

Priorities for Pakistan Agriculture by 2030 and beyond

Submitted by Dr. Zahoor Aslam
Ex-Director
National Bio-Saline Agriculture Program

Concept Note: Agri-Vision 2030 +

Overall performance of agricultural sector has been satisfactory since 1960, despite miscellaneous problems. Agriculture sector comprises crops, livestock, fisheries and forestry sub-sectors. Main successes were with wheat, rice and poultry. Self sufficiency has been achieved in grain production and both rice and cotton have contributed substantially towards export earnings. However production of sugar, edible oil, milk, pulses, some vegetables and forestry and fishery sub-sectors lag much behind.

Population of Pakistan is increasing and is projected to increase to more than 300 million by 2030, making it mandatory for us to increase the productivity of all sub-sectors of agriculture. For ensuring strategic food security and export surpluses, Pakistan needs to give priority and modernize agriculture, in line with internationally accepted good agricultural practices (GAP), to attain a rate of production higher than population growth rate, sustainable for several decades.

Application of science based technology gives way to yield growth derived from the impetus, organizational improvements and better efficiencies in farm supply and marketing systems and in the infrastructure supporting the agricultural sector. Farmers can and do observe the results of their husbandry and modify their practices to incorporate successful inventions and innovations, using science derived technologies.

Agriculture in Pakistan is not being given attention it has received in Western countries. In Western countries, agriculture was, first of all, mechanized and made highly productive hence surplus income and labor was spared for manufacturing industries. For replicating success story of the West (of-course with modifications to accommodate local needs), we need to re-conceptualize "Agriculture as an Economic Engine of Growth", rather than merely as a "Tool for Food Security". Progress in non-agro-industries would follow the suit. A healthy growth of agriculture in Pakistan would require taking care for all those problems it suffers from at present, in production and processing chain.

Crops

Land: Land degradation is known to badly affect agriculture in Pakistan. Common forms of land degradation in Pakistan are moderate to severe types of salinity and/or sodicity, water logging, soil structure deterioration, soil contamination, soil fertility depletion, surface sedimentation/burial, soil erosion, surface scapping/excavation and permanent soil loss due to urbanization. These issues are complex and we need to adapt sustainable conservation strategies to reverse degradation processes. Being prime agriculture land, Indus Basin deserves priority. The most pressing problem is salinity and water logging which has already devastated more than 25 % of land in Indus Basin. Concerted efforts are needed to minimize

salinity and water logging, minimize use of saline water on good soil and maximize utilization of brackish ground water on bad soil. "Bio-Saline Agriculture" holds a great promise to these ends.

Water: Since 1960, Pakistan has made large investments in water development. The farm gate availability of irrigation water has almost doubled. Enhanced water availability was used to cultivate more land, to raise the cropping intensity and to increase the crop yields. Additional water supplies came partly from the completion of Mangla and Tarbela storage projects but mainly from the public and private tube wells. It is alarming that storage capacity of Mangla, Tarbela and Chashma reservoirs is continuously decreasing due to sedimentation. Moreover, uncontrolled pumping of ground water has triggered a water table draw down to dangerous levels. Unfortunately, we cannot eliminate mismanagement of our limited water resources, despite dwindling irrigation resources. There are huge conveyance losses at distribution levels in canals and distributaries. Farmers waste a lot of water due to defective field application and poor agronomic practices. High efficiency irrigation systems have yet to find a place in our agriculture.

Climate change: During 20th century, a rise in mean temperature of 0.6 -1°C in arid coastal, arid mountains and hyper arid plains was noted. Increase by 1.8 - 4°C is projected for the 21st century. Climate change induced by global warming is associated also with several water related problems. Latest trends of climate change, melting of ice sheets/glaciers and disturbed patterns of rains are haunting the scientists and policy makers all over the world. These problems are likely to have a greater impact on Pakistan than many other countries. With science-based monitoring we need to fully understand the formidable impact of climate change on our agriculture in different agro-ecological zones of Pakistan, accept associated challenges and grasp opportunities, with appropriate technologies.

