

ESAP CHAPTER 1

CONTEXTUAL REALITIES

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Key messages

Together, the combined populations of China and India currently constitute around 50 per cent of global population. The demography of the ESAP region is changing rapidly,. Population in India will exceed that in China within a few decades. In India and some other ESAP countries, the younger generation will continue to dominate the labor force. But in China, Japan and the Republic of Korea, family planning policies and improvements in health care will contribute to an ageing of the population. Economic development and rural-urban wage differentials will encourage rural to urban migration. An educated younger generation will be less interested in agriculture and the trend of rural depopulation will continue into the future. Therefore, a declining labor force (and in particular a declining male labor force) will be available for agriculture, particularly on small to medium farming enterprises, and the available labor force will be dominated by women.

The ESAP Sub Global Region is characterized by considerable diversity in terms of agroecological zones, climate and farming systems and is highly vulnerable to natural hazards but rich in natural resources and biodiversity. These realities would require a diverse AKST to ensure productivity and sustainable development.

People are the wealth of East and South Asia and the Pacific region, since this region is the home for three of the most populous countries in the world. Developing countries have a relatively large youthful population with labour advantages in comparison to OECD countries that have rapidly ageing populations. The region has recorded in the last five decades accelerated urbanization with implications for demand for food, but there is also a significant rural population lacking in basic services and education demanding attention on rural development. Agriculture labour force composition is changing with increased female participation and child labour that are most often representing the unpaid family workers. The population's educational attainment is marked by gender and rural disparities with uneven gain in human capital. The region also demonstrates high level of migration both international and internal leading to labour flight but with remarkable gain in remittances received.

There has been an overall improvement in human welfare in the region, but South Asia continues to have the highest concentration of poverty. Wide disparities in well-being is observed between urban and rural areas, with rural areas demonstrating increasingly greater incidences of poverty and women are highly represented among rural poor. Two current threats to human well being in the region are HIV AIDS and HPAI and these have adverse impact on rural economy.

The ESAP is a very important agricultural trade region, with Japan, China, Australia, Thailand and South Korea as top trading countries. Japan and South Korea are the biggest importers while

China and Australia are the biggest exporting countries, followed by Thailand, Malaysia and Indonesia. Australia and New Zealand export mainly livestock products while Indonesia and Malaysia export palm oil and rubber; Thailand and Vietnam export large amount of rice and China exports mainly vegetables and fruits. The Pacific countries are exporters of copra and cocoa beans.

While ESAP region's agricultural export expands progressively, it is facing increasingly in recent years the technical barriers to trade (TBT) and sanitary and phyto-sanitary (SPS) measures.

Stringent trade barriers adopted by developed countries constrain international trade in the region.

Hence, the AKST should aim to assist farmers in this region to adopt good farming practices to improve the quality of exportable agricultural produce and commodities to overcome import constraints originating from high quality standards such as food safety. As the multinational negotiation like WTO achieved little progress, regional free trade agreements are progressively promoted to develop regional trade blocks to strengthen intra-regional trade, like China-ASEAN free trade agreement.

The global orchestration of AKST development began with the creation of the Consultative Group of International Agricultural Research (CGIAR) and the establishment of National Agricultural Systems (NARS) which eventually organized regional R and D networks. These global, regional and national bodies set the directions of R and D in many countries in ESAP. Lately, private organizations are now highly involve in the generation of AKST especially in the development of GMO products while the Non Government Organizations (NGOs) are leading in the AKST development to suit specific needs of the region's diverse environment. In spite of all these efforts, the region has maintained many of its traditional knowledge and indigenous practices.

Agricultural extension services are mainly provided by central governments but more and more countries in ESAP are starting to devolve this. NGOs initiatives in providing extension services are becoming highly recognized in the region with the private sector also doing its share. Information, Communication Technology (ICT) starts to make its impact in facilitating the transfer of AKST although it is not so much felt yet in poor developing countries in the region.

1.1. IAASTD Framework

The International Assessment of Agricultural Science and Technology for Development (IAASTD) is a global initiative to evaluate the relevance, quality and effectiveness of agricultural knowledge, science, and technology (AKST); and effectiveness of public and private sector policies as well as institutional arrangements in relation to AKST. The primary goal of the IAASTD is “to assess how we can reduce hunger and poverty, improve rural livelihoods and facilitate equitable, socially, environmentally and economically sustainable development through the generation, access to and use of agricultural knowledge, science, and technology”.

An assessment is a critical, objective evaluation, and analysis of information, including local knowledge, designed to meet user needs and support decision-making. It is an application of experts’ judgment to existing knowledge, with a view to providing scientifically credible answers to policy-relevant questions, quantifying the level of confidence wherever possible.

Agriculture in this report is defined broadly to include agricultural systems consisting of crops, livestock and pastoralism, fisheries, biomass, and agricultural goods and services, and land management activities such as forestry and agroforestry.

[Insert Table 1.1: The list of countries that are grouped under the ESAP region]

It is important to recognise the variations in grouping of countries adopted by different UN agencies under the category of Asia and the Pacific region and countries included under ESAP region for this assessment. These differences in country groupings present implications for UN data retrieval and arriving at generalizations on regional trends.

The countries that make up ESAP region (see **Table 1.1**) are characterized by multiplicity in terms of size, geography, agro-ecological systems, production systems, culture, religion and political systems, as well as economic performance and social development. The complex regional realities are shaped by historical trends, agro-ecological environments, farming practices, contradictions surrounding agriculture trade and aid to farmers, and investment in agriculture knowledge, science and technology. Collectively these interactive influences impact AKST generation and application with significant variations in processes and outcomes in achieving the goals of development and sustainability in ESAP countries.

After providing a brief summary of the Conceptual Framework developed for the IAASTD, this chapter provides an overview of geographical features of the region, the major direct and indirect drivers of change that affect agriculture and/or the generation and adoption of AKST.

1.1.1. IAASTD conceptual framework

The process of IAASTD began with the development of a conceptual framework. The conceptual framework (**Figure 1.1**) provides guidance on common concepts and terminology and enables systematic analysis and appraisal of the primary goals of the assessment. It illustrates linkages between several components and the process, methods and tools for addressing them. Components include Direct Drivers of change : availability and management of natural resources, climate change, labour, energy and AKST use; Indirect Drivers : economic changes, demographic changes, changes in level and availability of education, socio-political changes, changes in infrastructure, agricultural knowledge science and technology. These drivers are described in detail in chapter 3 of the global volume. The assessment focuses on the interactions among the drivers in order to understand how to facilitate the achievement of the IAASTD goals.

[Insert Figure 1.1: The Conceptual framework developed for the IAASTD]

1.1.2. Introduction to ESAP Assessment

ESAP sub-global assessment report begins with a presentation of contextual realities for the region. The contextual realities are broadly grouped under geo-physical context, demographic characteristics, human well-being, trade context and agriculture research system and outreach. ESAP specific geo-physical issues as relevant to agriculture enterprise and livelihood are reviewed with specific focus on farming systems and resources. Demographic dimension includes such aspects as population trends, urbanization, agriculture labor, education and migration in ESAP region and their implications for human capital for agriculture and rural economies. Human well-being section takes broad overview of the ESAP situation in gains and gaps in selected development indicators identified as health, poverty, nutrition, access to sanitation and water along with the threats to human-well being in the region both past and current. EASP region is dynamic in global trade as illustrated by the review as the trade context. The trade context is described to capture the various trade blocs, trade agreements, trade partners and commodities traded with implications for agriculture trade and regional economic development. Finally the research, extension and investment scenario for for maintaining the vitality of agriculture sector is reviewed.

Chapter 2 focuses on history and impact of Agriculture Knowledge, Science and Technology in the ESAP region. The major themes explored are trends in AKST and its Impacts on current production systems; AKST Systems: Actors and Institutions; Impacts of AKST on Development and Sustainability Goals. The evolution of AKST and the pros and cons of various technological paradigms and technology promotion and adoption outcomes and constraints are examined. In exploring links between AKST and sustainability goals, scope of sustainability is expanded to include aspects such as reducing hunger and

poverty ; improving rural livelihood; improving nutrition and human health; environmental sustainability; and social equity and sustainability.

Chapter 3 focuses on influence of trade regimes and agreements on agriculture knowledge, science and technology. The discourse begins by setting the context exploring the freed trade agreement in ESAP and focusing on the trade and food security linkages, Asian zone and its importance in the global economy, and National policy trends. It moves further to review the relationship between trade and technology such as trade agreements and technology developments, trade and technology options, trade agreements, intellectual property rights and AKST; environmental, health and social dimensions in trade agreements; and climate change and trade.

Chapter 4: presents the regional outlook on agricultural change and drivers of change. This chapter takes an impact assessment approach and identifies the current and future drivers of change pertinent to agriculture. the relevant drivers identified are, demographic change, economic drivers, implications of growth for agriculture , socio-political drivers, education, culture, ethics and health, science and technology natural resources - land use and land cover change, climate change and natural hazards and energy. Moving on further the section reviews future food systems, agricultural products and services in drawing information from past assessments and relevance to ESAP (e.g. FAO, IFPRI, GEO, IPCC, MA). The conclusion summarizes major uncertainties to drivers and projections and relevance of drivers and uncertainties to AKST.

The final chapter presents the options related to AKST for meeting the sustainable development goals. The options are discussed under such groupings as technologies and practices, capacity building, trade and markets, investment, policy options, natural resource management biodiversity, genetically modified organisms and information and communication technologies.

1.2. Geophysical Characteristics

1.2.1 Geographical location

The ESAP Sub Global Region covers three of the five major regions in Asia, the earth's largest continent, and the Pacific. These three major regions are South Asia, South East Asia and East Asia (**Figure 1.2** and **Table 1.1**). It has some of the most populous countries such as India and China and many island nations, especially in the Pacific. It is home to a few of the most developed countries in the world like Japan and Australia but also houses many least developed countries such as Laos People's Republic, Cambodia and Nepal. The newly industrialized countries like the Republic of Korea and Singapore are also part of the ESAP Sub Global region. The diversities of the countries in the ESAP sub global region is not only confined in terms of population, sizes, economies but also in terms of agroecological zones.

[Insert Figure 1.2: Location of ESAP Region (Courtesy of IWMI, 2006)]

Myanmar, Thailand, Cambodia, Vietnam, Laos, Malaysia, Philippines, Indonesia, Singapore, Brunei, and East Timor. The first five countries belong to the mainland Asia while the last six belong to the region of peninsulas and islands. Southeast Asia extends from the peninsular mainland to the archipelagos offshore.

East Asia is made up of a vast mainland China, North and South Korea, and the islands of Japan and Taiwan off the eastern coast. North Korea and Taiwan are excluded under the ESAP Sub Global Region. East Asia is on the eastern edge of the Asian continent, bordered by the Pacific Ocean to the east, Russia to the north, and the countries of south and southeast Asia to the south.

The Pacific Islands countries under the ESAP Sub Global Region include Australia, Fiji, Kiribati, Marshall Islands, Micronesia, New Zealand, Republic of Palau, Papua New Guinea, Samoa, Solomon Islands, Tonga, and Vanuatu. The South Pacific Islands are spread across more than 30 million km but occupy less than 2% of the area. Some of the world's smallest and most remote countries are located here. Among countries in the South Pacific, Kiribati, Samoa, Solomon Islands, Tuvalu and Vanuatu are characterized by the presence of small islands. Kiribati and Tuvalu are made up of small atolls and raised limestone islands scattered over great expanses of open ocean.

1.2.2. Agroecological zones

Three dominant agroecological zones predominate in ESAP and include: a) warm arid and semi arid tropics, b) warm subhumid tropics, and c) warm subhumid tropics with summer rainfall. On the other hand, warm arid humid tropics predominates Southeast Asia while cool subtropics with summer rainfall predominates East Asia (**Figure 1.3**). This diversity in agroecological zones require different sets of genetic materials with a corresponding sets cultural practices appropriate for each agroecological zone. Hence, genetic resources developed or available in one agroecological zone are not suitable in another zone.

[Insert Figure 1.3: Agroecological zones in South, Southeast and East Asia.]

