

IAASTD CWANA REPORT

CHAPTER 3

AGRICULTURAL CHANGE AND PLAUSIBLE FUTURES

Coordinating Lead Authors: Abdin Zein-El-Abdin (Sudan), Syed Wajid H. Pirzada (Pakistan)

Lead Authors: Jamal M. Abo Omar (Palestine), Rafael G. Litvak (Kyrgyz Republic), Sajid Kazmi (Pakistan)

Contributing Authors: Younis Al Akhzami (Oman), Abdallah Muhammad Omezzine (Oman)

Review Editor: Hamid Siadat (Iran)

Key Messages

3.1 Introduction and Scope

3.2 Methods for Looking into the Future

3.2.1 Approaches for forward-looking assessments

3.3 Key Drivers of Agricultural Change and Major Policy Issues

3.3.1 Direct drivers

3.3.2 Indirect drivers

References

Key messages

Weak coordination: impedes development: If MDGs are to be attained by the CWANA region, member countries need to cooperate and coordinate the efforts.

- Coordinate and collaborate within and across the CWANA region to deliver the development objectives, especially with reference to poverty alleviation, amelioration of hunger, socio-economic and sustainable development. Also establish network for preservation and development of natural resource, human capital and mitigation of natural disasters such as droughts & floods, and resolution of conflict over natural resource management.

Low agricultural productivity & profitability: To improve productivity & profitability, through enhanced capacity to innovate, necessitates the followings:

- **Conservation & development of indigenous knowledge & practices**, natural resource base and social norms and moving on to AKST- driven agricultural innovation, oriented towards enhanced productivity, quality & profitability and overarching sustainable development.
- **Making economic growth policies including trade development more people-centred & development-oriented**, especially with reference to the goals identified in the assessment. Refurbishing & revamping of AKST institutions & related infrastructure including academia, R & D settings aiming at capacity to innovate, and quality control infrastructure, and forging effective linkages between AKST & development institutions through effective coordination.
- To face the challenges of globalization of trade, and of emerging technologies in this regard successfully, the CWANA region will have to **focus sharply on AKST policies** to realize a shift from primary commodity production to value- added and innovation-led agriculture. Improved social safety nets and compensatory policies would be required to safeguard the disadvantaged of likely fallouts and reforms-related adjustments and negative externalities

The CWANA regions' agricultural research is not development-oriented: An AKST-driven development strategy is needed.

- The countries in the region need to focus on practical client-oriented, demand-driven and problem-solving agricultural & NR research(applied research), and at the same time contributing towards generation of new knowledge, through investment in basic research guided towards innovation and development
- The culture of participatory R&D and technological development is to be cultivated and due priority assigned in the national planning at all levels by employing system-based participatory approach.
- Private sector needs to be mobilized to invest in agriculture research, building public private partnership, to cater to national development agenda.
- Active participation of women & the youth at all levels in development in general and AKST in particular needs to be emphasized in national planning, and R&D.

- AKST linkage with rural development and investment in public goods/ social safety nets especially for marginalized and the resource-poor communities is needed

Policies are inadequately informed: *There is a need for evidence-based national policy making*

- Proactive engagement, based on informed policy in negotiations in the multilateral/regional economic cooperation including *inter alia* WTO and Multilateral Environmental Agreements (MEAs). This will in turn need AKST-based capacity to generate empirical evidence informing policy-making process.

- Further, a strategic planning for shift towards market oriented agriculture policy closely integrated with national development objectives, without compromising food security/food sovereignty would be required.

Poor governance calls for:

- Improved governance, transparency, accountability and efficient information management along with demonstrated political will & commitment to this end will help enhance the credibility of the institutions and attainment of the development objectives.

- **Poorly-Knit NARS:** NARS in many countries is fragmented and lacks in policy direction & coherence.

An integrated NARS with well-spelled out and target oriented in terms of development goals & growth objectives agricultural policies are required.

Centres of Excellence in pre-defined areas of innovation are to be developed in stipulated time period.

Low level of investment in agricultural research: *The level of investment is to be enhanced to 1 percent of GDP by 2025.*

Inadequate human resource to innovate: There is need to realize a shift from traditional agricultural research agenda to innovation-led agricultural development agenda. This in turn requires amply trained human resource to underpin such a requirement.

3.1 Introduction and Scope

The present chapter builds on the gaps identified in Chapter 2, and taking up major issues-challenges, and then suggest possible “Policy Options” for addressing these challenges.

Chapter 3 seeks to explore the plausible future of the CWANA region, perceived for the next fifty years, in the short, medium and long term, and in this context takes the baseline world (i.e. “Business as Usual”) scenario outlining plausible futures as a benchmark and adds value, while prospecting the situation 50 years ahead. In this backdrop, the present scenario has a logical plot and narrative storyline, the manner events unfold over next five decades. To this end, the Scenario draws heavily upon existing body of knowledge and learning from the historical analyses of trends, in qualitative terms.

Although the Scenario is not prescriptive in nature as mentioned at the very outset, yet it suggests the most likely outcomes for the CWANA and how Agricultural Knowledge and Science and Technology (AKST) interventions, especially innovation-driven, can help manage change and ensure the attainment of the development goals.

Apart from the ‘Business as Usual’ scenario, one may also perceive, other plausible scenarios, such as:

- Sunset agriculture interfacing authoritative governance and weaker AKST institutions.
- Sunrise agriculture interfacing democratic governance and strong AKST institutions.
- People-cantered & development-oriented agriculture interfacing globalisation.

Since the role of agriculture is likely to further decline as key employer in the long term, its contribution to national output, may concomitantly decrease, as has happened in the case of industrialized countries, making agriculture a sunset sector. Agriculture, however given political will to manage change, through-AKST, can potentially re-emerge as a promising sector with value-added contributions towards economic growth & development in the region. In this context, it has a future as a sunrise sector. As the world in general and CWANA in particular has witnessed the ills of authoritative regimes and the models of development they have been implemented in the past by such regimes, the focus is likely to shift on the learning curve, towards more people-centered development. Historical evidence suggests that development models drawn in consultation with the people, for whom those interventions are made, hold promise of yielding more sustainable solutions in terms of development objectives, since they place people at the centre of the development paradigm.

The different ways AKST is developed and applied to interface with the ‘business as usual’ scenario and its relevant impact on development goals (i.e. poverty alleviation, amelioration of hunger, and the promotion of sustainable social, economic and environmental development) is discussed below.

The scenario is based on a pragmatic and rational understanding of direct and indirect drivers, and how these are likely to behave under a different set of conditions, learning from the historical trends and analyzing these in qualitative/quantitative terms. This scenario thus sets a future scene, with a logical plot describing how things are likely to unfold, interfacing AKST, under different socio-economic & political conditions and AKST environment in the short, through medium to long run, especially in the context of the development goals.

3.2 Methods for Looking into the Future

The approach draws on the “**Business as Usual (BAU)**” scenario as benchmark, and adds value while prospecting the situation 50 years ahead. The assessment builds on gaps, identifies and prioritizes the drivers for change, based on and learning from historical analysis of trends, prioritize them, and then identify a “Policy Tool Kit”-the policy options for the decision makers

The Scenarios: Scenario development and analysis provides a logical way of thinking through a range of plausible future development options in a structured, yet creative manner. Scenarios have been described as “plausible and often simplified descriptions of how the future may develop, based on a coherent and internally consistent set of assumptions about key driving forces and relationships” (MA, 2005). Scenarios can be developed for various purposes: to explore a range of plausible futures, to analyze possible response strategies, or to provoke create thinking. These different purposes each require somewhat different tools and types of scenarios.