There are five important areas which merit considerations by scientists and policy makers. These are:

1. There are clear indications that some glaciers in catchment area of Indus are melting. Melt flow is likely to increase with time. Estimated time frame for glaciers melt is 45-50 years. Flooding would be greater during next two to three decades. Inaction on our part means not only a heavy toll on property and life but also wastage of precious water. What are the management options, we can consider?
 - a. Revegetation in catchment areas
 - b. Precise weather warnings
 - c. Install electronic gadgets in catchment areas for early information on flash floods
 - d. Delay action dams in hilly areas
 - e. Increased capacity in storage dams
 - f. Recharge of depleting aquifers using agronomic and engineering options.
2. At present snow and glacier melt contributes more than 80% to Indus River flows. Within three decades, capacity of glaciers to provide melt flow would reduce, implying decreased river flows by up to 30 to 40 %, over the subsequent 50 years. Erratic patterns or a partial or total failure of monsoon rains in Pakistan is another predicted impact of climate change. Overall a 40% decline in precipitation is projected for

Pakistan. At the same time, with rising temperature, a 5% increase in net irrigation requirements by crops is predicted. Crops are prone to damage more than forages, grasses and trees under the spirals of drought and floods during heavy and erratic rains. Therefore silvi-pastoral systems supporting livestock and fisheries sub-sectors could be more resilient enterprises in the wake of forthcoming calamities.

3. Information collected for Pakistan so far show that temperature increases in both summer and winter are higher in Northern Pakistan than in Southern Pakistan and these increases are higher in winter than in summer. Increased temperatures in Northern Pakistan during winter can help expand mountain agriculture to greater heights. Hence, agriculture can move upward.
4. Increase in temperature in central and southern parts of Pakistan would lead to warmer and drier environment with more evaporation from soil surface. We would need to diversify our cropping systems with low delta/drought tolerant, preferably C-4 species. Ground water pumping would increase, leading to further water table draw down. It would not only increase the pumping cost but also would increase saline water intrusion into fresh aquifers from horizontal and vertical saline water zones. Because of reduced availability of water, there would be increased use of brackish ground water. With time, less and less water would be available for salt leaching. Combined effect would expand the extent and intensity of desert and salt-affected areas, making "Bio-Saline Agriculture" as the only profitable option.
5. Rise in sea level would devastate coastal ecosystems, including mangroves, coral reefs, breeding grounds of fish, and other marine life. Sea water rise would also increase upstream intrusion of saline water because of very gentle slope in the Indus delta, increasing salinization of aquifers to greater distances from the coastline. Cyclones and erratic rains may also have a disastrous effect on crop and marine life in coastal districts. A combined effect may be ruined agriculture in coastal districts. Saline-aquaculture, partially replacing conventional agriculture, would be a plausible option.

Cropping systems: Although there are over a dozen of agro-climatic zones in Pakistan, crop production is dominated by a few crops. There are only 2 major cropping systems viz. cotton-wheat and rice-wheat. Wheat is the major winter crop in all regions. In summer, rice and cotton are widely grown. Sugar cane, maize and forages are also grown in some areas. There is a clear need to diversify cropping patterns to accommodate a range of crops so that chronic deficiencies of other agricultural commodities eg. Edible oil, pulses etc. could be removed.

"Green Revolution" has been a great success in Pakistan also; yields of staple crops were greatly increased. This technology uses a lot of chemicals (fertilizers and pesticides etc.), water and fossil fuels. All farming systems were originally poly-cultures providing a range of basic requirements for subsistence. However "Green Revolution" targeted only staple crops, promoting monocultures with loss of bio-diversity, more vulnerable to pests and diseases and drastically reducing variety of local diet. Agronomists have identified several apparently sustainable local farming traditions-all of them form of poly-cultures, which need to be reintroduced.

Other agri-inputs: The other non-water physical inputs essential for boosting agriculture production are seeds of high yielding varieties, fertilizers, plant protection measures and credit. Seed is relatively low cost but it suffers from availability and quality problems. It is now inconceivable to get any reasonable yield without fertilizers and in most cases save crops from insects, diseases, weeds and vertebrate pests during pre-and post-harvest phases. The major constraint for use of fertilizer and weedicides/pesticides are their high cost, lack of quality control and adulteration and occasional non-availability at right time. Mechanization of land preparation is also not well taken by farmers. What is happening is tractorization. Modern tillage practices and appropriate equipment are to be promoted yet more to mechanize land preparation and other agriculture operations.