1.2.3. Climate

ESAP is a region with very diverge climatic zones from temperate to arid climatic zones. The most important climatic/atmospheric feature in the region is 'monsoon'. In South Asia, two monsoon systems operate. They are: Southwest or *summer monsoon* and the Northeast on *winter monsoon*. The summer monsoon accounts for 70-90% of the annual rainfall over most of South Asia, except over Sri Lanka and Maldives where the Northeast monsoon is dominant. Apart from the monsoon, the Northern part of South Asia receives considerable precipitation from Western disturbances.

The inter-annual climatic variability, influenced mainly by Southern Oscillation (ENSO) is a feature of many countries in EASP including India and Australia (IPCC 2001 and other references). This affects flood and drought events, as exemplified by Monsoon rainfall data in India (see **Figure 1.4**), and thus development goals. However from the detailed data that is available for India, there has been no specific trends in rainfall.

No significant trends exist in the all-India rainfall since the record available from 1871 (Mitra, 2003). However, long-term changes were experienced on spatial smaller scales. An increasing trend of monsoon rainfall (+10 to +12% per century) was observed in the west coast, North Andhra Pradesh and in Northwest India. On the other hand, decreases in rainfall (-6 to -8% per century) were observed in East Madhaya Pradesh, northeast India and parts of Gujarat and Kerala. Inter-annual variability of monsoon is highly influenced by El Nino Southern Oscillation (ENSO) (**Figure1.4**). Inter-annual variability has impacts on agricultural production, employment and marketing.

[Insert Figure 1.4: All-India summer monsoon rainfall (1871-2003).]

In comparison to precipitation, air temperatures have increased. One indicated a warming of 0.4°C/100 years for India as a whole. The warming in the annual mean temperatures was mainly contributed by the post-monsoon and winter seasons. The monsoon temperatures do not show significant trend (\pm ve) over major part of India (Kumar *et al.*, 2003). Similar trends were also noticed in the other South Asian countries.

For the most part, the margins of Asia have cool to cold, dry winters and hot, humid summers, with a strong concentration of precipitation in the summer months. Although the term *monsoonal* is applied to all the climates of eastern and southern Asia, the true monsoon is characteristic only of part of the Indian subcontinent and Myanmar; in these areas average annual rainfall exceeds 2,000 mm (79 in). In other parts of southern and eastern Asia, rainfall is either less heavily concentrated in the summer or evenly distributed throughout the year. Most of eastern Asia experiences flows of maritime air from the western Pacific in the form of a monsoon effect. In places where orographic factors (that is, mountains) intervene,

the winter is wet, as is the case along the eastern coastal areas of the Philippines, Vietnam, and Malaysia, and in parts of southern India. The coastal areas of eastern Asia are also subject to destructive typhoons, which originate in the western Pacific and the northern part of the South China Sea.

1.3 Natural/Agricultural resources

In EASP region where agriculture sector makes a substantial contribution to the economy and agriculture and rural production is the basis for majority of the population, land is the primary resource. The land area grouped under the categories of arable permanent crops land; Permanent pasture and forest and wood lands (**Table 1.2**).

East Asia has the biggest total land area among the major regions in Asia with more than 1 billion hectares followed by Southeast Asia and South Asia (**Table 1.2**). China tops all the ESAP countries in terms of total land area with a 932,743,000 hectares followed by Australia, India and Indonesia. Most of the countries in the Pacific Islands and Maldives have the smallest total land area in the ESAP region.

[Insert Table 1.2: Land Use and land cover for various countries in ESAP]

In terms of arable and permanent crop lands, South Asia has the largest area because India tops all the countries in the ESAP region with a total of 202,835,000 hectares. East Asia comes next followed by Southeast Asia with a total of 160,796,000 and 95,361,000 hectares respectively. Developed countries composed of Australia, New Zealand and Japan have a combined arable and permanent crops land of 56,043,000 hectares.

China and Mongolia have substantial areas for permanent pastures with 400,001,000 and 129,300,000 hectares, respectively giving East Asia the highest potential for livestock production especially ruminants. On the other hand, Australia has a total permanent pasture area of 391,565,000 hectares which also provides the country the opportunity to produce a lot of ruminants.

1.3.1 Major farming systems in ESAP

Within in the milieu of diversity in agro ecological systems and variations in natural resource endowment, the region has developed unique farming systems. The farming systems are presented under the three groups namely South Asia, East Asia and the Pacific. The classification of East Asia and the Pacific would vary in country inclusion depending on classification of country groupings used. The East Asia and Pacific classification will differ from the Pacific Island grouping in the farming systems analysis. But in general the review in this section illustrates the differences in agriculture production systems and the rural livelihood in EASP region.

The diversity of farming systems in South Asia (**Figure 1.5**) and the primary livelihoods adopted and incidence of poverty in the farming systems areas is described in **Table 1.3**. Rice-wheat and rainfed mixed farming systems cover about half of the total land area of South Asia. Rice-wheat farming system is characterized by a summer paddy crop followed by an irrigated winter wheat crop (and sometimes also a short spring vegetable crop). The Rice-Wheat Farming System forms a broad swathe across a India, (including Pakistan in the geographic region) from the Indus irrigation area in Sindh and Punjab, across the Indo-Gangetic plain to the northeast of Bangladesh. About 60 percent of the land of the system is under cultivation of which about three quarters is irrigated. The system has a significant level of crop-livestock integration, with an estimated 119 million bovines which produce draught power and milk, as well as manure for composting. Around 73 million small ruminants are kept, principally for meat. Of the total system population of 484 million people, 254 million are classified as agricultural.

[Insert Figure 1.5: Major Farming Systems in South Asia]

[Insert Table 1.3: Major Farming Systems in South Asia]

The rainfed mixed farming system occupies the largest area within the sub-continent and, with the exception of a small area in Northern Sri Lanka, is confined entirely to India. Total system area is 147 million ha with about 59 percent under cultivation. Rice and some wheat are grown, as well as pearl millet and sorghum, a wide variety of pulses and oilseeds, sugarcane, and vegetables and fruit. About 16 percent of the cultivated area, is irrigated. There are an estimated 126 million bovines and 64 million small ruminants, which are partially integrated with cropping. In many instances, relatively small areas are irrigated from reservoirs and in recent decades, tubewells have contributed to an elevated level and stability of cereal production. Vulnerability stems from the substantial climatic and economic variability. Poverty is extensive and its severity increases markedly after droughts.

Three farming systems predominate in East Asia and Pacific. These farming systems are: Upland Intensive Mixed, Pastoral and Sparse (Arid) which occupy 19, 20 and 20 %, respectively, of the total land area of this sub-global region. But these can be further classified depending on the production systems adopted (**Figure 1.6**). The livelihood options and incidence of poverty in different farming systems areas are presented in **Table 1.4**.

[Insert Figure 1.6: Major Farming Systems in East Asia and Pacific]

Upland Intensive Mixed Farming System found in upland and hill landscapes of moderate altitude and slope, in humid and subhumid agro-ecological zones. Total system area is 314 million ha, with an agricultural population of 310 million - the second most populous system, after Lowland Rice, in the region. Cultivated area is 75 million ha of which just under one quarter are irrigated. This is the most

widespread and most heterogeneous farming system in the region (even including some remnant shifting cultivation), with major areas located in all countries of East and Southeast Asia. The system is characterized by the cultivation of a wide range of mostly permanent crops, but the specific crops preferred depend on geographic area, agro-climatic conditions, slope, terracing and water regime. A significant crop area - mainly rice - is irrigated from local streams and rivers. Livestock production is an important component of most farm livelihoods (there are 52 million large ruminants and 49 million small ruminants in this system) and contributes draught power, meat, cash income and savings. Off-farm work is an important source of income for many poor households. Poverty is extensive, varying in severity from moderate to very severe.

[Insert Table 1.4: Major Farming Systems in East Asia and Pacific]

Pastoral Farming System is found in semiarid and arid temperate agro-ecological zones (with less than 120 growing days per annum) in both plain and hill landscapes. The system is extensive in Western China and much of Central and Northern Mongolia. Total area is 321 million ha, but with no more than 42 million people classed as agricultural, cultivated area is just over 12 million ha of which some 20 percent is irrigated in dispersed zones. The farming system is dominated by transhumant pastoralism and characterised by mixed herds of camels, cattle, sheep and goats extensively grazing native pasture. Irrigated crops include cotton, barley, wheat, pulses, peas, broad beans, potatoes and grapes, while sericulture is sometimes practised. Severe poverty, often triggered by drought or severe winters - with consequent loss of livestock - is common in both pastoral and irrigated areas.

The total area of the Sparse (Arid) Farming System, located in Western China and Southern Mongolia, is estimated at 322 million ha, supporting an estimated 9 million cattle and 59 million small ruminants. Only a little over one percent (less than 4 million ha) is cultivated, of which about two-thirds are under irrigation. Two types of irrigation are practiced - some large-scale irrigation areas concentrated in the west; and scattered small areas of irrigation used by pastoralists to supplement their livelihoods. There is a population of 24 million people, 17 million of whom are classified as pastoral or agricultural. Apart from these arable areas, the dominant arid areas are utilized for opportunistic grazing. Poverty is extensive and, especially after droughts, severe in this system.

Except for Australia, most nations in the Pacific are relatively small islands and atolls. In small islands, traditional agricultural production systems in the Pacific Islands-as well as in most other small island environments-are forms of agroforestry, where trees are planted and/or protected for the great variety of their functions and products, including food. Food or fruit species are the most common trees and shrubs in villages and house yard gardens, in permanent village tree groves, and as protected or planted intercrops in food gardens. They include a wide range of: coconut palms, banana and plantain cultivars, breadfruit, edible pandanus varieties (especially on atolls), fruit trees, nut and seed trees, and kava (root

used for traditional alkaloid social beverage). Most of these species are either aboriginal introductions (pre-European contact) or, in some cases, indigenous.

In atoll islands, soil resources are among the most infertile in the world, and there are virtually no surface freshwater resources. Despite inadequate land, soil and water resources as well as relatively high population pressures, atoll societies have developed sophisticated subsistence agroforestry systems. These systems are based on coconut, breadfruit, pandanus, native fig, bananas (on the wetter islands) and giant swamp taro, cultivated in excavated pits dug to the freshwater lens. This type of pit cultivation, utilizing leaves of salt-tolerant coastal trees and plants as mulch and fertilizer, is also applied to important staple tree crops to ensure their survival in the atoll environment.

1.3.2 Water resources

Except for Australia and some of the Pacific island, ESAP region is relatively well endowed with water resources: for a total area representing 21 percent of the world's land surface, it has 28 percent of its water resources. Water endowments vary largely among the countries in the region. The figure of 2000 m³/capita/year is usually used as an indicator of water scarcity: China is reaching this limit, while India and the Republic of Korea are already below it at 1700 m³/capita/year and 1,450 m³/capita/year respectively. Here what you need is how much water is being used for agriculture. For Asia as a whole, about 80% of the water withdrawals are for agriculture – the range is 95-96%% (for Bangladesh, Bhutan and Sri Lanka) to 50-60% in Vietnam, Malaysia, Rep of Korea and Japan. For the Pacific, the water withdrawals vary from about 1% in some Pacific islands (e.g. Papua New Guinea) to 75-78% (Australia and Fiji).

The hydrology of the ESAP region is dominated by the typical monsoon climate which induces large inter-seasonal variations of river flows. In this situation, average annual values of river flows are a poor indicator of the amount of water resources available for use. In the absence of flow regulation, most of the water flows during a short season when it is usually less needed. In Bangladesh, for example, the surface flow of the driest month represents only 18 percent of the annual average; in Indonesia, it is 17 percent. In India, the flow distribution of selected rivers in the monsoon period represents 75-95 percent of the total annual flow. In north China, 70-80 percent of the annual runoff is concentrated in the period between May and September (FAO, AQUASTAT, 2006).

Water contained in shallow underground aquifers has played a significant role in developing and diversifying agricultural production in the region, particularly in China and India. Groundwater offers a primary buffer against the vagaries of climate and surface water delivery. Because groundwater is on

1 demand and just-in-time, crop water productivity is often higher than that in the surface irrigation
2 condition.