A number of recent international environmental assessments have made use of scenario development and analysis and the scenarios introduced by international environmental and agricultural assessments have influenced both the scientific and public debate. Prominent examples of global scenario-based assessments include the Intergovernmental Panel on Climate Change (IPCC, 1992, 2000), the United Nations Environment Programme (UNEP, 2002) or the Millennium Ecosystem Assessment (MA, 2005).

3.3 Prioritizing Key Drivers of Agricultural Change Impacting Policy-Related Challenges

This section of the chapter focuses on the factors that drive the change - the drivers, regarding future of agriculture in the CWANA region. Understanding of and prioritizing these drivers of agricultural development is necessary to assess the plausibility of the future.

For the purpose of this assessment, driver (s) is a factor(s) that can potentially change to certain degree the development landscape in the given sector or sub sector of economy with regard to agricultural R &D. A direct driver unequivocally influences agricultural production and services and can therefore be identified and measured to differing degrees of accuracy. An indirect driver on the other hand operates more diffusely, often by affecting the outcome of one or more direct drivers, and its influence is established by understanding nature of effect on a direct driver. Drivers are also linked to decision-making, as many of the drivers can be influenced by policy

choices. However, it should be noted that the distinction between indirect and direct drivers at times may not be very clear in all instances, and many implicit links between and across the different drivers do exist and the discussion in this chapter needs to be viewed in that context.

This chapter provides an overview based on existing literature as to how these factors may lead to change in the future in different socio-economic & AKST environments. By looking at plausible assumptions on future changes, in relation to the agriculture system, we aim to provide an idea of the key challenges that agriculture might face over the next 50 years. In that context, it sets the future scene, based on qualitative analysis and guided by 'business as usual' approach. The scenario draws on improved interactions between agrarian & food systems and AKST in the longer term.

It is in this backdrop, that CWANA Chapter 3 visualizes the plausible future. There are host of **direct drivers** & indirect drivers relevant to agricultural systems and AKST. The prioritized set of direct drivers is highlighted in this section:

- **Economic Drivers:** Economic growth and development, national and per capita income, macroeconomic policies etc., international trade, trade policies, globalization ,trade liberalization & capital flows-Investment, Out come of WTO negotiations-Doha Development Agenda-DDA, marketing chains, market access opportunities, market distortions/support, food security.
- **Food Demand and Consumption Patterns:** Population dynamics, consumption levels of cereals and animal protein products.
- **Agricultural Resource Management:** Land tenure, agricultural inputs, pest & disease management, cropping patterns, role of livestock, agricultural biodiversity & transgenic crops (GMOs), the impact of agriculture on natural resources, constrains from management of natural resources on agriculture, indigenous knowledge and Information Communication Technologies (ICT).
- **Land & Water Resources Management:** Land use, land cover change, land availability and productivity, water allocation, transfer and trans-boundary water management.
- **Climate Change:** The impact of climate change (i.e. global warming, change in precipitation etc.) on agriculture, drought, floods and famine vulnerability and climate driven changes.
- **Energy:** The relationship between energy (i.e. Cost, access etc.) and agriculture, impact of large-scale alternative energy resources/bio-energy production.
- **Human Resources:** Education, training, role of women, movement out of agriculture/ labor migration, social capital, cultural and religious developments.
- **Investment in AKST:** Scientific & technological developments, private vs. public investments in R&D, rate of adoption of new technologies (i.e. biotechnology and information technology), training of agricultural scientists, research cooperation.

The main **indirect drivers of change** are discussed and prioritized below:

- **Demographics:** demographic developments (i.e. population size and growth, age and gender structure, spatial distribution etc.), migration patterns within and outside the region.
- **Socio-political Drivers:** Socio-political developments, governance and democratization, corruption, enforcement of legislation, role of government, civil society and the private sector, conflicts and international politics.

The future of agriculture and related sectors will definitely be affected by the interaction of potential direct & indirect drivers with changing socio-economic, political & technological environments over fifty years from short through medium to long run. The "Business as Usual" Scenario visualizes a situation where because of inward-looking policies, national government's capacity to deal with the development objectives, in general, and development goals, envisaged under international commitments like Millennium Development Goals (MDGs) would be limited at least in the short to medium term. As such, this scenario itself does not provide an enabling environment in general for AKST to play its effective role towards attainment of the cherished objectives of development goals. However, in the global context-the changing geo-economics & geo-politics, national policies are likely to be influenced with more space for AKST- as driver of innovation & growth. The role and detailed impact of different drivers of change in this perspective, under this scenario, are summarized below.

List of key drivers affecting agricultural production in the CWANA region and assessment of their role (impact) under the "Business as Usual" scenario

| Drivers | Components | Impact under BAU Scenario |
|---------------------|--------------------------------|---------------------------|
| Energy | Price of oil | ++ |
| | Access | - |
| | Alternative sources/Bioenergy | - |
| Land | Availability per capita | - |
| | Availability in absolute terms | - |
| | Quality & characteristics | -- |
| | Land Use Management | - |
| | Land productivity | - |
| Agricultural Inputs | Seeds | - |
| | Fertilizers | - |
| | Pesticides | - |
| | Animal feed for livestock | - |
| Water | Quality | - |
| | Quantity | - |

| | | |
|-----------------------------------|---|----|
| | Management | - |
| | Allocation, transfer | - |
| | Trans boundary water management | - |
| Climate Change | Temperature | + |
| | Precipitation | - |
| | Drought & famine vulnerability | ++ |
| Economics & Trade | Trade liberalization | -- |
| | WTO negotiations | - |
| Demographics | Population growth | + |
| | Migration patterns within region | + |
| | Migration patterns outside region | + |
| Governance | Corruption | ++ |
| | Enforcement of legislation | - |
| | Role of government | ++ |
| | Conflicts | ++ |
| | Regional cooperation | - |
| Natural Resource Management | Pest & disease management | - |
| | Cropping patterns | - |
| | Role of livestock | + |
| | Agricultural Biodiversity & Transgenic | - |
| | Innovation and indigenous knowledge | - |
| Human Resources in Agriculture | Education | + |
| | Training | + |
| | Role of Women | ++ |
| | Movement out of agriculture/ labor migration | + |
| Agriculture & KST Investment | Funding | - |
| | Training of ag scientists | + |
| | Role of government vs. private sector | + |
| | Role of traditional knowledge | - |
| | Research cooperation | - |
| | Corruption | ++ |
| | Infrastructure | - |

| | | |
|--|---------------------------------|---|
| | Marketing chains | - |
| | Food processing | - |
| | Consumption patterns | - |
| | Expenditure on non-staple crops | - |

3.3.1 Direct drivers and policy options

3.3.1.1 Economic drivers

Under the Baseline World Scenario, with its inward-looking economies, it is probable that the capacity & capability of both national governments and communities, to swiftly re-adjust to the changes in a dynamic way in the global arena, would continue to be rather limited. Democratic institutions however will gradually evolve and national policies will get more focused in the long term. As such, the economic growth and development in the CWANA will help attain development goals albeit a bit slower.

The present day economic paradigms like trade-investment and growth, and trade innovation and growth is nurtured by enabling environment being created for some drivers under globalization and technological boom, which helps deliver economic & development objectives. Whereas, under BAU scenario countries would slowly integrate in to the process of globalisation, there is a silver lining that countries on the learning curve will benefit from experiences of countries across regions such as Korea, China & Singapore.

