smallholdings. Of course, linking growth of food markets to farms is the biggest challenge, because government policy initiatives are targeted at stimulating the supply side only. The law of supply and demand works well if an adequate supply of foods is assured. Otherwise, prices fall and farmers operate at a loss or with a meager margin of profit.

Food security is also challenged by a poor distribution system; but with GATT policies, regions should have the right to regulate imports to prohibit overproduction and export dumping, as farmers suffer from the increase in agricultural imports. Under the free trade agreement, it is now possible and easy for farmers to obtain patents for any innovation or charge the corporate sectors for any genetic local crop races and other natural resources used for crop improvement. A new class of patents covers plants derived from conventional breeding. These patents even claim harvest and derived food products such as milk, butter, and bread. Such patents would become a major threat to food security, food sovereignty, and innovation, since the whole chain of seed, harvest, trade, and food production might be controlled by a few big international companies, leading to a monopoly via patent laws. These consequences would be reflected in genetic resources that would be subjected to seed patents and might increase food crises. Small farmers would be deprived of access to seeds—a productive resource essential for their livelihood—and the price of food could rise, making it less affordable for poor people. The adoption of diversified farming systems to lower the risk of crop losses is advised.

FINANCE/CREDIT

The existing laws regulating landholdings prevent farmers from obtaining hassle-free credit from formal banking channels, and the gap between demand and availability of agricultural credit continues to be huge. Therefore, laws need to be amended and informal credit channels allowed as they are easier and more flexible methods of lending than formal bank loans. Crop insurance should protect farmers against loss of revenue and not against loss of investment. Thrift and credit cooperatives could potentially form joint liability groups of small farmers.

CONCLUSION

India's annual farm growth target of 4–7% could still be a false hope, unmatched by an action plan on the ground. The government should reform the agenda on agriculture, particularly in regard to tenancy legislation, contract farming, the freeing up of credit and insurance, introduction of risk-mitigation

instruments, public expenditure (with a shift from input subsidies to rural infrastructure, particularly water and power), removal of adverse price signals through administratively determined output prices/MSP, research and extension, removal of state controls (production, storage, and distribution), removal of intermediaries, creation of skills, regulation and enforcement of seeds and fertilizers, and encouragement of off-farm employment. Promotion of postharvest operations can be initiated at the village level to increase farmers' income. Farmers should be given subsidy and fixed cash support to ensure a fair living standard. This rate can be revised every year depending upon availability of food and market prices.

The Mission for a Green India and the National Water Mission, in conjunction with National Rural Employment Guarantee Act (NREGA), can certainly enable planning for a new dimension of sustainable growth that also enhances livelihood options. Schemes such as Rashtriya Krishi Vikas Yojana, the National Horticulture Mission, and the National Food Security Mission have been introduced to maximize returns to farmers by getting states to increase their investment in agriculture and food stocks. With the implementation of NREGA and the National Food Security Act, it is possible to eliminate chronic hunger (Swaminathan, 2009). The National Commission on Farmers envisaged that farmers would earn the minimum net income and agricultural progress would be measured by the increase in net income. One has to ponder how the integration of socioeconomic problems with agriculture can be used to predict whether hunger and famine would affect livelihood and, subsequently, food security. Despite persisting food insecurity, efforts by the Indian government to eliminate poverty and hunger are still lacking. Political and social mobilization to make food security a resonant demand that cannot be ignored is therefore essential (Ghosh, 2010).

Another welcome step would be to appoint a "Farmers Income Commission" to examine the real income of farmers every year across the states. By way of wage support and subsidy alone, the government could extricate >50% of people from BPL. Many such future indications have been described by eminent scientists (Swaminathan, 2005). Both private and public investments are being designated for achieving food security—from the corporate sector, NGOs and international agencies (viz., International Alliance Against Hunger, ActionAid International, Oxfam International, Right to Food Campaign, World Food Program, International Fund for Agricultural Development, etc.), and national alliances. In this context, the National Food Security Mission may provide an excellent opportunity for states to leverage funds to promote agricultural growth and introduce a second Green Revolution. This would empower people and their participation would make it possible for them to feed themselves with assured food security.