3
4 However, over abstraction of groundwater can result in water levels declining beyond the economic reach
5 of pumping technology. Groundwater depletion has been a widespread problem in many areas in the
6 region, especially in the semi-arid areas. Poorer farmers are hit the most. When near the sea, or in
7 proximity to saline groundwater, over-pumped aquifers are prone to saline intrusion. Groundwater quality
8 is also threatened by the application of fertilizers, herbicides and pesticides that percolate into aquifers.
9 These non-point sources of pollution from agricultural activity often take time to become apparent, but
10 their effects can be long-lasting, particularly in the case of persistent organic pollutants.

11 12 **1.3.3 Biodiversity**

13 The Asia-Pacific region encompasses parts of three of the world's eight biogeographic realms and
14 includes the world's highest mountain system, the second largest rainforest complex and more than half
15 the world's coral reefs. Of the 12 "mega-diverse" countries identified by McNeely et al. (1990), 5 are in
16 this region. The rainforests of South-East Asia contain more than 25,000 species of flowering plants,
17 equivalent to about 10 per cent of the flora of the world. The region as a whole encompasses two thirds of
18 the world's flora. Almost all the nations in the region (with the exception of Singapore and Brunei
19 Darussalam) are heavily dependent on direct harvesting of natural products.

20
21 The flora and fauna of the region are increasingly threatened but only a few countries have designated
22 more than 15 per cent of their land area as protected areas. The drive for increased agricultural
23 production has resulted in the loss of genetic diversity. The area of land under rice cultivation rose by only
24 25 per cent between 1960 and 1970 although production rose by 77 per cent due to the replacement of
25 traditional varieties by higher yielding, semi-dwarf varieties. It is estimated that by 2005 India will produce
26 75 per cent of its rice from just 10 varieties, compared with the 30,000 varieties traditionally cultivated. In
27 Indonesia, 1,500 varieties of rice have disappeared during the period 1975–90 (see also Chapter 2).

28
29 The Indo-West Pacific is the key area for shallow water marine biodiversity. Coastal habitat loss and
30 degradation, combined with increased sediment, nutrient and pollutant discharge into coastal areas, is a
31 major cause of concern particularly for the insular countries of the region. The rates of loss of coral reef
32 and mangrove habitats in this region are amongst the highest in the world. Thailand alone has lost about
33 0.2 million hectares of mangrove forest during the period 1961–93 (Government of Thailand, 1994).
34 Conversion of mangrove forest to shrimp mariculture and the use of unsustainable fishing practices, such
35 as blast fishing, are widespread. However, the impacts of such unsustainable practices on regional
36 biodiversity are difficult to quantify.

1 Although terrestrial biodiversity loss has been identified as a major concern, actual losses still have to be
2 quantified. It has been estimated that as much as 70 per cent of the major vegetation types in the Indo-
3 Malayan realm have been lost, with a possible associated loss of up to 15 per cent of terrestrial species.
4 Dry and moist forests have suffered 73 per cent and 69 per cent losses respectively, while wetlands,
5 marsh and mangroves have been reduced in extent by 55 per cent. Overall habitat losses have been
6 most acute in the countries of the Indian sub-continent (ESCAP, 1995b), the People's Republic of China
7 (ESCAP, 1995b), Vietnam and Thailand.

8
9 The underlying causes of biological diversity loss in the region include international trade, particularly the
10 trade in timber (which results in habitat losses); population growth (leading to accelerated rates of land-
11 use change); poverty (in conjunction with demand leading to unsustainable consumptive use of "common
12 access resources"); introduction of non-native species (leading to destruction of predator-prey
13 equilibrium); and improper use of agrochemicals (leading to loss of aquatic species). Other major reasons
14 for biodiversity loss include loss of keystone species, extensive deforestation and habitat loss, increased
15 trafficking in animals and animal body parts, widespread conversion of land for agriculture and the
16 construction of large-scale dams.

17
18 In response to this issue, national Governments are participating in the implementation of conventions
19 related to biodiversity and are taking measures to protect biologically-rich areas. Twenty nine Asia-Pacific
20 countries had ratified the Convention on Biological Diversity by the 1 May 1996. Several regional
21 conventions covering parts of the Asia-Pacific region deal with specific aspects of biological diversity; the
22 most significant are the Convention on Conservation of Nature in the South Pacific (Apia Convention), the
23 ASEAN Agreement on the Conservation of Nature and Natural Resources (ASEAN Agreement), and the
24 Convention on the protection of the Natural Resources and the Environment of the South Pacific (SPREP
25 Convention).

26
27 Progress in designating protected area is generally positive. It is clear that almost all countries in the
28 region understand the importance of establishing terrestrial and aquatic areas as natural reserves in the
29 form of national parks, wildlife sanctuaries, gene pool reserves, etc. There has been a dramatic increase
30 in number and total area of protected areas in both South and South-Eastern Asia. The Pacific region has
31 also shown a major increase in the number of protected areas although increases in this sub-region have
32 been less dramatic.

33
34 In summary, biological diversity has finally been accepted as a legitimate issue at national and
35 international levels in the Asia-Pacific region with a considerable response (e.g. conventions on biological
36 diversity and designation of protected areas) at both levels. However, patterns of unsustainable use and
37 conflicting policies contribute to continued losses of diversity throughout the region. With only 10–30 per

cent of natural habitats remaining in many countries of the region, any further decrease could have serious consequences for biodiversity (ESCAP, 1995a). High rates of population and economic growth in most countries of the region suggest even greater losses will occur in coming years, unless decisive action is taken. Such action could include intensifying in situ conservation such as protected area systems and ex situ conservation such as zoological parks, botanical gardens, gene resource centres, seed banks and the use of tissue culture techniques.

1.3.4 Bioenergy

Bioenergy—that is, biofuels of biological and renewable origin, like bioethanol, biodiesel, and biomass for energy—is the subject of increasing attention around the world (Hazell, and Pachauri, 2006). In ESAP region increasing concern that development gains could be at risk due to rising fuel prices and instability in supply of energy resources has led to heightened interest in bio-energy. Much of the increase in demand for energy in developing countries will come from Asia, including China and India, whose fast economic growth and enormous populations put them on track to become large energy consumers (Joachim von Braun and Pachauri, 2006). Though many Asian countries in the region historically have been using certain bio-fuels such as agriculture crop waste, fuel wood, charcoals, currently there is increased focus on in ethanol, biodiesel, and biogas. In Southeast Asia palm oil is being primarily grown to produce bio-fuel that could be used for diesel engines and bio mass is used in methane digester to produce bio-gas. In India, Nepal and the Philippines crops such as *Jatropha* and sugar cane for bio-fuel is being undertaken.

The rationale for promoting cleaner and more efficient bio-fuels is that it could contribute to combating climatic change by reducing carbon emissions. Yet there are debates if the bio-fuel approach would be entirely environment friendly and ensure livelihood security to poor farmers when large scale production of basic crops like sugar cane and maize are grown as raw material for bio-fuel production. Land needed for producing crops may come from clearing large forest areas or by consolidating agriculture land for producing bio-fuel crops and there could be related environment issues (McNeely, 2006). The issues related to agriculture sector and farmers by adopting bio-fuel production or production shifts in crops and leasing land for bio-fuel crops are under debate, though there is increasing interest and investment in this bio-energy sector. “As countries move to strengthen their energy security by increasing their use of bio fuels, they should also work to ensure poor people's and small farmers' participation in the creation of a more sustainable global energy system. With sound technology and trade policies, win-win solutions—that is, positive outcomes for the poor as well as for energy efficiency—are possible with bio fuels in developing countries” (Joachim von Braun and Pachauri, 2006). Hence, an emerging challenge to AKST for sustainable development in EASP countries' is that agriculture and environmental policies and

technologies is to address the opportunities and costs for farmers and rural-poor while addressing national energy security needs while investing in bio-energy sector.

1.3.5 Natural hazards

The natural disasters are grouped in 3 specific categories (ISDR, 2005) as Hydro-meteorological disasters: including floods and wave surges, storms, droughts and related disasters (extreme temperatures and forest/scrub fires), and landslides and avalanches; Geophysical disasters: divided into earthquakes and tsunamis and volcanic eruptions; Biological disasters: covering epidemics and insect infestations. In common parlance these would be seen as cyclones, droughts, earthquakes, fires, floods, land slides and volcanoes. ESAP region is prone to suffer frequent incidence of natural disaster and record considerable human and economic loss. The most recent and dramatic natural disaster that caught the world's attention and empathy was the 2004 Tsunami. Since 2000, the region has suffered major events of earth quakes, floods, tsunami and pestilence. Since, 2004 the Highly Pathogenic Avian Influenza (HPAI) epidemic, commonly known as Avian Influenza presents high risk to small farmers in EASP region who practice mixed farming system combining crops and livestock.

An overview of the reported natural disasters with economic damage and estimated economic damage for the period of 1974 to 2003 as relevant to ESAP region is presented in Table.1.5.. Additionally among the top 50 countries ranked by the magnitude of economic loss due to natural disasters 14 countries from ESAP region are included with Japan and China placed at 2nd and 3rd rank and India and Indonesia being placed 6th and 8th rank (EM-DAT : The OFDA/CRED).

[Insert Table 1.5: Incidence of Natural Disasters and Reported Economic Damage: 1974-2003 in ESAP Region]

From the 2003 report, "Both hydro-meteorological and geophysical disasters have become more common, becoming respectively 68 per cent and 62 per cent more frequent over the decade. This reflects longer-term trends. However, weather-related disasters still outnumber geophysical disasters by nine to one over the past decade. Among natural disasters, floods are the most reported events in Africa, Asia and Europe, while windstorms are most frequent in the Americas and Oceania" (IFC, 2004). Frequent occurrence of these disasters make agriculture and land based production in ESAP region a high risk venture. Livelihood vulnerability of the community dependent on agriculture and natural resources with limited diversification is increased. Natural capital (water, land, forests, minerals) is essential for survival. Landslides across southern Philippines in December 2003 killed 200 people and left thousands homeless, reigniting the disaster prevention debate. From 1971 to 2000, 'natural' disasters killed 34,000 Filipinos. From 1990 to 2000, 35 million people were severely affected by natural disasters (World Disaster Report -2004: International Federation of Red Cross and Red Crescent Societies) . A

windstorm that has serious implications for considerable impact agriculture due to land and crop loss, affected 100 million people in China in 2002 (Guha-Sapir, Hargitt and Hoyois, 2004). For many countries in South and East Asia floods have become annual events alternating with drought and for the Pacific region cyclones present constant threats to livelihood. In Thailand 2004 Tsunami had a devastating impact on the livelihoods of villagers in over 400 local fishing and farming communities along the Andaman coast. Many of the communities' livelihood assets were lost (FAO, 2006). The situation of lost livelihood and basic productive assets was similar in other countries affected by Tsunami such as India, Indonesia, Sri Lanka, and Maldives. Since 2004 Indonesia is affected by multiple disasters- Tsunami, Avian influenza, volcanic eruption, haze and floods –that taxes the capacity of government in managing disaster and tests the people resilience capacity.

Environmental degradation can increase the impact of floods and landslides; while equally, disasters such as wildfires, droughts and floods can cause serious damage to forests, farmland and livestock. Small-scale measures to increase environmental resilience include social forestry, fish-farming, drought-resistant crops and rainwater harvesting. In India, local knowledge of indigenous, hardy seeds has helped farmers recover from the loss of cash crops devastated by drought and pests (World Disaster Report - 2004: International Federation of Red Cross and Red Crescent Societies). Hence the disaster events present challenges to achieve poverty reduction and sustainability goals. In the region increasingly emphasis is being placed on early warning system for disaster, information access to local disaster prone communities, community based approaches in disaster management and risk reduction and in exploring strategies to improving of existing agriculture extension systems and local government capacities to support such community based approaches.