At present, Foreign Direct Investment (FDI) is playing a key role, as an enabling driver. Under the present situation, it would be rather difficult to attract FDI under typical BAU, yet the investment policies of national governments will tend to change, especially because of Bilateral Investment Treaties (BITs) that may help create investment-friendly environment. Informed investment policies provide springboard to the development agenda, for trade, investment, economic growth and development are closely linked. Protected borders, low level of investment and lack of innovation capacity which is impacting economic development under BAU now, will witness change a bit slower though. Poverty now entrenched in the fabric of the CWANA region will be alleviated to some extent with these changes, especially in AKST context, and thus will help realize development goals in the medium to long run.

With forceful trend of globalization, national economies even under BAU are bound to integrate with the international economy, sooner than later. This can lead, in the short term, to some adjustment pains, before actual gains are realized in the long run, e.g. agriculture will undergo structural reforms, including a shift from a self-sufficiency paradigm to export-led agriculture:-a shift from subsistence crops to cash crops, and from low-tech to high-tech agriculture. This, on the one hand, may provide better market opportunities for the production surplus generated by

1 the farmers, but at the same time may compromise food security, and may create joblessness
2 among farmers, especially if compensatory policies and social safety nets are not in place.

3
4 The countries of the region, unfortunately, have no social safety nets or other compensatory
5 policies in place at present to cope with this situation. Whereas, in the short-run small farmers
6 leaving their farms and thus means of livelihood may become victim to the onslaught of
7 globalization. Emerging democratic thinking and awareness of human rights will however compel
8 governments to address social safety issues in medium to long run. It is also perceived that while
9 trying to adjust to global policy framework, there will be relatively lesser policy space available for
10 national governments to maneuver, such as through price or other domestic support (subsidy)
11 mechanisms, and they will have to focus on efficiency and per unit productivity for which they will
12 need strong AKST base to realize these gains.

13
14 A lot, therefore, shall depend on the capacity of the governments to adjust under the changing
15 environment and deal with the complex issues outlined above, and AKST certainly has a central
16 role in developing the required capacity, and in making agriculture efficient & sustainable. E.g.,
17 many countries today are venturing trade-investment-growth paradigm, and more progressive
18 ones even are capitalizing on innovation-trade-growth paradigm. For innovation, countries have
19 to invest in S &T and R&D. Such an investment- as a driver of change, in the future in the
20 CWANA region will determine the final outcome.

21
22 At this stage, the fate of WTO negotiations, especially Doha [Round] Development Agenda (DDA)
23 with built-in development dimension, seeking cuts in tariffs and subsidies, and making trade
24 liberalization development friendly, is uncertain. Moreover, protectionism and support in some of
25 the regions, e.g. OECD continues to be rampant, and is impacting upon market access
26 opportunities e.g. the issue of tariff escalation further impacts the efforts of the countries in the
27 region to enter the processing sectors and value-added agriculture, for on value chain ladder
28 they face higher levels of tariff. Despite recent resumption, suspension of negotiations in WTO in
29 July 2006, the risk of protectionism has been compounded. However, mushrooming Free Trade
30 Agreements (FTAs) and Preferential Treatment Agreements (PTAs) can be a starting point for
31 integration initially at regional and then international level.

32
33 This makes proactive engagement of developing countries in multilateral negotiations far more
34 important to register and secure their trade interests. If the issues of tariff peaks, tariff escalation
35 and subsidies are objectively addressed, countries of the region will avail of emerging market
36 opportunities in agriculture, including *inter alia* export of high value and processed products. In
37 that case, AKST will be instrumental in developing the required capacity, in terms of
38 competitiveness in the region, especially in agricultural processing.

One of the indicators under globalization of trade is the ratio between the trade and GDP, which is at the lowest ebb these days in many of the CWANA countries. Future growth in trade to GDP ratio will depend to a great extent both on the outcome of the negotiation, and the change in management ability of national governments. As of now, the CWANA is the region where majority of the poor of the world live and is at the same time densely populated. The majority population also eke out their existence from the agriculture. These three attributes of the region pose a colossal challenge in meeting development goals, like poverty alleviation and socio-economic development, on a sustainable basis. To this mix, human resource scarcity and poor R&D infrastructure add complexity, further complicating the situation. Integration of S&T (AKST) with national economic development plans can thus help overcome such problems.

The agriculture research settings in most of the countries in the region lack policy direction are fragmented and their work is hardly guided towards development agenda, because of disconnects between economic development plans and research policies. Knitting agricultural research institutions into a coherent National Agricultural Research System (NARS), and integrating national agricultural research plans with development agenda would help realize development goals.

Agriculture and food markets in the CWANA region are not well organized, and the producers generally complain about not having access to the both domestic & international markets. The key problems remain to be poor market infrastructure and communication means, lack of cool chain, storage facilities, transportation infrastructure and vertical integration-linkage between producers, industry and consumers. At the farm level, value- chain management is practically non-existent and farmers rely only on production and marketing of primary commodities. Due to instability of markets & volatility of prices, and poor communications, the farmers confront problems like heavy post-harvest losses, particularly in the high value agriculture(HVA) like horticulture, meat and dairy sectors in the range of 20-50 percent in some of the countries, and are therefore, not able to fetch prices which can help sustain agricultural activities.

In most cases, the prices farmers get are not enough to buy the required inputs, which make agriculture inefficient and put its sustainability at stake. Furthermore, because of lack of policy focus under BAU, this area is not likely to get priority in the short run. As a result, the countries will continue to produce primary commodities with high post-harvest losses, which will have long-term consequences on food security, poverty alleviation and amelioration of hunger.

Globalization of trade may, however, may sensitize the markets, particularly for producing price and quality competitive products for which production efficiency and quality & safety management, including value-chain management, grading & adoption of Good Agricultural Practices (GAP) would be of paramount importance in this regard. However, with the current state of affairs, without sizable investment, re-adjustments in farm sector and development of

1 quality infrastructure, it will not be possible for the CWANA countries to penetrate markets across
2 borders in near future. In this respect, integration of local markets with regional or international
3 markets would be difficult.

4
5 At present, in many of these countries, agricultural markets are protected with high tariff rates,
6 and domestic regulatory policies intervene in the market distorting price structure. This makes
7 agriculture production systems inefficient. Such limitations will ultimately affect the realization of
8 the potential benefits of globalization, but could be overcome to a great extent through AKST
9 development and by advancement of Doha Development Agenda (DDA), under the WTO.

10
11 At the same time, as was ably argued by four African countries namely, Mali, Benin, Chad and
12 Burkina Faso in recent WTO negotiations, given the presence of highly subsidized agriculture in
13 OECD countries, it would be far more difficult to sell the developing country's produce on the
14 global market place. A case in point is the negative impact of subsidized cotton, which affects
15 such countries as Sudan, Uganda, Egypt and Pakistan in the CWANA region. Similarly, in Bio-fuel
16 sector recent subsidized ethanol production by United States from Maize is yet another example.

17
18 Such distortions and restrictions in global market place, on the one hand, impact upon market
19 access opportunities for the countries of the region, and on the other, hinder agricultural market
20 transformation and diversification in the developing countries, which otherwise would have gotten
21 a stimulus from multilateral trade liberalization under WTO, e.g. in case of bio-fuels. Thus highly
22 protected and subsidized agriculture in the North impacts attainment of development goals in the
23 countries in the South, including the CWANA region.

24
25 The sea, air and dry ports infrastructure, which is basic for transportation of goods and services,
26 is very weak in the majority of the CWANA countries. The legislation related to markets,
27 especially for border control, like quarantine facilities and the movement of goods and services
28 within the country and across borders is also weak. Legislation needs to be made compliant with
29 the emerging multilateral trade regime under the WTO. Some of the countries in the CWANA
30 have either not yet acceded to, or are in the process of accession to the WTO. At this stage,
31 adjustment to market requirements have a cost, particularly in terms of developing technical
32 capacity & quality regulatory infrastructure compliant with the emerging multilateral trade regime
33 under the WTO.