There is a clear need for promoting agro-input industries and just distribution systems for seed, fertilizers (especially water soluble), appropriate agro-equipment, integrated pest management, mulches, and storage facilities for grains and perishable commodities by Controlled Atmosphere technology and processing and packaging industry. Credit is not easily available to small and medium farmers, because of requirements for excessive documentation and cumbersome procedures. Major part of credit goes to politically influential big farmers who spend most of it on non-agricultural purposes.

High-value agriculture: With sustained rise in per capita income and urbanization, dietary patterns in Pakistan and regional countries are rapidly shifting from cereal based to high value food. This transformation will have profound effects on overall direction of agricultural development, in favor of high value agriculture, nature of agricultural supply chain, opportunities for small holders, and the role of public policy and development. High value agriculture in Pakistan, (costly fruits/vegetables, livestock, farm fisheries, honey bee, mushrooms, industrial plants etc) is being practiced as old fashioned enterprises. Critical knowledge is now available to at least semi-modernize these enterprises in a short time.

Livestock

Livestock is a part of rural landscape in Pakistan. However performance of this sector is far from being satisfactory. Growing deficit in milk has prompted increased imports of powdered dry milk. The price of meat is rising. Poultry production at times has made spectacular progress and has only partially blunted the price hike in mutton and beef. We have very good livestock breeds which need promotion along with improvement in feed and hygienic conditions in sheds and disease and pest control. We should also give more attention to goat and camel which has a great potential to provide all sorts of livestock products. The products of animal farming not only are likely to fetch more income for farmers but these products have also greater export potential. Not to mention that Pakistan has a good market in gulf and Iran, but is yet underexploited.

Fisheries

The progress in fisheries sub-sector in Pakistan is dismal so far. Traditionally, rivers and Arabian Sea have been used for fishing. Aquaculture technology is almost a recent introduction. It has the potential to surpass livestock rearing if proper investment in research-based

production technology and human capital are made. It is likely that fish would make-up the deficit for high value protein in local market but would also capture export markets in Europe.

Fish farming is a very successful enterprise in saline environments also. Farming for salt-tolerant tilapia, shrimps, crabs and lobsters is common in many countries. In this context it is pertinent to assume that rearing fish and other marine life, in saline water, as so-called in-land marines, in deed has the potential to become a relatively most profitable and fastest growing "Saline Agribusiness". This exercise alone can salvage the environmental and economic ruin in coastal areas.

Fruit, vegetables, mushrooms, honey bee etc.: Agro-ecological conditions are favorable for fruit and vegetable production in Pakistan. However, production is much lower and more importantly export markets are not properly tapped, despite best quality in some cases. Selection of suitable varieties, most productive for different areas, may be expedited, along with formulation of proper nutrition and disease/pest control plans. Frost injury to fruit plants is a big problem in some areas. This can be overcome by growing all susceptible fruit and vegetable plants in plastic covered green houses (tunnel technology) in cold seasons. Appropriate water harvesting techniques would also be needed for fruit orchards in hilly areas. Sufficient technical know-how and suitable conditions also exist in Pakistan to promote profitable honey bee and mushroom enterprises, catering the needs of domestic and export markets.

Forest

Forest cover in Pakistan is much below the economic and environmental needs of the country. Low wood production in the country is not only attributed to small forest area but also to low per unit area production. The factors responsible for low production include inferior soils, unfavorable climatic conditions, slow growing indigenous species and old management practices with primitive tools and equipment. Incidentally irrigated plantations raised on high value land are also producing less than their potential. Research based production technologies for different tree species suitable for different agro-ecological zones are urgently needed.

Afforestation on agriculture land, particularly as agro-forestry systems can help boost wood production in the country. With research findings farmers need to be convinced that trees do not harm crops and are rather profitable if grown with right species, number and configuration. Moreover, there is about 9 million ha of culturable waste land, not being cultivated either due to inferior soils or lack of irrigation facilities. Production technologies on such soils, including selection of suitable tree species and suitable techniques for planting would help revegetate these areas. Salt-affected soils are a particular promise for profitable tree farming if grown with salt-tolerant species.