1.4 Demographic Characteristics

The demographic scenario in the ESAP region describes the people of the region who are both producers and consumers of AKST. Given the complexity of demographic phenomenon only selected population indicators that have immense and immediate implications for AKST are explored. These are male and female population; ageing of population; urban and rural population trend; agriculture labour disaggregated by male and female workers; child labour in agriculture; unpaid work in farm sector; literacy and educational status among men and women; the migration realities and contributions of migrants to capital formation.

1.4.1 Regional demographic trends

People are the wealth of East and South Asia and the Pacific region. The region encompasses three of the world's most populous countries and developing countries that have a relatively large youthful population. Six countries in the region are among the top ten countries ranked by population size, and 14 countries are among the top 50 most populated countries (U.S. Census Bureau, 2006). In the period of

2000-2005, three countries in the ESAP region were among the six countries in the world that accounted for half of the world's estimated 77 million annual population gain. These countries and their rate of increase are India (21 percent), China (12 percent), and Bangladesh (about 4 percent). India is expected to overtake China as the most populous country in the world by 2035 (UN Economic and Social Council, 2004).

The population of the Pacific Islands reached an estimated 8.6 million in 2004, representing an increase of approximately 1.7 million people over the past 10 years. The population distribution has remained largely unchanged: the five largest countries and territories (those comprising Melanesia) account for vast majority (86.4 percent) of the regional population, followed by much smaller island countries and territories of Polynesia (7.4 percent) and Micronesia (6.2 percent). Two out of every three Pacific Islanders live in Papua New Guinea. Fiji's current population is 25 percent larger than 10 Polynesian island countries and territories combined. The fertility rate in the Pacific Islands is still moderately high while mortality is declining thus contributing to increased population (Haberhorn, 2004).

In the East and South Asia and Pacific Region people are the fundamental resource for sustainable development, hence investment in people would bear development dividends. Human resource centred strategies present opportunity for sustainable development but also present enormous challenges to ensure equitable access to education, productive assets, consumption goods and services to the billions of people. The critical development dilemma would focus on transforming a large reserve of human resources to human capital as a dynamic driver of development. Within this regional population scenario human development concerns would be the core challenge for achieving development with social sustainability.

In the Asian region fertility has declined remarkably. The average number of children born to Asian women declined by more than half from 5.4 in 1970 to 2.4 in 2003. Average life expectancy of Asian men and women increased about 15 years over the same period. Life expectancy for males at birth increased from 52 years in 1970 to 66 years in 2003. For females in the same period, life expectancy at birth increased from 54 to 70 years (Hugo, 2005). In Asia, women's life expectancy increased across the region, overtaking men's life expectancy in nearly every country. In some Asian countries, however, girls are more likely than boys to die during early childhood, and in some unusual preponderance of male births points to sex selectiveness (Westley, 2002). Women are making some gains as reflected in the improved sex ratio trend (defined as the number of males per 100 females) in most of the region's countries between 1950 and 2005. Sex ratio also indicates gender equity in broad terms by reflecting women's chances of survival. The population sex ratio situation is improving either with decrease in female-male difference or with female gains over males. A few exceptions are Brunei, Darussalam, India, Samoa and Tonga (Population Division of Economic and Social Affairs of the United Nations, 2005). The

1 region records positive trends in declining fertility and improving population sex ratio, though with mixed
2 impacts such as the increase in aged population and female headed households.

3
4 The elderly population is growing rapidly, both in absolute numbers and in its percentage relative to the
5 younger population, the trend known as population ageing. In developed countries of the ESAP region the
6 ageing population in relative terms is greater than in the lesser developed countries. Asia is one of the
7 world's fastest ageing regions; the percent of elderly is projected to double between 2000 and 2030 but
8 with differences among the countries (Kaneda, 2006). Developed economies in the region such as Japan,
9 Australia and New Zealand record a rapid rate of ageing; by 2050, 25 percent of their population will be
10 over 60. During the period of 1950 to 2005, all but a few countries in the region (Bangladesh, Maldives,
11 Nepal and PNG recorded increased population over 60 years of age (Population Division of Economic
12 and Social Affairs of the United Nations, 2004). In general, the trend of population ageing challenges
13 productivity and innovation adoption in the agriculture sector as well as saving and investment potential
14 and increased poverty among the elderly in rural areas.

15
16 Fertility decrease and ageing population in mostly developed countries in the region contrasts with a still
17 growing youthful population in developing countries. The outlook for the future in the Asian region is for
18 the youth population to increase to 685 million in 2040 when they would be 14 percent of the total
19 population. Moreover, while the young adult population will continue to grow over the next two decades in
20 developing countries, their numbers will decrease in most OECD nations in the region (Hugo, 2005). Yet
21 while a relatively large youth population presents the unique situation of labour pool advantage to the
22 developing countries, the lack of appropriate skills may present barriers to utilise human resources
23 effectively.

24 25 **1.4.2 Accelerated urbanization with a significant rural population**

26 Since 1950 countries such as Australia, China, Fiji, Indonesia, Japan, Korea DPR, Republic of Korea and
27 the Philippines have recorded negative population gain in rural area. The trend of relatively less gain in
28 rural population applies to most developed countries in the region. In most developing countries,
29 however, the urban population is less than 50 percent of the total population. Countries that depend on
30 agriculture as the economic driver register less than 30 percent urban population, such as in Bangladesh,
31 Bhutan, Cambodia, India, Lao PDR, Nepal, PNG, Sri Lanka, Samoa, Solomon Islands, Vanuatu and Viet
32 Nam. The projection for China is that the urban population will be 60 percent by 2030 (Population Division
33 of the Department of Economic and Social Affairs of the United Nations, 2003).

34
35 While the decrease in rural population will be minimal in Asia, the Pacific actually will gain rural population
36 between 2010 and 2030 (Population Division of the Department of Economic and Social Affairs of the
37 United Nations, 2004). The Asia Development Bank estimates 2.2 billion rural Asians by the year 2020,

and that this rural population will have much lower access to health and education and a lower level of general well being (ADB, 2000). Hence by 2030, this region still will have a substantial rural population demanding attention to agriculture, rural livelihood strategies and investment in rural physical and social service infrastructure.

Asia is expected to experience rapid rates of urbanization during 2005-2030; by 2030, 55 percent of Asian inhabitants are projected to live in urban areas. It is argued that in the Asia-Pacific region although economic growth and prices are closely monitored drivers of food demand, demographic changes — urbanization, growth in populations, and changes in the age structure of populations — likely will have more profound long-term implications for the region's food system. The region's food system will be impacted by migration, by the aging population and by the urban population's increased demand for a more varied diet with a premium on convenience (Coyle, Gilmour, and Armburster, 2004)

1.4.3 Agriculture labour: feminization, child labour and unpaid work

The overall share of agricultural employment decreased between 1995 and 2005 from 44.4 to 40.1 percent. This decline is seen in all regions except for East Asia where the share in agriculture remained stable over the period. As a regional trend, with a few exceptions, for the period between 1979 to 2002 agricultural labour as a percentage of the total labour force decreased over the decades (**Figure 1.7**). The decline is remarkable for the wealth creators in the region such as Japan and Republic of Korea, Australia and New Zealand. For poorer wealth producers, however, such as Bangladesh, Bhutan, Cambodia, India, Lao PDR, Nepal, PNG, and Solomon Islands, agriculture employs a large proportion of people and the rate of decrease was less than in wealthier countries. Countries such as Thailand and China still illustrate the dominance of the agriculture sector in employment, though these have proved to be high growth countries. In general for the poorer countries in the region, agriculture continues to be an important sector for employment and livelihood.

[Insert Figure 1.7: Agriculture Labour in ESAP Region from 1981-2003]

The World Employment Report for 2004-2005, based on various studies, contends that rural non-farm activities are important for income generation of households; this also applies to poor households engaged in agriculture (ILO, 2004). In Asia, various estimates suggest that one third of total rural labour force participation is in non-farm activity. When agriculture stagnates, employment in the non-farm sector offers a way out; these workers are pushed into non-farm sector, not pulled by dynamic non-farm activities (Islam, 1997).

The rate of the region's female participation in agriculture stands at 33.1 percent for South Asia and 47.2 percent for East Asia and the Pacific (ILO, 2006). Participation of women in agriculture for the period,

1 1995 to 2002, shows that female labour continues to be key in the region's agriculture labour force. If
2 women's contribution as family workers also were considered, then it can be concluded that women play
3 a critical role in the region's agriculture (UNDP, 2005). In recent decades the debate on agricultural labour
4 in the region focused on "feminization of agriculture" which refers to the predominance of women in the
5 agriculture sector. Across Asia and the Pacific even within the constraints of data deficiency, it is clear
6 that with the exception of only a few countries women in the region are a significant the component of the
7 labour force, making a substantial contribution to the agriculture sector. For those countries for which the
8 most current data are available, evidence supports the greater participation of women than men in
9 agriculture. Indeed, there is a consistent trend that women's participation in the agriculture sector is
10 substantial and increasing (UNDP, 2004).

11
12 Asia is not merely the world's densely populated region (excluding Japan) in absolute terms, but it also
13 has the most child labour, approximately 61 percent of the world's total. About one in five children in Asia
14 work (21 percent) (ILO, 1998). The Asia-Pacific region has the largest number of child workers in the 5 to
15 14 age group, some 127 million. Not all these children are classified as child labourers, though they are
16 below the minimum working age. In the 5-14 age group there is almost no difference between the number
17 of boys and girls in child labour; in the 15-17 age group, more boys than girls are in hazardous labour, 57
18 percent compared to 47 percent. Within the Asia-Pacific region, child labour in agriculture is common
19 among boys and girls and most child labourers live in rural areas (ILO, 2005). Families in poverty
20 consider child labour an asset to improve the current access to income and food, but the human capital
21 potential of another generation as a productive asset with literacy and education is lost.

22
23 Unpaid work of women and men represents a very large contribution to economic activity but has yet to
24 be reflected appropriately in the System of National Accounts (SNA). The unpaid work within the SNA
25 boundary includes work done in a family enterprise or agricultural holding on an unpaid basis (ESCAP
26 and UNDP, 2003). Estimates of women in the labour force are not comparable internationally because in
27 many countries large numbers of women assist on farms or in other family enterprises without pay, and
28 countries differ in the criteria used to determine the extent to which such workers are counted as part of
29 the labour force (World Bank, n. d.). In South Asia, female employment rates recorded by official sources
30 usually are low because of arbitrary definitions. If definitions were revised and all activities for which
31 women are traditionally responsible incorporated, a huge difference in activity rate would be noted
32 (Mahbub ul Hag Development Centre, 2003). Until and unless the unpaid component of work by men,
33 women and children is measured effectively as labour contribution to agriculture and rural economic
34 production, the labour contribution of rural households will not be fully accounted. Hence, the current
35 labour structure in ESAP agriculture is both incomplete and inaccurate in capturing the human resource
36 endowment as relevant to AKST.

1.4.4 Education: gender and rural disparities

South and West Asia is one of the three regions encompassing countries with literacy a rate of about 60 percent. Although the East Asia and Pacific region has the highest literacy rate among developing regions (91 percent), its large population means it is home for 17 percent of the world's illiterate adults. A considerable difference among the regions in literacy gains is evident in UNESCO categories of the world regions that include ESAP countries. In all regions in both adults and youth, female literacy rates are lower than that of males. More remarkable is the poor literacy gain in the South and West Asia region that includes two of the most populous countries in the ESAP region, India and Bangladesh (UNESCO, 2006). In South and West Asia on average 93 percent of boys and 86 percent of girls of the relevant age are enrolled in primary education.

This region accounts for 38 percent of the world's out-of school children and among which 56 percent are girls. In East Asia and the Pacific on average, 94 percent of boys and 94 percent of girls of the relevant age are enrolled in primary education; this area accounts for 9 percent of the world's out-of-school children, 49 percent of these are girls (UNESCO Institute for Statistics, 2004). Of the small island Pacific countries, Papua New Guinea heads in the gender gap.