34
35 Collective efforts at regional level, and through multilateral initiatives, can help evolve the required
36 system in the CWANA region. Success stories of the region in terms of market structure, like the
37 one in the United Arab Emirates (UAE), a regional trade hub, could be replicated elsewhere given
38 political will and investment opportunities. Growth in trade would help countries in attainment of
39 development goals viz. alleviation of poverty and amelioration of hunger in the CWANA region.

1 In some of the countries of the region, which were previously over-controlled, like the countries in
2 the former Soviet Union (USSR), and even in some other Asian and African countries, non-
3 transparent market practices hinder the development of competitive marketing systems, because
4 of hoarding practices, and strong lobby groups with political support and monopoly. Effective
5 competition policy-related regulations can help fight such monopolies. State Enterprises (STEs) in
6 developed countries like Canada and Australia also enjoy such monopolies, to the competitive
7 disadvantage of the developing countries like those in the CWANA.

8
9 Vertical integration, linking farmers backward and forward with industry and consumers, such as
10 through contract farming, can help evolve better marketing system and cope with problems
11 related to value-chain management including post-harvest losses. Cooperative settings can also
12 be evolved by mobilizing and organizing the farming communities. This will help overcome
13 problems associated with cyclical nature of agricultural markets, such as in poultry & horticulture,
14 and consequent slumps which agriculture sectors of the countries in the CWANA region
15 frequently encounter. Yet another challenge would be guarding local agricultural sector against
16 potential risks of exotic/ transboundary diseases, which are likely to emerge because of increased
17 movement of goods & services under globalization.

18
19 A case in point is of the Avian Influenza (AE) and Bovine Spongiform Encephalomyelitis (BSE) or
20 the Mad Cow Disease. Applying standard management practices, especially those related to
21 sanitary & phytosanitary (SPS) issues, and by adopting GAP, some of those problems could be
22 managed, which would help to sell the produce of the region on the global market place with
23 confidence and certainty. AKST has to play an important role in SPS management, both in terms
24 of standardization, and also towards quality infrastructure development. countries of the region
25 therefore need to participate proactively in the international standardization process, through
26 international standard setting bodies like International Plant Protection (IPPC), International World
27 Health Organization (OIE), and Codex Alimentarius Commission (CAC).

28 29 3.3.1.2 Food demand and consumption patterns

30 Fundamental changes are occurring in the global structure of food demand, driven in large part
31 by economic growth in the developing countries. Rising incomes and rapid urbanization,
32 particularly in Asia, are changing the composition of food demand. Direct per capita food
33 consumption of maize and coarse grains is declining as consumers shift from wheat & rice to
34 protein food with increasing incomes. Growth in incomes in the developing countries is driving
35 strong growth in per capita and total meat consumption, which in turn induces strong growth in
36 feed consumption of cereals, particularly maize.

37
38 As incomes and urbanization continue, dietary shift towards increased consumption of fruits,
39 vegetables, and milk and milk products increases. With yet further changes, diets will change to
40 more consumer-ready convenient foods- processed, sugary& fatty foods, increasingly procured

1 from supermarket chains and fast food establishments, controlled by Multinational Transnational
2 Corporations (MNCs/TNCs). At the same time, growth in per capita meat and cereal
3 consumption in the developed countries has slowed dramatically as these countries have
4 reached very high levels of meat & dairy products consumption in the past few decades. These
5 trends will lead to an extraordinary increase in the importance of developing countries in global
6 food markets (Cranfield et al., 1998; Rosegrant et al., 2001; Schmidhuber, 2003).

7
8 Population is a key driver for demand and consumption. As discussed above, growing population
9 and declining agricultural productivity are likely to create more demand for food which may not be
10 met locally at least in the short to medium run by majority of the CWANA countries. However,
11 with AKST, more efficient practices could evolve both in parenthood planning and agriculture
12 production that may in the long run help satisfy food demand locally.

13
14 With trade liberalization, growing local demand is likely to be met through supplies across
15 borders, especially from the more efficient producers through MNCs/TNCs that in turn can have
16 an adverse effect on local productivity and on livelihood means of the local communities with
17 negative impact on attainment of the development goals.

18 19 3.3.1.3 Natural/Agricultural resource management

20 Seeds of various plant varieties are basic to agricultural development, especially for the purpose
21 of crop breeding programs. Accesses to High Yielding Varieties (HYVs), and a more diversified
22 seed base, can potentially lead to an increase in production efficiency. However, local seed
23 production in the CWANA region is insignificant, and there is extensive reliance on exogenous
24 sources, which are mainly controlled by MNCs/TNCs in this field. This may continue at least for
25 the short to the medium term. Moreover, the indigenous crop varieties may be dislodged, and
26 even some of these may become extinct over the long run, with adverse implications for agro-
27 biodiversity in the region, implying weaker social & food safety nets for generations to come.

28
29 The TNCs and MNCs have an aggressive trade interest in biotech products and GMOs. GMOs
30 may lead to mono-crop culture with implications for bio & agro-diversity. Furthermore, given low
31 level of AKST in the CWANA region, coupled with religious and other social factors; people in the
32 region may not be inclined to accept GMO seeds/food crops, or biotech development in the near
33 future. This may compromise development in this area. As a result, on efficiency front, the
34 CWANA region may become even lesser efficient compared to other regions, especially in terms
35 of use of high -tech like biotechnology for enhanced agricultural productivity.

36
37 Consequently, productivity may be constrained, as access to indigenous sources of seed will also
38 become limited in the region, due to scarcity of seed preservation measures e.g. gene banks. In
39 the same vein, plant breeding would have great limitations, because development of better seed
40 varieties in terms of yield, disease resistance, and other attributes like water economy, needs an

1 interface with AKST and R&D capacity, which at present is lacking in the region. AKST promotion
2 can help underpin preservation of indigenous seeds through gene banks and its integration with
3 local knowledge & practices.

4
5 Fertilizer remains yet another key input. Its use is likely to register further increase in order to
6 replenish the organic base of the depleting land resource, with mounting pressure for enhanced
7 production. Unfortunately, there are no rehabilitation plans in place that can help restore soil
8 health in the CWANA region. Traditionally, farmers used to depend on organic sources of
9 fertilizer, however, this trend is registering a decline, and farmers have to depend more and more
10 on chemical fertilizers to replenish the depleted nitrogenous and other minerals. In the majority of
11 countries of the region, fertilizers production is minimal, and most of the requirement is met
12 through imports. Under globalization of trade, however access to fertilizers may increase, in
13 terms of falling trade barriers, and the prices of fertilizers & other inputs like pesticides may
14 become cost-effective through fair competition in the long run. However, without AKST capacity
15 dependence on imported fertilizer may increase and may lead to monopolies.

16
17 In the CWANA region, biodiversity will continue declining, accompanied with increase in
18 deforestation, and diseases and subsequent medical costs. This will provoke a drastic response
19 of governments of the CWANA countries

20
21 In most of the countries of the CWANA region, livestock is reared in extensive farm settings,
22 mainly thriving on the rangelands. In many of Asian & African countries, the carrying capacity of
23 the land is on decline, because of over-grazing and deforestation. Lack of rehabilitation measures
24 further accentuates this situation to the level of desertification which, on the one hand, is
25 becoming a major limitation on development of livestock sector and food security of the region in
26 particular. Because of continued intensive damage to land in terms of degradation, part of the
27 region continues to be vulnerable to climatic changes like drought and famine. African and some
28 Asian countries have experienced these in the recent past. With threatened eco-balance in the
29 region and attended risk of food insecurity, could precipitate societal disruption, breeding crimes
30 and conflicts, promoting poverty, hunger and disease which alternate with each other. This would
31 make it rather impossible to attain the development goals in the stipulated time frame. AKST
32 interfacing the situation can help cope with such externalities in the long run.