REFERENCES

- Aggarwal, P. K., & Pathak, H. (2009). Conservation cultivation to combat climate change. *Indian Farming*, 59(3), 5–11.
- Anonymous. (2007, March 2). ICRISAT reintroduces pigeon pea in China. *Crop Biotech Update*. Retrieved from <http://www.isaaa.org/kc/cropbiotechupdate/article/default.asp?ID=1586>
- Arivazhagan, G., & Ramanujam, V. (2009). Food security in India: The real story. *Kisan World*, 36(12), 27–28.
- Dhillon, B. S., Kataria, P., & Dhillon, P. K. (2010). National food security vis-à-vis sustainability of agriculture in high crop productivity regions. *Current Science*, 98, 33–36.
- Gahukar, R. T. (2004a). Are Indian foods from genetically modified crops safe? *Journal of Food, Agriculture & Environment*, 2(2), 11–13.
- Gahukar, R. T. (2004b). The problem of food security. *Kisan World*, 21(3), 43–45.
- Gahukar, R. T. (2007a). Contract farming for organic crop production in India. *Current Science*, 93, 1661–1663.
- Gahukar, R. T. (2007b). Dry land agriculture in India: Current issues and future needs. *Intensive Agriculture*, 46(2), 12–17.
- Gahukar, R. T. (2009a). Food security: The challenges of climate change and bioenergy. *Current Science*, 96, 26–28.
- Gahukar, R. T. (2009b). Sustainable agriculture in India: Current situation and future needs. *International Journal of Agricultural Sciences*, 5(1), 1–7.
- Ghosh, J. (2010). The political economy of hunger in 21st century India. *Economic & Political Weekly*, 45(44–45), 33–38.
- Indian Network for Climate Change Assessment. (2010, November). *Climate change and India: A 4×4 assessment of sectorial and regional analysis for 2030s*. Retrieved from <http://moef.nic.in/downloads/public-information/fin-rpt-incca.pdf>
- Jain, S. (2010). Reading between poverty lines. *Down to Earth*, 19(1), 53.
- Jose, S., & Navaneetham, K. (2010). Social infrastructure and women's undernutrition. *Economic & Political Weekly*, 45(13), 83–89.
- Joshi, P. K. (2008). Conservation agriculture. *Indian Farming*, 58(11), 44–46.
- Kumar, P., Joshi, P. K., & Birthal, P. S. (2009). Demand projections for foodgrains in India. *Agricultural Economics Research Review*, 22, 237–243.
- Lal, R. (2008). Soils and India's food security. *Journal of the Indian Society of Soil Science*, 56(2), 129–138.
- National Informatics Centre. (2011). *National Food Security Mission*. Retrieved from <http://nfsm.gov.in/>
- Panda, M., & Ganesh-Kumar, A. (2008). *Trade liberalization, poverty and food security in India*. Retrieved from <http://www.igidr.ac.in/pdf/publication/WP-2008-013.pdf>
- Rao, P. V., & Krishna, C. T. (2009). Food security in India. *Kisan World*, 36(6), 8–10.
- Sen, A. (2000, June). *Social exclusion: Concept, application and scrutiny* (Social Development Papers No. 1). Manila, Philippines: Asian Development Bank, Office of Environment and Social Development.
- Singh, A. (2009). Food sufficiency through diversified farming: A case of a small farmer. *Down to Earth*, 11(1), 15–16.

- Singh, P. K. (2010). A decentralized and holistic approach for grain management in India. *Current Science*, 99, 1177–1180.
- Strzepek, K., & Boehlert, B. (2010). Competition for water for the food system. *Philosophical Transactions of the Royal Society of London, Series B, Biological Sciences*, 365, 2927–2940.
- Swaminathan, M. S. (2005). *India's greatest living industry: Hundred years later* (Centenary Lecture Notes). New Delhi, India: Indian Agricultural Research Institute.
- Swaminathan, M. S. (2009). Rising India needs a farmer-centric budget. *Kisan World*, 36(8), 12–13.
- United Nations. (n.d.). *Universal declaration of human rights*. Retrieved from <http://www.un.org/en/documents/udhr/>
- Venkataraman, C., Habib, G., Eiguren-Fernandez, R., Miguel, A. H., & Friedlander, S. K. (2005, March 4). Residues and industrial biofuels in South Asia: Carbonaceous aerosol emissions and climate impacts. *Science*, 307, 1454–1456.