In part, the high drop out rate in rural schools and among girl children could explain the differences. Available data on the rural-urban differentials in adult literacy demonstrates rural-urban disparity in literacy achievement along with a gender dimension where more women are illiterate compared to men; there also is a higher school dropout rate among girls in rural areas. As the importance of agriculture employment decreases changes in the stock of human capital will impact on the non-agricultural sources of growth. From the society's perspective, education provides a more adaptable and productive workforce that is able to move with the times and adjust to technological change (Siamwalla, 2001).

In general the region has demonstrated gains in education and literacy but with intra-regional differences; it also has shown improved gender parity in education though the gender gaps persist. The uneven gender-specific educational achievement and the rural disparities present risks for transformation of the large youth population into productive human capital – a workforce that could improve competitiveness of the ESAP countries in fulfilling the demand for trained labour in the context of globalization.

1.4.5. Migration: labour movement and capital gains

The distinct features of migration in the EASP region are intra-regional, international and intra-country migration that impact labour flows and capital gains through remittances in migrant sending countries. The highly populated countries with agriculture dependent economies seem also to be those that send most migrants in Asia; women represent a large proportion of migrant labour.

1
2 Asia provides half of the world's international migrants and most of the international labour migrants; in
3 recent times, it is the primary source of migrants to most of the world's immigrant-receiving countries. The
4 international migration in Asia in recent years has reached an unprecedented scale, diversity and
5 significance, but inadequate data hampers regional understanding of the extent and impact of
6 international migration. A facet to the international migration within the region is migrants from poorer
7 countries who go to better developed countries seeking employment in agriculture and construction while
8 highly skilled labours seek employment in economically advanced countries across the globe. The largest
9 international migration influencing contemporary Asian countries is the non-permanent labour movements
10 that involve mainly unskilled and semi skilled workers employed in low-paid, low status, so-called 3 D
11 (dirty, dangerous and difficult) jobs that are eschewed by local workers in fast growing labour short
12 nations of Asia and Middle East (Hugo, 2005). In East Asian countries such as China, Indonesia and the
13 Philippines and South Asian countries such as Bangladesh, India and Sri Lanka, migrants with a
14 destination of the US have tertiary education (Adams, 2003). The economic significance of female
15 migration is so high for some Asian governments that female labour export targets are included in their
16 development programs. Sri Lanka is exceptional in that its expatriate labour force has more women than
17 men (IOM, 2005).

18
19 Levels and patterns of internal migration vary among countries of Asia, partly as a consequence of
20 variations in economic and cultural structures (Guest 2003). Rural to urban migration still dominates
21 migration flows in most Asian countries because of the high proportion of population living in rural areas.
22 Furthermore, women increasingly are involved in the movements, and temporary migration continues to
23 be an important component of migration flows. Economic motivations for migration dominate decision-
24 making. Current rural-urban labour migration in China is one of the most obvious as well as influential
25 social factors which profoundly changes the current system and the society as a whole (APMRM, n. d.). In
26 China, South-East Asia and India temporary migration is increasing. Studies in India indicate that rural
27 households migrate, and migrants improve their economic returns in spite of the risks and family
28 disruptions. Women from rural areas also migrate with adult males or groups of women (Deshingkar and
29 Grimm, 2005).

30
31 Internal and international migration in the Pacific Island countries is way to improve economic and
32 professional opportunities at all levels. "The currently widely perceived disparities in economic
33 development and welfare between the Pacific states, especially the smallest countries and territories of
34 Polynesia and Micronesia, and the fringing metropolitan countries, have contributed to substantial
35 migration but also increasing pressures for further international migration. Migration remains, in different
36 forms, a time honoured strategy from a poor area to richer one in the search for social and economic
37 mobility at home and abroad" (Connell, n. d.).

Yet, the other side of the migration process equation is that migrants are key contributors to wealth creation in their home countries. Remittances from the migrants are an economic benefit and play an important role in reducing the incidences and severity poverty in origin countries. These funds from migrants directly increase recipients' income and improve household consumption. Such remittances reduce the household economic shocks at adverse times such as crop failure and natural disaster (World Bank, 2006). Over the last decade China, India and the Philippines received highest remittances flow into the countries. In small economies though the volume is relatively small compared to large countries, but remittances contribute significantly to foreign exchange funds in the receiving countries (World Bank, 2006). In Pacific small island countries remittances are important to augment household resources and national economies. Migrant remittances that come to rural households could form an important capital for investment in small scale agriculture or off-farm enterprises. Human capital flight has turned into financial capital benefit for these migrant-sending countries in the region.

1.5 Human Well Being

Agriculture plays a prominent role in human well-being which can include components such as human health, nutrition, poverty and rural livelihood. These components are also related to the development goals. As with other country specific data, the region shows a great deal of variation for indicators that can be used to measure these components. The commonly used indicators for human health include life expectancy, infant mortality and access to safe water and sanitation.

Life expectancy for babies born in 2000-2005 is 67 years for Asia as a whole (c.f. 65 for the world) and 75 for Pacific. These figures also reflect developed and developing country life expectancy of 75 years and 65 years. In many countries (Bangladesh, Bhutan, India), life expectancy has increased by a decade or more with the extreme being in Bhutan where the life expectancy for babies born in 1980-85 is 48 years vs 63 for the 2000-2005 (See also section 1.4 Demographic characteristics).

While the region records remarkable gain in economic growth and trade linkages, poverty is still a common occurrence and poverty perpetuates cluster of insecurities related to well- being such as health, food and nutrition. In many ESAP countries though the economic growth has lead to substantial reduction in poverty there had also been increase in income inequality. In Asia and Pacific region, between 1990 and 2001, the number of people living in less than \$ 1 day dropped by nearly a quarter of a billion. In developing countries of the region the proportion of the population living below the \$ 1-per-day poverty line is 22 percent, but for the Least Developed Countries it is 38 percent (UNDP, 2006). In ESAP region the least developed countries are Afghanistan, Bangladesh, Bhutan, Cambodia, Kiribati, Lao People's Democratic Republic, Maldives, Myanmar, Nepal, Samoa, Solomon Islands, Timor-Leste, Tuvalu and Vanuatu.

1
2 In Asia and Pacific region, it becomes necessary to distinguish between poverty and extreme poverty
3 including deprivation since the region still records incidence of extreme deprivation. In 2002, at \$ 1 day
4 measure of extreme poverty estimates reveal that almost 690 million Asian were poor and using a more
5 “generous” poverty threshold of \$ 2 day, 1.9 billion Asian were poor and South Asia is the home to a
6 majority of Asia’s poor. Across the region, the number of poor in rural areas is far higher than the number
7 of poor in urban areas (ADB, 2004). Gender differentiated poverty incidence and poverty among children
8 are frequently observed and often cited. Asia and Pacific region has nearly two-thirds of the world's poor
9 and two-thirds of the region's poor are women. Poverty is particularly acute for women living in rural
10 areas (ADB, 2004).

11
12 As related to food and nutrition security measured as undernourished by FAO, Asia and Pacific region
13 accounts for 64 percent of world’s undernourished population and it is 16 percent of the region’s total
14 population. Since 1995-97 Asia and the Pacific have seen an overall reduction in both the number and
15 prevalence of undernourished people. But recently the number of undernourished has reverted to an
16 increasing trend. For the period 2001-03, India has the largest number of undernourished, followed by
17 China (212 million and 150 million respectively) and other Asia and Pacific countries together record 162
18 million undernourished (FAO,2006). Girl children and women in poor households are included under the
19 hunger vulnerable group in the region. Poor maternal nutrition and health can be considered the hub of
20 the vicious cycle that passes hunger from one generation to another with reduced capacity among
21 children with low- birth weights to be productive adults (FAO. 2005). Nutritional deficiency among women
22 and children in South Asia is seen as a major crisis in the making.

23
24 On an average, two out of every three malnourished children in the world live in South and Southeast
25 Asian countries (FAO, not dated). Malnutrition and under weight prevalence in children under 5 in
26 developing countries of ESAP is about 31% compared to 28% for all developing countries. Bangladesh,
27 India and Nepal have nearly 50% children under 5 who are underweight. The estimated mortality of
28 under age 5 – per 1000 live births in 2002 – is less than 10 for some countries (e.g., Singapore, Japan,
29 Australia, New Zealand and Malaysia) and around 100 for others (e.g. India, Myanmar). Changes in
30 nutrition, poverty and rural livelihood and the impact of AKST on these in the recent past are covered in
31 Chapter 2 (section 2.4). The chapter shows the improvement in many of these indicators for many ESAP
32 countries and especially the role of green revolution and the associated AKST on them. It is clear that the
33 gains in nutrition have not been equitable in the same country nor the region as a whole with many of the
34 poor and the landless not benefiting as much as the rest of the population. In addition, in some cases,
35 the use of chemicals and irrigation that are often associated with the green revolution have had a
36 negative impact on human health, e.g., through vector and water borne diseases and pollution of water
37 supplies as well as direct exposure to pesticide chemicals among farmers.

The underlying causes of these indicators can be improved sanitation, access to potable water as well as nutrition. About three quarters of people living in urban areas and a third of the people in rural areas of Asia and about same for some of the developing island nations in Pacific. Most countries in Asia have improved drinking water sources, but about 1 billion people still do not have access to safe drinking water (WRI 2005, WHO 2004).

In recent times ESAP region has faced threats to human well-being due to economic turmoil and epidemics as well as ethnic and political conflicts. The notable threats are East Asian economic crisis of late 1990's, Severe Acute Respiratory Syndrome (SARS) in early 2000, increasing HIV AIDS incidences and currently Highly Pathogenic Avian Influenza (HPAI). ESAP countries also have demonstrated resilience through effective coping or recovery from these crises to achieve well-being targets but the impacts remain.

East Asian economic crisis threatened sustainable growth that undermined the economic, health, food security and educational opportunities among the population in the affected countries. In 1997-1998 many millions of people fell below the poverty line and created concerns over labour rights. Women workers in low-paid formal and informal labour markets were most severely affected (Heller, 1999; Jones, 1998; and ESCAP, n.d.). In 2003 major threat came from the out break of Severe Acute Respiratory Syndrome (SARS) that had an impact on regional economy and it was contained within year that illustrates the resiliency of the affected ESAP countries. Currently in progress are two significant threats to human well-being with both health risks and economic consequences including threats to livelihood in rural sector- namely HIV AIDS pandemic and Highly Pathogenic Avian Influenza (HPAI) epidemic.

In 2006 an estimated 8.6 million people live with HIV in Asia, including 960000 people who became newly infected in 2005. In Oceania, an estimated 7100 people acquired HIV in 2006, bringing to 81000 the number of people living with the virus. Three quarters of those persons are in Papua New Guinea (UNAIDS and WHO, 2006). Women currently comprise 13 percent of HIV-positive adults in East Asia and the Pacific and South and South-East Asia. In Cambodia, India, Japan, Papua New Guinea, Sri Lanka and Thailand, infection rates among women aged 15 to 24 are higher than among their male counterparts.

From a human well-being perspective, impact of HIV AIDS on economic output is likely to be hardest at the sub-national level, namely among households and such economic impact is predicted to be severe in a region where millions live under one US \$ 1 a day. Two major causes for financial and material burden are a drastic increase in health-care expenditures coupled with severe reduction in incomes of both patients and care givers. In a rampant epidemic local economic loss can accumulate and act as drag on economic growth at the sub-national and national level. One of the more significant effects is on the

labour supply (ESCAP, 2003). The labour loss in agriculture sector due to HIV/AIDS and increased economic burden in rural households' raise issues associated with rural economic viability and capacity for innovation adoption.

Yet another current threat to human-well being is the Highly Pathogenic Avian Influenza (HPAI) epidemic, commonly known as AI with potential to become an human health crisis with adverse economic impacts not just for the region but globally with Asia as the epicenter. The emergency officially began in December 2003, when a highly contagious type of avian influenza struck chickens on a farm near Seoul, Republic of Korea, and spread rapidly across the country. Within weeks, simultaneous outbreaks of infection in Cambodia, China, Indonesia, Japan, Lao PDR, Thailand and Viet Nam had devastated domestic fowl. It is predicated that the impact has been distributed within the entire poultry market chain, affecting producers, consumers and employees in the retail industry and in some areas, farmers have lost more than 50 per cent of their poultry (FAO, 2005). In this context AKST as related to animal health would have implications for health security, food security and economic security of both rural and urban populations in the region.