33
34 Livestock continues to be the mainstay of the farming community and employs a sizable
35 agricultural workforce in many of the CWANA countries. It is also a source of social security for
36 the masses in the region. Poor genetic makeup, limited feed resources and lack of effective
37 animal health cover are the main constraints for livestock development in the region. Under
38 globalization, and especially through transfer of technology, increased access to quality animal
39 health services and genetic material for upgrading of livestock should be possible. However, lack

of capacity in the countries of the region to absorb the technology and meet the requirements locally would continue to be a limiting factor in the short to medium run.

Dependence on external sources for those inputs like genetic material, vaccines and preventive medication, is likely to compromise the livestock development efforts of the countries in the region in this time frame. Improved investment in S&T, agricultural education and tech-based agricultural development in the region could help develop local capacity, underpinning livestock development in the area, without which sustainability of livestock resource would be at stake. A logical course would be to invest more in livestock by improving skill level, moving from low-tech to medium-tech in the medium term and high-tech in the longer run, to develop value-added livestock sector in the region. Conservation of local livestock breeds would be required to sustain development, and non-traditional feed resources need to be developed to contain losses to range lands. Similarly development of processing sector and cool chain will help improve marketing of livestock products. Through AKST development such initiatives would be possible.

3.3.1.4 Land and water resources management

Increased control over land resources by the powerful, especially large farmers with political constituencies, leads to a monopolistic attitude, where land is a symbol of power and not productivity. General experience in the CWANA region testifies that the people with smaller holdings are more efficient in terms of productivity, compared with those who have larger holdings. As a result, not only the productivity, but the quality and characteristics of land use are all compromised, because of the possessive attitude of people with larger holdings.

Agriculture *per se* would not be focused upon by national governments, under typical 'business as usual' who normally try to satisfy the needs of urban elites who have political clout, as against small farmers who belong to rural areas with hardly any voice in the power corridors. Therefore, rural and agricultural development cannot get due priority under 'business as usual' scenario at least in the short to medium run.

Because of fewer jobs in industry, rural people would be compelled to stay and work in rural areas, in the short to medium term, under such a scenario, which may lead them to tend the land in a better way. They may not however have access to new technologies and efficient inputs such as HYVs, in this time frame, which will adversely affect productivity, with implications for attainment of development goals. In the long term however, national governments will be compelled to address issues of food security and rural development because of likely changes in the governance structure due to the aforementioned reasons. This may lead to better investment in AKST. As a result, an enabling environment will be provided through improved AKST capacity for better management of land resources, e.g. through efficient soil conservation, water management, and salinity and water logging technologies & practices.

1 In most of the countries of the CWANA region, land holdings in general are too small to realize
2 economies of scale, while large holdings are either with rich families or these belong to the public
3 sector, in the form of either cooperative setups or agricultural schemes. In the former Soviet
4 Union-USSR, e.g. land was farmed by large cooperatives, and an integrated approach was
5 employed to improve productivity gains. Now with the demise of the USSR, there is some land in
6 private hands, which too is small and fragmented. Due to the lack of an integrated management
7 approach, productivity is now on the decline in this area. In addition, the AKST focus has become
8 weaker, and consequently, it is difficult to realize development objectives without a strong AKST
9 underpinning if things continue as 'business as usual'.

11 The majority of countries in the CWANA region are predominantly Muslim countries. Islamic
12 inheritance laws guide distribution among heirs. The result is fragmentation of landholdings in
13 most of those countries. This too has a negative impact on the realization of economies of scale
14 in agriculture in affected countries. Family farms & cooperatives, on lines of Brazil, can help
15 address these problems.

17 Deforestation due to the use of wood as source of fuel, coupled with overgrazing has led to land
18 erosion, and ultimately desertification in some of the areas of the region. Lack of land
19 rehabilitation plans, together with meager investment in this area, further accentuates the
20 scenario. Efforts need to be made for integrated rangeland management, for which AKST can
21 potentially provide underpinnings.

23 Water is the most important natural input in agricultural development. Barring a few countries in
24 the CWANA region, the majority depend on rain-fed agriculture. In some areas, ground water is
25 pumped to irrigate agricultural fields. But due to factors like climatic change and over-mining of
26 ground water reserves, this important resource is now at the verge of non-availability in many of
27 the CWANA countries. In some countries, where water sources feed canals and rivers, the
28 sources are drying up because of climatic changes.

30 The main control over water resources in the region will continue to be in the hands of a few
31 people and governments under 'business as usual' scenario at least in the short to medium run.
32 The most powerful will continue to exploit this important yet scarce agricultural input at the
33 expense of smaller farmers who need it the most. This situation could be further compounded by
34 efforts to get water services privatized, which in turn could further increase the burden on
35 farmers. With an increase in the prices of other inputs such as seeds, fertilizer, pesticides, a tariff
36 on water can become a major constraint in realizing the agricultural potential of the region, and
37 feeding the growing population. High input costs, coupled with water scarcity, will adversely affect
38 developing competitiveness.

Water use efficiency in most of the developing countries is very low, because of poor water-related infrastructure and resultant water wastage. E.g., there are hardly any water harvesting schemes in place in rain-fed parts of the CWANA, and in countries with canal irrigation systems poor lining of watercourses leads to heavy water losses. Rational use of water is not likely to be practiced in countries of the region, in short to medium run and as such water use efficiency is likely to further deteriorate. Improved management, enhanced water use efficiency, rational allocation and informed exploitation are likely in the long term with development of AKST capacity, which will help increase agricultural productivity, sustainability, and realization of development goals.

A different set of technology mix would be required for optimizing water use efficiency. This would be possible through development of AKST, where an appropriate technology mix can help achieve those objectives. In this respect, there are dedicated water research councils in some countries, which can develop strategic plans for the region, in this area - technological development, in close cooperation with international institutions such as the International Water Management Institute (IMMI).

3.3.1.5 Climate change

The many challenges posed by global climate change, from increased temperatures and extreme weather events to rises in sea level, are now widely recognized in both scientific and policy circles. In this respect, the 4th report of the Intergovernmental Panel on Climate Change (IPCC) estimates global temperature rise, during the century, between 2C and 4.5C, and are almost inevitable according to the report. Ominously, however, it also says that much higher increases of 6C "or more" cannot be ruled out. IPCC's latest report makes it clear that climate change could be far worse than previously thought because of potentially disastrous "positive" feedbacks which could accelerate rising temperatures.

Furthermore, a recent report from Britain's Sir Nicholas Stern warned of the devastating economic effects global warming could have on the world in coming years. Stern, former Chief Economist at the World Bank, cautioned that if greenhouse gas emissions weren't significantly reduced, by 2050 the global economy would shrink by up to 20 percent, millions of people would be permanently displaced and droughts would plague the earth.

So far, the main response at both national and international levels has been to focus on initiatives aimed at mitigating i.e. reducing the potential size of these effects. Most industrialised countries, e.g., have sought to do this by committing themselves, through signing the United Nations Framework Convention on Climate Change (UNFCCC) and the Kyoto Protocol, to stabilise or reduce greenhouse gas emissions, and enhance carbon sinks.