Traditional use of wood in Pakistan is as fire wood or as timber. Tree plantations can be made more profitable and hence much attractive for farmers if it can be linked with the production of some high value products. Sericulture and lac culture is a case in point. Moreover appropriate technologies are available or can be indigenized to produce high quality charcoal by suitable carbonization techniques, methanol, useful gases and charcoal by pyrolysis, combustible fuel by

gasification technique, for use in a variety of ways, viz. energizing small petrol/ diesel engines or to produce electricity.

Organic farming: The products of organic farming are a fad food now in developed countries. Unfortunately organic farming is much less productive than conventional farming introduced after “Green Revolution”. This is particular true for Pakistan where soils have very low organic matter contents and any added organic materials are rapidly oxidized and pest attacks are common. This would require a sustainable supply of organic matter in the soil and integrated pest management techniques, involving predator insects, without using pesticides. Research programs needs to be developed to formulate technologies which may ensure incomes from organic farms competitive to conventional agriculture.

Integrated farming: “Green Revolution”, although a success story, has promoted monotonous monocultures, susceptible to pest and diseases, chemical-intensive and dependent on external sources. Therefore we need to promote integrated farming systems, involving more than one sub-sectors of agriculture viz. crops, livestock, fisheries and forestry that use land intensively and offer a basis for economic diversification and need reduced use of inputs, particularly fertilizers. It must provide living for all its population, farmers and non-farmers alike. A sustainable agricultural system must therefore be able to create employment as well as to produce food. It should be flexible and diversified, able to yield not only subsistence but also marketable surpluses, and it should sustain an internal rural exchange of goods and services instead of depending heavily on external world for both inputs and markets.

Education of farmers: Agriculture development is a function of farming communities. The more farmers are educated, the more development becomes dynamic and evolutionary. Agriculture extension has contribution in introduction of new plant varieties and educating farmers on modern agriculture practices, especially, use of chemical fertilizers, and plant protection measures. In spite of these efforts, agricultural extension has not been able to maintain a positive image among farmers. It is a general belief that traditional agriculture extension has failed to provide an adequate service to the growers. Reasons for this sorry state of affairs need to be sorted out.

The agriculture extension programs are particularly not adequate to cater for the needs of information sharing with the farmers on high-tech interventions to modernize agriculture sector. To develop efficient social infrastructure, consisting of vibrant farming communities, skilled and well-versed with knowledge on GAP, modern processing and marketing, special projects are to be developed and launched in selected areas.

Value addition and packaging: Agriculture exports from Pakistan are mostly raw materials. Therefore Pakistan does not earn enough income from agriculture sector international markets. There are several countries that do not produce raw material for their agriculture dependent industries yet earn handsome profits by value addition to raw agricultural commodities imported from countries like Pakistan. Packaging industry is too in rudimentary form in Pakistan. Urgent attention is needed to develop state-of-the-art value addition and packaging industries to make agriculture an efficient engine of economic growth in Pakistan.

Marketing: Functioning markets play a crucial role in transformation from traditional to scientific farming. Both collection and in-put markets are relevant in this regard. A vigorous market structure offering an elaboration of services and goods to area farmers provides a foundation for change. Public and private sector needs to cooperate on this matter, more fully. In addition we should also encourage building village cooperatives (with due sensitivities to village hierarchies) as the source of productive inputs, new technologies, farm credit and product market.

Special note: As it has happened with other rivers in the world, a pronounced decrease in discharge in tail reaches of rivers in Pakistan has long been noted. The cause is greater diversion of water for ever-expanding irrigation, in order to increase food production. As the irrigated areas upstream expand, old areas downstream are abandoned. These trends are likely to continue as agriculture would develop in northern areas, Potwar Plateau and Blochistan. This would leave much reduced water supplies for lower Sindh and South Punjab. Bio-Saline Agriculture would mitigate these conditions. We should get ready with a high degree of preparedness with relevant R&D and institutional arrangements to keep agricultural communities in these areas prosperous and in good shape.

Conclusion: Ministry of Food, Agriculture and Livestock may take an initiative to hold a “National Workshop”, inviting all stakeholders to thoroughly discuss and develop a consensus on R&D needs and development strategies on all these issues. The workshop proceedings may help devise medium and long term strategies to modernize agriculture and mitigate likely detrimental effects of global warming and climate change on agriculture in Pakistan.

□