1.6 Trade Contexts

1.6.1 The role of agriculture in ESAP region

Trends of the agricultural share in the national economy are not homogeneous across the ESAP region. The South Asia region exhibits a higher importance of agriculture. This indicates that agriculture is still an important component of trade in South Asia. Though slowly declining in the past 10 years, compared to the developed region like Europe, the shares of agriculture in GDP and labour force dependent on agriculture are still very high in East Asia and Pacific and South Asia (**Table 1.6**). Trade reform in their export partners, particularly, the OECD countries, will affect a significant share of population in these countries. The East Asia and the Pacific (EAP) is a net agricultural exporter in most of the time in the past two decades with a significant number of net agricultural exporters. The region's trade position after the WTO was created, however, has been fluctuating. The region became a net importer in 1996 followed by rapid growth in net exports in 1998. South Asia is a net agricultural importer region, in which India is the only country with trade surplus (net agricultural exporter), and also a dominant country in the regions' exports.

[Insert Table 1.6: Share of Agriculture labor in East Asia and Pacific and South Asia]

1.6.1.1 East Asia and the Pacific (EAP)

The agricultural share in GDP and in total trade have been declining over the last decades in many countries of the ESAP region, but agriculture remains a significant source of employment, income, and economic activity (World Bank, 2006, FAOSTAT, access in 2006). Most low- and middle-income countries

1 of the region, about 22 to 81 percent (from Mongolia to Timor-Leste) of the labor force is dependent on
2 agriculture (see **Table 1.6**). The share of agriculture in total GDP ranges from 14 to 57 percent (from
3 Kiribati to Myanmar), agriculture and agriculture-based products represent a large share of exports.
4 Products exported included natural rubber, palm oil, rice, fruits, and vegetables (mainly to the United
5 States, Europe, and Japan). Imports are primarily cereals and dairy products (mainly from the United
6 States and Europe). Many of the countries in this sub-region trade a large share of their GDP, mostly in
7 primary products or processed primary products. Tariffs and market access are important issues to East
8 Asian exporters, but in the region, agricultural protection remains considerably higher than industrial
9 protection.

10
11 The economy of the East Asia and Pacific region is growing rapidly, and poverty is falling. The GDP of
12 this region grew at 8.5 percent in 2004. The number of East Asians living on less than \$2 a day declined
13 by about 250 million between 1999 and 2004. Countries in the region are on track to meet the Millennium
14 Development Goal for poverty reduction, although there is wide variation in the pace of progress across
15 and within countries. China exerts strong economic influence through trade and cross-border production
16 networks. Its growth has helped strengthen economic integration within East Asia and has increased the
17 region's integration into the global economy. Many countries are considering how to maximize the
18 opportunity China presents while managing the challenges. High prices for natural resources, especially
19 oil, likely will slow growth in the years ahead. Several other risks also threaten to reduce the rate of
20 growth.

21 22 1.6.1.2 South Asia

23 The majority of the population in South Asia depend on agriculture and agriculture related activities for
24 their livelihood. Despite more than five decades of policy commitment to industrialization, agriculture still
25 plays an important role for most of the countries in the region. **Table 1.6** indicates that all countries in
26 South Asia belong to the low- and middle-income countries; about 20 to 93 percent (from Maldives to
27 Nepal) of the labor force is dependent on agriculture. The share of agriculture in total GDP ranges from
28 18 to 40 percent (from Sri Lanka to Nepal).

29
30 The share of agricultural products in total exports has declined significantly over the past two decades in
31 this region. However, in terms of net foreign exchange earnings, agriculture is much more important than
32 it appears when looking only at gross export earnings. The decline in agriculture's share in total exports in
33 these countries cannot be explained solely by the rapid growth of exports of manufactured products.
34 There is considerable evidence that they have lost market shares in a number of agricultural product lines
35 in which they have comparative advantage, due to the significant anti-export bias embodied in the
36 incentive structures of these countries. South Asian agricultural exports account for a significant share of

world trade in only five products: spices, rice, tea, oilseeds, and jute. In all other major internationally traded agricultural goods, South Asia accounts for less than 4 percent of market share.

1.6.2 Trade flows

1.6.2.1 Major trade players

In terms of the trade value (both for the import and export), Japan, China, Australia, Thailand and South Korea are the top five countries in the ESAP region, followed by Malaysia, Indonesia, India, New Zealand and Singapore (**Table 1.7**). Actually, Japan and China are also the leading traders in the world, with 71 and 66 billion US\$ in 2004.

[Insert Table 1.7: Imports and Exports in ESAP region]

As for the export side, China, Australia, ranking in the fifth and sixth exporter places in the world, are the biggest exporting countries in ESAP region, followed by Thailand, Malaysia, Indonesia, New Zealand and India.

Japan is the biggest importer in the region, also the second biggest importer in the world, just behind the United States of America. On the one hand, China is one of the biggest exporters, and it is also one of the biggest importers in the region and even in the world (ranked at the fourth place). Other big agricultural importers in the region are South Korea, India and Malaysia (Table 1.7).

If the ASEAN countries are regarded as a group, the large trading players in the region are China, Japan, ASEAN, Australia, New Zealand, South Korea and India. Regarding the Pacific countries, even though copra and cocoa beans have important place in the region or in the world, generally, they occupy only a marginal place in terms of the total trade value.

1.6.2.2 Main trading commodities

Because the production is influenced by the weather, market and other factors, the import and export of agricultural products of a given country change during the year and sometime between years. Based on 2003 FAO country profile and World Bank data, among ESAP countries, Australia had the biggest trade surplus, with US\$11,117 million, followed by Thailand (US\$6,828 million), New Zealand (US\$6,429 million) and Malaysia (US\$5,247 million). By contrast, Japan was the biggest importer in the region, with US\$35,295 million trade deficit for agricultural products, followed by China (US\$11,424 million of net import) and South Korea (US\$7,761 million of net import).

In terms of the products traded, Australia and New Zealand export mainly livestock products (especially mutton and lamb, beef, milk products) and wool, Indonesia and Malaysia export palm oil and rubber,

1 Thailand, Vietnam, Cambodia and India export a large amount of rice and fisheries products. The main
2 exporters of rice in the world come from ESAP region, especially from Association of Southeast Asian
3 Nations (ASEAN) countries. China exports mainly vegetables and fruits, and maize. India, Sri Lanka and
4 China are the major exporters of teas in the world. The Pacific countries are the exporters of copra, cocoa
5 beans and to a less extent raw sugar.

6
7 Japan, China and South Korea are three biggest importers (Table 1.8); Japan and South Korea import
8 the majority of agricultural products, mainly cereals and meat products. Japan has a low self-sufficiency of
9 food, with about 40% of food is imported. China and India import mainly land-intensive products such as
10 soybeans, wheat, cotton and edible oils. As Singapore almost has no agriculture, it relies almost entirely
11 on food import.

12
13 **[Insert Table 1.8: Importers in East Asia and Pacific]**

14
15 **1.6.2.3 Trading partners**

16 Apart from internal trade among countries in the region, USA, Brazil, Europe are the main providers of
17 agricultural products to ESAP region. On the export side, USA, Europe, Russia are the main destinations
18 of the agricultural export of ESAP countries (Table 1.9). However trade between countries themselves is
19 very important. For example, 66% of China's exports go to Asia (out of which Japan and Korea alone
20 account for more than 40% of China's total export). ASEAN is also an important trade bloc and there are
21 very strong trade relations between member countries.

22
23 **[Insert Table 1.9: Trading Partners]**

24
25 Australia and New Zealand have close trade relationship with Pacific countries, they are not only the
26 major exporters to these countries, but also main importers from these countries. Australia has long been
27 the major source of imports for many of the Pacific island economies, and its importance has increased
28 significantly except in Tonga and Vanuatu. In contrast, for agricultural products as a whole, New Zealand
29 has had a relatively small import share except in Fiji, Samoa and Tonga, and that share also declined in
30 recent years.

31
32 Asian economies are more important as suppliers of imports than as markets for exports for Pacific island
33 countries with the exception of Papua New Guinea, Solomon Islands and Vanuatu. They have a
34 significant import share in many Pacific island countries and saw this share increase quite sharply in Fiji
35 and Papua New Guinea. However, their share in the imports of Samoa and Tonga was eroded
36 considerably and the United States has become much more important in sourcing imports into these
37 countries.

1.6.3 *Trade agreements/Trade Blocs*

ESAP region in the context of globalization demonstrates dynamism as illustrated by the proliferation in trade agreements. The trade agreements could be broadly grouped under three categories namely regional, bilateral and interregional based on the countries included in the agreements. Among the three groups it would also be valuable to differentiate between FTAs already in force and many that are under consideration (Table 1.10). Following this overview selected important regional trade agreements in ESAP region are further explained.

[Insert Table 1.10: Trade Agreements in ESAP Region]

Currently, the multinational trading system is facing serious difficulties and challenges, the WTO negotiation makes very limited progress, and in 2006, the Doha Round negotiation was even suspended. Nevertheless, the bilateral trade agreements and regional trade agreements grew very fast, they become the important driving forces for the world's economic development. Without exception, the bilateral and regional trade agreements were also developed in ESAP region, many trade blocs are formed in the past years.

“Regional trade agreement” (RTA) is a general term that refers to a whole spectrum of levels of economic integration (see also Chapter 3). The lowest level of integration is represented by trade preferences, or partial scope agreements, which liberalize trade in specific commodities or sectors (Evans et al., 2005a). Regional integration has differed enormously across the world in ways that affect trade patterns. East Asia has followed a regional strategy based on most-favoured nation (MFN) liberalization, but without any formal cooperation agreements. The Asia-Pacific Economic Cooperation (APEC) agreement embodies the principles of a non-discriminatory non-preferential approach to trade liberalization. The APEC group is also playing a role in establishing an environment for free trade in the region, especially for agricultural trade. In addition, ‘behind the border issues’ are now central to the new trade agenda and highly relevant to East Asian countries.

This informal approach has been labelled “regionalization” rather than “regionalism” because it is a market-driven integration. East Asia’s increasing trade and investment linkages are due in part to unilateral reforms and the fragmentation and relocation of production processes that has arisen since the mid-1980s. East Asia’s regional liberalization strategy led to lower average tariff rates than most of the other regions. Even without the support of formal regional trading agreements, countries in EAP achieved lowered barriers to intra-regional trade, and a “virtuous circle” or synergistic interaction between open development strategies, increased trade both within the region and with world markets, diversification of production and trade, increased foreign direct investment and growth (Evans et al., 2005b).

South Asia adopted highly protectionist regimes upon its independence in the late 1940s, limiting trade, unilateral liberalization and domestic reforms that were gradually introduced led to high growth rates for exports in the 1990-2000 period and an increasing share of exports in GDP, but from a very low base, South Asian exports as a share of the world trade have remained low throughout the 1980-2000 period. South Asia has maintained high levels of average applied tariffs. Recently, political considerations, as well as concern about the expansion of trading arrangements in other regions, have led to an increase in the number of trade agreements in the region, the latest of which is the South Asia Free Trade Area (SAFTA) Agreement (January 2004). However, these trade agreements have had a minimal impact on regional trade, given continuing high levels of protection, a lack of meaningful concessions, domestic political problems, and hostility between India and Pakistan (Evans et al., 2005b).

1.6.3.1 ASEAN

The Association of Southeast Asian Nations (ASEAN) was established on 8 August 1967 in Bangkok, with its Secretariat based in Jakarta, Indonesia. Currently, the members of ASEAN are Brunei Darussalam, Cambodia, Indonesia, Laos, Malaysia, Myanmar, the Philippines, Singapore, Thailand and Viet Nam. The ASEAN region has a population of about 500 million, a total area of 4,5 million km², a combined gross domestic product of US\$737 billion, and a total trade of US\$ 720 billion.