1 Climate change may lead to potential eventualities, such as drought and famine, which has
2 already been experienced by some of the CWANA countries. In this connection, the capacity of
3 the national governments and communities for mitigation efforts would be limited, in the short to
4 medium term, paving the way for more vulnerability to the adversaries of climatic change.
5 Climate change is a global issue with regional implications. There are many Multilateral
6 Environmental Agreements (MEAs), which address those issues, and some of the countries of
7 the region have already ratified some of such MEAs. On the other hand, international donors and
8 institutions like Organization of Islamic Countries' (OIC) Standing Committee on S&T
9 (COMSTECH) and Islamic Development Bank (IDB) can also help regional countries in
10 integrating environmental development agenda into overall national economic development
11 plans. However, some national governments may not be cognizant of the need for such a
12 proactive initiative in the short run under BAU, but in the long run they are likely to be sensitized
13 to the issue and may start responding to this challenge.

14
15 Too much or too little rain can be a matter of life or death in some countries in the CWANA region
16 (reference). At different times and in different places across the region, climate change threatens
17 both. Prolonged and severe climatic desiccation, coupled with intensive exploitation of soil,
18 pasture, forest & other natural resources, as well as the huge increase in human and livestock
19 populations, have led to extensive degradation and resulting inherently fragile environment in
20 some parts of the region to the extent that conflicts caused or catalyzed by these compounding
21 ecological factors were bound to take place.

22
23 In fact, ecological degradation, mainly caused by climate change, has been so severe that the
24 traditional means for the prevention and management of inter-ethnic disputes have been
25 rendered virtually unworkable. Indeed, many of the current disputes are not being fought along
26 traditional political borders, but along ecological borders that divide richer & poorer ecozones. To
27 continue to treat the conflict in Darfur, and many other parts of Africa, as purely ethnic, tribal,
28 political or religious, and to ignore the growing impact of ecological degradation and depletion of
29 the resource base, could ultimately lead to a distorted understanding of the real situation, and
30 consequently limit the possibility for genuine conflict resolution. Therefore, a new model of
31 development is called for, one in which strategies to increase human resilience in the face of
32 climate change and the stability of ecosystems are central. Above all, the challenge calls for a
33 new flexibility and not a one-size-fits-all approach to development.

34
35 Aforementioned issues and other environmental factors precipitating climate change like
36 industrial pollution can only be addressed through efficient technologies. Yet, the available
37 technology mix (AKST) can have both positive and negative effects on the climate, and at times
38 may not be efficient or environment-friendly. In the historical perspective, most of the
39 technologies in the past had an adverse effect on climate e.g. carbon emissions from industrial
40 settings led to extensive damage to the Ozone Layer. Under 'business as usual' national

1 governments may remain complacent with what already exists at least in the short term. This
2 would compromise attainment of environmental health agenda in that particular time frame.

3
4 In the regional context, the countries sharing borders or those members of regional
5 cooperation/custom unions could address cross border environmental issues. The coping
6 strategies at times could be costly in propositions, and countries of the region may not be able to
7 handle those issues on their own. At present, issues of environmental goods and services are
8 being negotiated in the WTO, and national governments and communities may not have the
9 capacity to engage in these multilateral negotiations proactively. Finally, the current weak AKST
10 infrastructure and human capital may not be able to support climate change mitigation
11 requirements.

12
13 In the absence of effective mitigation efforts, subsequent climatic changes can potentially lead to
14 major crisis, which will encourage stronger alliances between selected countries to attempt
15 reducing the incidence of further natural disasters without affecting agricultural production
16 efficiency. In order to counter such fallouts, the CWANA countries need to develop coping
17 strategies, by promoting environment-friendly policies, and by developing AKST to counteract
18 those adversaries, and help manage climate change. This will depend to a great extent on
19 research and development and S&T (AKST) capacities of the countries in the region, investment
20 in R&D / S&T infrastructure, human capital, and research & extension linkages that will help
21 promote understanding of the issues and ability to mitigate those problems. This change is likely
22 to happen in the longer time frame.

23
24 African countries are spearheading ways to tackle climate change and have important lessons for
25 how others can cope in future, said a report by the International Research Institute for Climate
26 and Society (IRI) at Columbia University, United States, which indicated how certain countries
27 were integrating climate information into development and planning. This can help them manage
28 climate risks such as flood and drought (reference).

29 A key component of all the strategies is the linking of early warning and risk management
30 systems to regional and local practitioners such as healthcare providers and farmers (reference).
31 Government departments and the media also have an important role to play, particularly in
32 getting information to rural areas. The report identifies gaps in knowledge and communication,
33 describing how meteorological information is not fully exploited, and farmers are often unaware of
34 products available to help them cope with climate change. The publication supports the Global
35 Climate Observing System's new African-led initiative, GCOS-Africa Climate for Development
36 2007, which aims at integrating climate information into development planning.

37 38 3.3.1.6 Energy

39 Perhaps the greatest challenge in realizing a sustainable future is energy consumption. It is
40 ultimately the basis for a large part of the global economy, and more of it will be required to raise

1 living standards in the developing world. Today, we are mostly dependent on non-renewable
2 fossil fuels that have been and will continue to be a major cause of pollution and climate change.
3 Because of these problems, and our dwindling supply of petroleum, finding sustainable
4 alternatives is becoming increasingly urgent.

6 At present, petrol prices are regulated by many factors, and one key player in this connection is
7 the oil producing countries, through associations such as OPEC. Under globalization, and
8 liberalization of trade, those associations are likely to lose control in terms of regulation of prices,
9 and as such, there will be a decrease in the price of oil. This can be used to the advantage of
10 agriculture in general, and development goals in particular, as access to energy would become
11 easier, especially for the poorer countries of the CWANA.

13 However, if the process of globalization is hindered for lack of progress in Doha Development
14 Agenda (DDA), as apparently has happened since the Mini-Ministerial meeting of WTO in
15 Geneva in July 2006, then targeted protectionism will get hold, nurturing the environment of
16 'business as usual' and associations like OPEC will continue enjoying their monopoly. Present
17 conflicts in some of the countries of the region, in the context of geo-politics and geo-economics,
18 may not get resolved in the short term.

20 As a result, the prices of oil may further increase. The present situation in the Middle East reflects
21 upon this type of scenario. Under such circumstances, countries may not be forthcoming in
22 sharing scientific knowledge, and transfer of technology. As a result, there will be a weaker flow
23 of investment, which will further add to the escalating prices. As such, both the efficiency and
24 sustainability of agriculture in the region will be at stake in the short to medium run.

26 Access to energy, for the purpose of agricultural development, is primarily a function of prices,
27 which is one of the limiting factors for agricultural development today. Accordingly, the increased
28 monopoly of associations such as OPEC shall further limit the access and capacity of the
29 CWANA countries & communities to develop and expand their agricultural base. This state of
30 affairs will have implications on evolving efficient technologies for agricultural development in the
31 short to medium term This will in turn compromise attainment of development goals in general,
32 and MDGs in particular in this particular time frame.

34 Development of alternative means of energy like solar, wind and bio-fuels need strong
35 underpinnings, both from a strong natural resource base and AKST capacity. Both of these
36 contributory factors may get required policy focus which lacks under 'business as usual' scenario
37 as of now, in the long term and thus some alternatives means of energy may become available in
38 the long term, especially with development of AKST capacity in the region. The soaring petrol
39 prices, coupled with limited economic activity to generate the required foreign exchange to

1 purchase energy, will compel countries in the region to look for alternatives and to that end invest
2 in AKST.

3
4 In oil rich economies, agricultural development these days is being driven by the income
5 generated through oil resources, which is a capital intensive activity, not integrated with AKST,
6 and thus may not be sustainable in the long run. Access to new technologies, such as green
7 houses, may not be possible in the future, if their current oil production is not sustained, as such
8 focused investment in AKST would be required even in these countries to sustain the agricultural
9 development initiatives.