Trade has always been part of ASEAN's economic development. ASEAN is one of the most open trading blocs in the world today. For example, the ratio of exports to GDP is 157% for Singapore, 96% for Malaysia, 68% for Brunei Darussalam and 56% for Thailand. The European Union (EU), the United States (US), Japan, China (including Hong Kong) and Republic of Korea (ROK) are ASEAN's largest exports markets. These five countries are also ASEAN's biggest source of imports. The share of ASEAN's total trade with these five countries is as follows: 14.08% (US); 13.72% (Japan); 11.50% (EU); 7.00% (China); and 4.06% (Korea). From 2001, ASEAN exports grew by 3.59% and 12.40% for 2002 and 2003, respectively.

Most of the Southeast Asian region is now a free trade area. Accounting for over 96 percent of all ASEAN trade, the first six signatories¹ of the Common Effective Preferential Tariff (CEPT) scheme for the ASEAN Free Trade Area have reduced their tariffs on intra-regional trade to no more than five percent for almost all products in the Inclusion List or removed them altogether.

The ASEAN Free Trade Area (AFTA) was established in January 1992 to eliminate tariff barriers among the Southeast Asian countries with a view to integrating the ASEAN economies into a single production base and creating a regional market of 500 million people. The Agreement on the Common Effective

¹ The first signatories to the CEPT scheme are Brunei Darussalam, Indonesia, Malaysia, the Philippines, Singapore and Thailand.

1 Preferential Tariff (CEPT) Scheme for the ASEAN Free Trade Area requires that tariff rates levied on a
2 wide range of products traded within the region be reduced to no more than five percent. Quantitative
3 restrictions and other non-tariff barriers are to be eliminated. The elimination of tariffs and non-tariff
4 barriers among the ASEAN members has served as a catalyst for greater efficiency in production and
5 long-term competitiveness. Moreover, the reduction of barriers to intraregional trade gives ASEAN
6 consumers a wider choice of better quality consumer products.

7
8 The free trade area covers all manufactured and agricultural products. However, 734 tariff lines in the
9 General Exception List (representing about 1.1 percent of all tariff lines in ASEAN), are permanently
10 excluded from the free trade area for reasons of national security, protection of human, animal or plant life
11 and health, and of artistic, historic and archaeological value. By the beginning of 2002, only 3.8 percent of
12 products in the CEPT Inclusion List of the first six signatories, or 1683 items out of 44060, would have
13 tariffs above five percent. The current average tariff on goods traded under the AFTA scheme is about 3.8
14 percent. In the light of their later accession to the CEPT Agreement, Vietnam is expected to realize AFTA
15 in 2006, Laos and Myanmar in 2008, and Cambodia in 2010.

16
17 After the establishment of the AFTA, ASEAN Member Countries have made significant progress in the
18 lowering of intra-regional tariffs through the Common Effective Preferential Tariff (CEPT) Scheme for
19 AFTA. More than 99 percent of the products in the CEPT Inclusion List (IL) of ASEAN-6 have been
20 brought down to the 0-5 percent tariff range in 2005. The ASEAN leaders have agreed to eliminate all
21 import duties by 2010 for the six original members of ASEAN and by 2015 for the new members. ASEAN
22 committed to strengthening trade flows between ASEAN regions through multilateral and bilateral means.

23
24 ASEAN has adopted a dispute settlement mechanism (largely patterned after the WTO dispute
25 settlement understanding) covering all economic agreements. This establishes a mechanism for resolving
26 any problem arising from the implementation of any economic agreement in ASEAN. The provision on
27 emergency measures under the CEPT Agreement has been strengthened to make it consistent with the
28 WTO Agreement on Safeguard Measures. A Protocol on Notification Procedures has been established
29 which requires advance warning of actions or measures that can have an adverse effect on concessions
30 granted under an existing ASEAN agreement.

31 32 1.6.3.2 SAFTA

33 The South Asia Free Trade Agreement (SAFTA) was agreed to among the seven South Asia countries
34 that form the South Asian Association for Regional Cooperation (SAARC): Bangladesh, Bhutan, India,
35 Maldives, Nepal, Pakistan and Sri Lanka.

SAFTA came into effect on 1 January 2006, with the aim of reducing tariffs for intraregional trade among the seven SAARC members. Pakistan and India are to complete implementation by 2012, Sri Lanka by 2013 and Bangladesh, Bhutan, Maldives and Nepal by 2015.

SAFTA replaces the earlier South Asia Preferential Trade Agreement (SAPTA) and may eventually lead to a full-fledged South Asia Economic Union.(http://www.bilaterals.org/rubrique.php3?id_rubrique=85).

1.6.3.3 APEC

Asia-Pacific Economic Cooperation (APEC), established in 1989, is the premier forum for facilitating economic growth, cooperation, trade and investment in the Asia-Pacific region.

APEC has 21 members, which account for approximately 40% of the world's population, approximately 56% of world GDP and about 48% of world trade. APEC's 21 Member Economies are Australia; Brunei Darussalam; Canada; Chile; People's Republic of China; Hong Kong, China; Indonesia; Japan; Republic of Korea; Malaysia; Mexico; New Zealand; Papua New Guinea; Peru; The Republic of the Philippines; The Russian Federation; Singapore; Chinese Taipei; Thailand; United States of America; Viet Nam. Out of which, 13 members are from ESAP region.

APEC is the only inter-governmental grouping in the world operating on the basis of non-binding commitments, open dialogue and equal respect for the views of all participants. Unlike the WTO or other multilateral trade bodies, APEC has no treaty obligations required of its participants. Decisions made within APEC are reached by consensus and commitments are undertaken on a voluntary basis.

The purpose and goals of APEC are to enhance economic growth and prosperity for the region and to strengthen the Asia-Pacific community. Since its inception, APEC has worked to reduce tariffs and other trade barriers across the Asia-Pacific region, creating efficient domestic economies and dramatically increasing exports. Key to achieving APEC's vision are what are referred to as the 'Bogor Goals' of free and open trade and investment in the Asia-Pacific by 2010 for industrialized economies and 2020 for developing economies. These goals were adopted by Leaders at their 1994 meeting in Bogor, Indonesia (http://www.apecsec.org.sg/content/apec/about_apec.html).

1.6.3.4 BIMSTEC

On 6 June 1997, a sub-regional grouping was formed in Bangkok and given the name BIST-EC (Bangladesh, India, Sri Lanka, Thailand Economic Cooperation). Myanmar joined the organization as a full member at a Special Ministerial Meeting held in Bangkok on 22 December 1997, upon which the name of the grouping was changed to BIMST-EC. Full membership has been granted to Nepal and

1 Bhutan in 2003. During the First Summit in Bangkok on 31 July 2004, the grouping's name was changed
2 to the 'Bay of Bengal Initiative for Multi-Sectoral Technical and Economic Cooperation', or BIMSTEC.

3
4 BIMSTEC provides a unique link between South Asia and Southeast Asia bringing together 1.3 billion
5 people - 21 percent of the world population, a combined GDP of US\$750 billion, and a considerable
6 amount of complementarities. A study shows the potential of US\$ 43 to 59 billion trade creation under
7 BIMSTEC FTA.

8
9 BIMSTEC covers 13 Priority Sectors lead by member countries in a voluntary manner; namely, Trade &
10 Investment, Technology, Energy, Transport & Communication, Tourism, Fisheries, Agriculture, Cultural
11 Cooperation, Environment and Disaster Management, Public Health, People-to-People Contact, Poverty
12 Alleviation and Counter-Terrorism and Transnational Crimes. Source: <http://www.bimstec.org/>

13 14 1.6.3.5 **ASEAN - China FTA**

15 In 2001, ASEAN and China endorsed the establishment of an ASEAN-China Free Trade Area within 10
16 years "with special and differential treatment and flexibility to the newer ASEAN members". In addition,
17 China agreed to grant special preferential tariff treatment for some goods from Cambodia, Laos and
18 Myanmar.

19
20 On May 14, 2002, China and ASEAN agreed to conclude an outline accord on the establishment of an
21 ASEAN-China free trade area by the end of 2002. The framework accord serves as the legal blueprint for
22 the agreement, and set down guidelines and principles for establishing a free trade area.

23
24 In 2003, China signed the ASEAN Treaty of Amity and Cooperation (TAC) and is signaling its firm
25 commitment to complete the China-ASEAN Free Trade Agreement (FTA) on schedule by 2010. China
26 has agreed to grant ASEAN a three-year "early harvest" tariff program. Under this program, China will
27 grant concessionary tariffs to ASEAN for over a thousand agricultural and industrial goods (about 600
28 agricultural products) from January 2004. By the end of 2006, the tariffs of agricultural products under
29 "early harvest" program will be reduced to zero. The FTA in goods will be established by 2010 for the six
30 original ASEAN members, including Singapore, and five years later for the four newer members.

31
32 The Early Harvest Program (EHP) has both a negative list (for chapters 1-8 of the HS) and a positive list
33 for other products from other chapters. The aim is an accelerated tariff reduction for these products to
34 zero percent starting January 2004 and no later than January 2006. Chapters 1-8 is approximately 10
35 percent of tariff lines in the HS classification. The products belong to categories in live animals, meat and
36 edible meat offal, fish, dairy produces, other animal products, live trees, vegetables fruits and nuts. In
37 addition, a small list of additional products from other chapters is included in the early harvest.

Because of the strong reciprocity condition of market access, the willingness to allow Chinese unprocessed agriculture products to ASEAN markets also reflects ASEAN interest to make inroads in the large Chinese market. In contrast, the Philippines, by liberalizing mainly products that are not significantly produced domestically also signals its relative lack of interest in penetrating the Chinese agricultural market (Pasadilla, 2006).

1.7 Research, Extension and Investment

1.7.1 Research and development

The experiences of the early 1960s clearly established the utility of agricultural research as a powerful instrument for increasing output from scarce land resources (Asopa and Berge 1997). Investments in AKST have expanded rapidly during the last four decades. During this period, major technical and institutional reforms occurred, which shaped the pattern of technology development and dissemination. This stimulated reorganization of agricultural research and education, and the evolution of the National Agricultural Research System (NARS). The NARS in developing countries have grown rapidly over the last 25 years as a result of increasing investment.

In the early 1970s, the Consultative Group on International Agricultural Research (CGIAR, 2006) was established while the National Agricultural Research Systems (NARS) were greatly strengthened.

During the 1980s and 1990s, partnerships among CGIAR centers and NARS were established. At the same time, some NGOs also contributed through their development innovations. Many of the current best practices in agricultural development have been piloted by NGOs.

In the early 90's, the Asia-Pacific Association of Agricultural Research Institutions (APAARI) was organized to further the development of National Agricultural Research Systems in the Asia-Pacific through facilitation of intra-regional, inter-institutional and international cooperation.

1.7.1.1 Green Revolution

The historical focus of research by CGIAR and NARS centres on food crop production technologies, with its emphasis on improved yielding varieties, has undeniably been successful. The case in point is the Green Revolution. Nearly three-quarters (71 percent) of production growth since 1961 have been due to yield increases. Increased yields have contributed to greater food security within developing regions and have contributed to declining real prices for food grains. Along with the release of higher productivity varieties was a range of technologies for fertility management ('bag' fertiliser recommendations), mechanisation (land preparation, seeding, harvesting and storage) and pest management (weeds,

diseases, pests, rodents etc.). The development of early maturing varieties particularly in rice has enabled double and triple cropping in areas that previously produced only one or two crops per year.

Overall, research has been focused principally upon intensifying crop and livestock production, usually by means of purchased inputs. There has been far less research on integrated technologies for diversifying the livelihoods of small farmers in developing countries and increasing the sustainability of land use. Little is understood, for instance, about the role of organic matter in soils, the development of reduced tillage systems, the use of on-farm organic resources in combination with inorganic fertilizers and the role of legumes in biological nitrogen fixation. Similarly, there has been limited research in Integrated Pest Management (IPM) and in weed and pest control. These are topics of little interest to the private sector, but also ones which are in danger of neglect by public research institutions.

1.7.1.2 Biotechnology

Growing investments in biotechnology are likely to increase agricultural research productivity and have the potential to revolutionize production practices through the generation of customized crop varieties. Whilst there has been a gradual decrease in national and international public funding available for agricultural research and extension systems, private sector biotechnology research has attracted ample support, although not generally for tropical food crops. Most of this research is likely to focus on profit-generating inputs, export crops and agro-processing.

1.7.1.3 Local, traditional and institutional knowledge

Traditional knowledge is now widely recognized as having played and as still playing crucial roles in economic, social and cultural life and development, not only in traditional societies but also in modern societies. Even today, the majority of the world's population depend on traditional knowledge and practices for food and medicines. A 80 percent of the world's people rely on indigenous knowledge for their medical needs and half to two-thirds of the world's people depend on foods provided through indigenous knowledge of plants, animals, insects, microbes and farming systems (RAFI 1997 p.4).

This recognition has heightened in recent years as a result of the increased awareness of the environmental crisis; the role of some modern technologies, production methods and products in contributing to this crisis; and a growing appreciation that local communities (especially in developing countries) have a wide range of traditional knowledge, practices and technologies that are environmentally sound or “friendly” and that have been making use of the manifold and diverse biological and genetic resources for food, medicines and other uses. The knowledge of local communities, farmers and indigenous peoples on how to use the many forms and types of biological resources and for many functions, as well as on how to conserve these resources, is now recognized as being a precious resource that is critical to the future development or even survival of humankind. At the same time, this

precious knowledge is maintained and thrives in the context of the traditional ways of social and economic life and customary practices of the traditional communities. Their rights to their knowledge, to the use of their knowledge and to the products arising from such use must be recognized. The misappropriation of their resources, their knowledge or the products of their knowledge would not only violate their rights, but also adversely affect the conservation and use of the knowledge and of biodiversity (as the IPRs obtained by corporations and other institutions may erode the communities' rights to continue using their resources or to continue with their traditional practices as discussed in earlier subsection).

1.7.2 Extension services systems.

Extension is clearly facing challenging times in Asia. Public extension has and will continue to play an important role in most Asian countries. Without public funds for extension, substantial public interests are compromised especially those concerned with ecological sustainability and poverty reduction. However, there is growing recognition that a narrowly defined model of public provision of technology transfer services has outlived its usefulness as an effective agricultural development strategy. At the same time, alternative and complimentary service providers from the private and non-government sectors are emerging. Four models extension service arrangements are presented here (Sulaiman and Hall, 2005)

1.7.2.1 Centralized approach.

Under this scheme, extension continues to be planned, funded and implemented by Departments or units attached to the Ministry of Agriculture and almost all of them are organized in a top down fashion, mainly supply driven, implementing the programs conceived by the state with little participation from farmers and other agencies and with little accountability to the clients.

This is the case in India, China and a number of other Asian countries where extension policy is developed centrally in a fairly prescriptive fashion. Although approaches have evolved over the long term in India, it is not clear how implementation experience and learning informs policy development. In fact development fads and encouragement from international agencies seem to be a major source of implementation. The approaches have now shifted to pluralism in extension financing and service delivery. While these new objectives might be laudable at a general level, ways of making them work on the ground is much harder to define. Furthermore these major shifts tend to lock up the extension in a particular mode of operation until yet another new idea comes along. For countries suffering from this policy trend, approaches that encourage learning and incremental institutional change are long overdue.

The case of China illustrates a quite different approach to policy and practice in extension. In China, the National Agricultural Extension Center under the Ministry of Agriculture continues to formulate extension

1 policy at the national level. The Center draws up extension strategies that link agricultural development
2 programs, connecting institutions with other national agencies and training and supervising provincial
3 agents. However, since the market oriented economic system was established the subjects of rural
4 extension have been expanded and diversified according to local resource and market development.
5 Arrangements have been restructured to help farmers relate to new market opportunities more effectively.
6 Arrangements have even been developed to provide incentives to extension workers through profit
7 sharing with farmers. The extension policy on the other hand has been fairly haphazard and weak in
8 prescribing what should be done. But it does seem to have been sufficiently reactive to provide the
9 facilitating support to assist and presumably legitimize the types of pragmatic extension innovations that
10 have been taking place at the local level. There seems to be much merit in an extension policy process in
11 which it is extension agents, farmers and others in the rural areas who drive the development of new
12 ways of approaching the topic. This seems to be particularly important in situations where the economic
13 and social context is changing rapidly and in unpredictable ways.

16 1.7.2.2 Decentralized approach.

17 Extension services are becoming decentralized in some Asian countries like Indonesia, the Philippines
18 and South Korea. This was part of a wider initiative to decentralize governance. Although it has improved
19 farmer control and made extension services more demand driven, lack of sufficient preparation on the
20 part of extension management and the huge institutional inertia of large extension bureaucracies have
21 considerably weakened extension.

23 The case of Indonesia and the Philippines highlights the gap between the broad policy prescription for an
24 approach such as decentralization and the reality of how these approaches can break down in
25 implementation. While the policy was originally (and laudably) conceived as a way of devolving authority
26 and decision making to local stakeholders and strengthening linkages in local knowledge networks,
27 neither this vision nor the skills to implement it were shared by those at the local level. This seems to
28 suggest that policy instruments such as decentralization need to be accompanied by capacity
29 development. In this case local stakeholders need to understand the importance and rationale for
30 strengthening local network. And since the performance of extension is dependent on these systems,
31 stakeholders need to have the skills to analyze these systems, diagnose system failure and design
32 remedial measures. These types of capacity development are not only necessary to successfully
33 implement these decentralized approaches, but they are also necessary if local stakeholders are to play a
34 more interactive role in the policy process.

36 In the case of the Philippines, inadequate funding of devolved extension has occurred where the
37 extension system is now managed largely at the local level. Although judgments vary on the effectiveness

1 of the Philippines' reform, the experience so far suggests that there has been a trade-off between the
2 effectiveness of technology transfer, which seems to have suffered, and the accountability of the system
3 to its clients, which seems to have improved. Indonesia and the Philippines must both grapple with the
4 overlap in central and local services that has arisen in the absence of a clear division of responsibilities.
5 Despite these difficulties, the widespread popular support for decentralization leads to the prospect that
6 these teething problems may eventually be overcome.

8 1.7.2.3. NGO-led approach.

9 Poor farmers often say that an important characteristic of poverty is lack of voice. In many developing
10 countries, NGOs have traditionally played an important role in articulating the needs of poor farmers and
11 other vulnerable groups. Since there is a continuum between research and extension and also between
12 work in the biophysical sciences and that in the social sciences, it is not surprising to see NGOs
13 becoming quite active in these areas. The range of their activities is enormous: agroforestry in Nepal, tea
14 production and vaccine research on cattle diseases in India, soil and water conservation techniques in the
15 Philippines, to name just a few gleaned from the case studies cited in Farrington and Lewis (1993) as
16 cited by Siamwalla (2001). The range of NGO inputs in the research to- extension continuum is also quite
17 wide, as is the range of their organizational frameworks.

18
19 In most countries, NGO activities are completely separate from those of the Government. Often the
20 relationship between NGOs and the governments has been more adversarial than cooperative. Where
21 the two actors have cooperated closely, as in Bangladesh, India, and the Philippines, the results have
22 been extremely fruitful. In India and the Philippines, the Government has taken the initiative to establish
23 close ties with NGOs. The Indian Council for Agricultural Research has set up farm science centers
24 (known by their Hindi initials as KVKs) to serve as centers for demonstration and training in "scientific
25 farming" (Farrington and Lewis 1993 as cited by Sulaiman and Hall, 2005). While the structure is no
26 different from a conventional extension system, the aim is to use this structure to open up NGOs' access
27 to the public research system. Similarly, the Philippine Department of Agriculture has set up an NGO
28 Outreach Desk.

29
30 Whilst NGOs and farmers' organisations have a well-established track record in a wide variety of
31 development fields, their core role in relation to poverty reduction should focus on building social capital
32 (e.g. farmers' groups, farmers' networks, small enterprise associations), catalysing entrepreneurship and
33 disseminating public information. Greater social capital, including strengthened farmers' groups and
34 community organisations, will underpin many aspects of agricultural development in the future. Some civil
35 society organisations can also contribute further through their development innovations.

1.7.2.4 Private Sector-led approach.

Siamwalla (2001) cited that the provision of extension services can be completely privatized, as has been done in Chile. In such a situation, the extension agent becomes a professional or a consultant, selling his or her services to farmers for a fee, much as a doctor does. No Asian country has gone this far and it is not expected that many will follow the Chilean example.

However, technology transfer by the private sector through the system of contract farming is popular in Thailand and the Philippines. The Thai case depicting the soybean trader sitting astride the commodity, input, and credit markets is an example of informal contract farming. More formal systems of contract farming exist: a wellknown example in the case of poultry farming was first pioneered in Thailand by the Charoen Pokphand company (CP), a firm that later became a large conglomerate, extending its reach to other Asian countries. Farmers traditionally raised poultry on a very small scale, most often as a sideline. CP brought in a hybrid breed from the Arbor Acres Company in the US. They also set up large automated feedmills, which remain the core of their operations. The arrangements between the farmers and CP range from a guaranteed wage contract to a guaranteed price contract.

1.7.2.5 Information and communication technology

According to Prakash (2002), data on the growth of the ICT industry for Asia-Pacific sub-regions show the IT sector on an upward trend for all the countries and all the sub-regions surveyed, although its own growth has been highly uneven (Table I.11). The Newly Industrialized Economies (NIEs) have 287 PCs for every 1000 persons; almost 30 per cent of their combined population has access to PCs. The sub-regions of Southeast Asia and South Asia, and the People's Republic of China (PRC), lie far behind the more digitalized economies, attaining less than one-tenth of the PC penetration in the NIEs. The same holds for the measures of internet hosts and users. These numbers are alarming, especially for the Pacific sub-region, the PRC and South Asia, where not even one internet host per 10000 persons is available. In terms of internet users, not even one per cent of the population of the Pacific sub-region uses the internet and only a little above one per cent of South Asia's population does so. This indicates limited outreach and how a large proportion of the population cannot take advantage of ICT, making it hard for the digitally backward and developing economies to catch up.

[Insert Table 1.11: Selected IT indicators for the ESAP region]

Estimates for 113 countries over a 20-year period show a positive link between telecommunications infrastructure and income, as well as between telecommunications infrastructure and gross domestic product (GDP). The estimates suggest that a 1 percent increase in the telecommunications penetration rate might be expected to lead to a 0.03 percent increase in GDP. At the same time, models for different country groups reveal that telecommunications infrastructure has a nonlinear effect on economic output,

1 particularly for lower and higher middle-income countries. These results imply that telecommunications
2 networks need to reach a critical mass to have a discernible impact on economic output. In particular,
3 growth effects were found to be the strongest in areas with telecommunications penetration rates of 5-15
4 percent. Above and below this threshold, growth effects were limited. Given that the average
5 telecommunications penetration rate in low-income countries is very low, significant network investment
6 and expansion are needed before ICTs can begin to affect growth. Marginal improvements in
7 telecommunications infrastructure are unlikely to yield any discernible growth effects.

8
9 This point is crucial. The benefits of networking are critical to the concept of ICT-induced growth, and if
10 the minimum critical mass is not achieved, the network externalities required to benefit users will not
11 materialize. By their very nature, ICTs have the potential to quickly reduce the digital divide among
12 countries and regions. Across countries where levels of inequality differ, "leapfrogging"- fast track access
13 to new ICTs-sometimes occurs, but sometimes does not. ICTs and their associated benefits are not yet
14 reaching poor countries, and especially poor rural areas within countries. These different outcomes are
15 largely determined by public action and by institutional arrangements for regulation and effective
16 privatization. In addition, technologies and service provision are concentrated in developed countries,
17 raising concerns about whether appropriate technologies are being provided at affordable cost in
18 developing countries.

19
20 In addition, World Bank, indicated that the internet has a potential to be a stronger force of inequality than
21 either earlier communication technologies because it is expensive, requires a high level of education and
22 skill to operate, uses languages not widely spoken by the poor, and needs skilled personnel, electricity
23 and critical mass of users to make it sustainable (World Bank 2002).

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