10
11 Renewable energy is one of the most efficient ways to achieve sustainable development. Much of
12 the focus on sustainable energy is aimed at different ways of tapping into the most abundant
13 renewable resources such as solar energy, biomass and alcohol from plant residues.

14
15 The continuing raise of oil prices, due to political crisis and growing demand, will place
16 pressure in countries outside CWANA to develop such alternative means, like efficient biofuel.
17 While the ascending oil price will bring revenues to CWANA petroleum-producing countries will
18 also result in more coordinated efforts of other countries to continue efforts in reducing
19 dependability in petroleum products. However, the production of biofuel without sacrificing food
20 availability, and competing with subsidized bio-fuel production as in case of USA, especially for
21 developing countries, will be a challenge.

A switch to biofuels will not save the planet

On the face of it, it's most encouraging that biofuels will be at the top of the agenda when George Bush touches down in Sao Paolo on Thursday to meet his Brazilian counterpart, Luiz Inacio Lula da Silva. For years, environmentalists have complained of the industrialized world's "addiction to oil", to use Mr. Bush's own words. The US President has now clearly grasped the message that his gas-guzzling compatriots need to wean themselves off fossil fuels - and not simply because the oil-rich Hugo Chavez of Venezuela is so hostile to America. Mr. Bush understands that, with or without Mr. Chavez, to continue consuming fossil fuels at the present breakneck speed is not an option.

Hence the biofuel "Summit" in Sao Paolo, where the two countries that make the bulk of the world's ethanol - from sugar cane in Brazil and corn in the US - are likely to seal an "ethanol alliance". The terms of this accord will probably be aimed at boosting sugar-cane production in Latin America to meet a rising demand for ethanol in the US that America's farmers can't meet.

It's not just Mr. Bush who is eyeing the potential for a world energy revolution in the endless fields of sugar cane surrounding Sao Paolo. Businesses are already excited, and are pumping huge sums into the development of renewable alternatives to oil, which include soybean-based biodiesel and other ethanol variants made from wood chips. In short, the ethanol business is booming. Moreover, the ambitious targets the US has set for ethanol production mean the boom has only just begun. Mr Bush has ordered a five-fold increase in American use of biofuels by 2017, which means a target of 35 billion gallons a year.

It's an exciting, almost dizzying thought, that the humble corn stalk or sugar cane may hold the solution to the looming energy crisis.

So what's the catch? This is the hard part. Of course it's good that the leader of America, a Texas Republican to boot, has finally understood that the US, as the world's biggest single consumer of energy, has got to change its energy source.

The problem is that many Americans, and Europeans for that matter, seem to think it is just a matter of flicking a switch: one moment fossil fuel, the next moment, sugar cane-plus-corn. Lifestyle - unaltered.

Sadly, that's not enough. Ethanol may sound like the kind of "friendly" energy the world has been waiting for. But for ethanol production to rise to the levels Mr Bush is hoping for, huge amounts of the world's remaining forests will have to be cut down and turned over to corn or sugar cane.

The existing hectareage devoted to agriculture will not be remotely large enough to produce the quantity of fuel needed. In other words, paradoxically, a growing reliance of renewable energy may accelerate the destruction of the rainforests we so desperately need to moderate the planet's temperature. Besides, according to the World Conservation Union, growing corn uses far more energy than the finished fuel produces.

There is another downside to the ethanol boom. As demand rises, the price of the cereals from which it is partly made soars as well. Tortilla prices in Mexico are already surging as a result of ethanol demand in America. This threatens the precarious livelihoods of many of the world's poorest people.

To simply shift from fossil fuel use to ethanol is not going to get us out of our dilemma. It's not going to "save the planet", or not alone. That will require a sharp reduction in fuel consumption, too. The question is whether Mr Bush, other world leaders, or the public, for that matter, have taken this fact on board.

Source: The Independent, March 5,2007

Biofuel's costs

When Rudolph Diesel unveiled his new engine at the 1900 World's Fair, he made a point of demonstrating that it could be run on peanut oil. "Such oils may become, in the course of time, as important as petroleum and the coal tar products of the present time," he said.

And so it has come to pass that US President George Bush has decreed that America must wean itself off oil with the help of biofuels made from corn, sugar cane and other suitable crops.

At its simplest, the argument for biofuels is this: By growing crops to produce organic compounds that can be burnt in an engine, you are not adding to the overall levels of carbon dioxide in the atmosphere.

The amount of CO₂ that the fuel produces when burnt should balance the amount absorbed during the growth of the plants.

However, many biofuel crops, such as corn, are grown with the help of fossil fuels in the form of fertilizers, pesticides and the petrol for farm equipment.

One estimate is that corn needs 30 per cent more energy than the finished fuel it produces.

Another problem is the land required to produce it. One estimate is that the grain needed to fill the petrol tank of a 4X4 with ethanol is sufficient to feed a person for a year.

Source: Article-The Big Green Fuel Lie

At the same time, renewable sources of energy, such as biomass, currently make up just 13.6 per cent of global energy supplies, even though they are widely available and less polluting than fossil fuels. Their widespread adoption is limited by the costs associated with importing the technology, such as wind turbines and solar panels. Yet, environmentalists warn that the trade in biofuels should be governed by environmental standards, and warn that planting crops solely for biofuels may cause catastrophic damage to the planet. How CWANA countries are going to tackle energy problems in the future will heavily depend on their AKST capacity and policy mix they choose to follow.

3.3.1.7 Human resources

Competitiveness in agriculture and food systems demands improvement and development of the human resource through investments in education, training, health, security and ICT. The creation of agricultural schools & colleges, and then faculties of agriculture and veterinary sciences in regular universities or even specialized agricultural universities came to represent an additional, sometimes alternative, knowledge system for agriculture & related sciences. The 20th

1 century saw the mushrooming of formal agricultural educational institutions in the Western world,
2 and significant colonial efforts also to introduce new science to the developing world. However,
3 with the rapid decline in the role meant to be played by agriculture in the developing country
4 economies, their agricultural educational systems were faced with new challenges.

5
6 Over the last 30 years, the early expansion in agricultural training has slowed down, many
7 faculties & universities of agriculture & related sciences have fallen on hard times, recruitment
8 and retention of highly qualified & motivated staff has become more problematic, and worst of all
9 agricultural education establishments in developing countries are no longer able to recruit
10 students among the scholastically best school leavers. Agricultural education is being seriously
11 challenged by the political downgrading of agriculture as an engine of growth in the developing
12 countries.

13 14 3.3.1.8 Investment in AKST

15 Investment in agricultural research has a net pay off and in many of the developing countries, a
16 share of agriculture in the GDP ranges from 25 to 70 percent. But the share of investment in
17 agriculture & agricultural research is very low, compared to the internationally recommended
18 level. This is one of the reasons that new technologies and better agricultural practices could not
19 take roots in the CWANA countries, and traditional agricultural practices, which are relatively less
20 efficient, continue to dominate. Therefore, there is an urgent need to invest more in AKST, so that
21 more relevant and effective technology mix could be developed.

22
23 On the other hand, weaker institutional & human capital base in the region has negatively
24 affected agricultural development. However, with globalisation countries now have opportunities
25 for interface across borders with nations and communities, who are well- equipped in terms of
26 agricultural S&T infrastructure and human capital & information. Knowledge powerhouses across
27 countries can help in the flow of scientific information to the advantage of agricultural
28 development in a region like the CWANA.

29
30 Countries of the region can also link investment treaties (BITs) with transfer of technology, and
31 also may even claim intellectual property rights (IPRs) for providing access to genetic resources.
32 Needless to mention that 90 percent of the genetic resources of the world are in the South, of
33 which the CWANA is a part. Through better management of those resources, and their
34 development, they can accrue monetary gains to the advantage of the custodians of those
35 resources, especially in the context of development goals.

36
37 There is a potential risk that foreign countries, which are better, placed to export their agricultural
38 products, could dump their subsidized produce in the CWANA countries, and turn them into
39 consumer markets. This onslaught can only be countered by developing an efficient agricultural
40 production system and R&D underpinnings, which will enable those countries to compete in terms

1 of price and quality. However, if the present trends prevail, governments will continue to follow
2 inward-looking policies and operate in an isolated way' under business as usual scenario. In
3 such a situation, agricultural R &D may not be a priority in the short to medium run, and with
4 same token badly needed human resources may not be developed. All this can compromise
5 development objectives, including, *inter alia*, those related to agriculture, food security and
6 poverty alleviation in that particular time frame.

7
8 At present, agricultural research institutions, in the majority of the CWANA countries, are
9 fragmented and not specialized enough to cater in terms of innovation, especially targeting
10 problem-solving, demand-driven and client-oriented agricultural research, which could help
11 overcome productivity constraints. In addition, there is hardly any well-thought of agricultural
12 research agenda that can contribute towards attainment of the objective of the national plans and
13 development goals. This situation is likely to remain unchanged for want of policy focus in
14 investment in agriculture R&D in the short term. New linkages with international research
15 institutions, and access to new technologies and innovations would however, be possible in the
16 long run due to reasons discussed earlier. The investment in research, particularly to develop
17 technology in specific industries such as fishery and greenhouse production will be key to
18 improve life quality in this region

19 20 **3.3.2 Indirect drivers and the policy options**

21 3.3.2.1 Demographics

22 The population dynamics of the CWANA region are witnessing very high rates of growth
23 compared to other regions. High rates of growth, coupled with problems like poor social safety
24 nets in terms of parenthood planning, education, immunization and child & mother care,
25 negatively affect human productivity and longevity. Marginal strata of the society like children &
26 women are the worst victims of this skewed demography, and are being further marginalized in
27 the absence of social safety nets.

28
29 Under globalization, on the one hand, there is a probability that better parenthood practices, child
30 and mother care programs and education could be afforded, on the other; there is an attended
31 risk of importing exotic diseases, because of expanding tourism, cross-cultural contacts, and
32 trade liberalization. Bird flu and HIV/AIDS are recent examples in this regard. Some countries in
33 the region are worst hit by both disease problems. HIV/AIDS also have long-term implications for
34 nutritional health of affected communities and families, that further compounds the risk of food
35 insecurity, under 'business as usual' scenario discussed earlier. This in turn impacts negatively
36 upon the rehabilitation of HIV/AIDS victims.

37
38 In the densely populated regions of the CWANA, agriculture remains a key source of livelihood,
39 but over the past few years, the capacity of agriculture to employ people, as a dependable means
40 of livelihood, has declined. Consequently, people have been compelled to seek non-farm jobs,

1 which are not available in rural areas. This has resulted in mounting pressure on urban satellites,
2 where mega-cities have developed, and where many people are living in abject poverty in urban
3 slums. The unemployed inhabitants of slums represent a potential threat for the civic peace,
4 because of crimes and social evils including, *inter alia*, prostitution at the hands of unemployed
5 people.

6
7 In the CWANA, the most pragmatic approach to arrest this process would be to develop the rural
8 areas by investing in education and S&T (AKST), agriculture and agro-based industry. The
9 problem of high population growth rates and urbanization is further compounded by conflict, poor
10 governance, lack of political will to move, and growing foreign influence in the CWANA region
11 which has led, in many countries, to a huge influx of refugees. Sudan, Afghanistan, Iraq,
12 Pakistan and Lebanon are recent examples of this unfortunate situation.

13
14 In the WTO, the developing countries have asked for an opening under General Agreement on
15 Trade in Services (GATS) Mode IV, movement of natural persons across borders. This will help
16 developing countries to send their semi and unskilled workforce to the developed world, if
17 industrialized countries accept this proposal, which hitherto they have declined to. This will help
18 ameliorate socio-economic pressures in developing countries, which would in turn help promote
19 cross-cultural peace, harmony and coherence.

20
21 AKST in general and S&T in particular will help control population because of new parenthood
22 planning methods & practices, and at the same time would enable the CWANA countries to deal
23 effectively with issues like early child mortality, neonatal & exotic diseases. In this context, it
24 would be equally important that socially compatible and economically affordable parenthood
25 planning and health security measures are evolved and promoted.

26
27 Nevertheless, history has shown that in inward-looking settings, population planning has never
28 been a priority, and polygamy and other factors promoting population growth are encouraged. In
29 BAU like situation, measures to control population and manage health and disease related issues
30 are not likely to be effectively addressed. This will increase pressure on land for production of
31 food. In this respect, many countries of the region, suffer from food insecurity and a high rate of
32 child mortality.

33
34 Per capita income in the majority of the population of the region is close to the poverty line of \$2-
35 a-day. High levels of population growth, low per capita income, and a lack of social safety nets
36 would be key obstacles in attainment of the development goals. Conflicts and disasters, at
37 national and communal levels, are quite rampant in certain parts of the region. If the present state
38 of affairs prevails, as 'business as usual' disaster management capacities will continue to be
39 lacking, for need of technology and skills to cope with such situations in the short to medium run.
40 As such, in the face of natural disasters or political turmoil, the national governments will not be

1 able to face the situation, putting regional political and economic stability and peace at stake.
2 Planned Parenthood, mother & child health care, and conflict management capacities, however
3 are likely to be developed in close interface with AKST in the longer time frame with positive
4 effect on attainment of the development goals.

6 3.3.2.2 Socio-political drivers

7 Historically, almost all the countries of the CWANA region were at one time under colonial rule,
8 and hence, inherited poor governance capacity and structures. Low levels of education and
9 monopolistic settings in the regional countries have further compounded the problem. This
10 situation has been aggravated in the post-colonial era, through political support being extended to
11 non-democratic regimes in the region by external forces. As a result, the democratic process was
12 discouraged in getting roots in some of the countries of the region, and farmers used to have a
13 low voice in the corridors of power. Consequently, national policies only focused upon urban
14 elites, and agricultural & rural development *per se* has been ignored. Some countries of the
15 region, with centralized government systems, suffer from rampant corruption, illiteracy, poor
16 infrastructure and utter disregard to the will of the people. This resulted in poor development of
17 agriculture and disrespect for human rights and security.

18
19 Under globalization, the CWANA countries are likely to be compelled to embrace and nurture
20 some sort of democratic thinking, which in turn will help the development of democratic
21 institutions and investment in AKST that will ultimately benefit agricultural development in the
22 region in the long run.

23
24 The governments in the CWANA region being signatories to multilateral agreements, including
25 the WTO Agreement, are bound to adhere to those international frameworks. This naturally is not
26 possible without having AKST capacity to deal with such complex issues. As such, changing
27 scenario will help them comply with a range of standards, from education through industry to food
28 safety, which in turn will help make agriculture more efficient and sustainable.

29
30 On the other hand, and if authoritarian governance, which is already in practice in many countries
31 of the region, will continue to dominate a likely scenario, under 'business as usual' prevails, the
32 axis of war & conflict will remain deeply embedded in governance structures and shall remain a
33 potential threat to the stability of the region in the short to medium term. This will eventually
34 undermine the ability of those countries to cope with the requirements of agricultural development
35 in that time frame.