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THIRTIETH FAO REGIONAL CONFERENCE FOR ASIA AND THE PACIFIC

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Agenda item 6

INCREASING CROP PRODUCTIVITY FOR SUSTAINABLE FOOD SECURITY IN THE REGION

Table of Contents

I. Introduction

1. The achievements of a number of countries in the Asia-Pacific region in promoting economic growth and reducing poverty and hunger in the last few decades are well-known and indeed remarkable. Despite this, the region is still home to the largest number of poor and hungry people in the world: 642 million out of the world's 1.02 billion malnourished people.

2. Although increased food production through improved crop productivity does not automatically translate into improved access to food, it can contribute to it by creating additional farm and non-farm employment, increased income and opportunities for capital formation, and lower domestic food prices.

3. A recent review of published literature on the subject found convincing evidence that higher agricultural productivity in developing countries, including the Asia-Pacific region, has led to lower food prices and higher wage income, thus improving food security for groups such as the urban poor and rural landless workers, who tend to be net buyers of food.[1] At the same time, despite the fall in food prices, it has led to higher incomes for net sellers of food such as medium to large farmers. One of the reports reviewed in this study pointed out that if other countries in the Asia-Pacific region had achieved the same rate of productivity growth as Thailand, by 2008 a third of the region's poor (218 million people) would have escaped poverty. Thailand had already achieved its Millennium Development Goal (MDG) 1 target on hunger by 1994 and that on poverty by 2001.[2]

4. Crop productivity growth in the region has been sluggish. There has not been any significant technological breakthrough in the crop sector since the Green Revolution. Moreover, existing research, including that involving biotechnologies, is generally focused on major crops, largely ignoring the so-called "minor crops" – coarse grains, roots and tubers – grown in less well-endowed and remote regions under rainfed conditions.

5. This paper examines the past trends and the present situation with respect to food security and patterns of crop productivity growth in the region. It then examines the major sources from which crop productivity growth can be expected and analyses two emerging issues that are important to the relationship between crop productivity and food security trends. The paper goes on to look at the major technical, economic, social and institutional constraints to achieving crop productivity growth and the policy options available for easing them. Finally it presents its key findings and recommendations.

II. Situation and trends

A. FOOD SECURITY

6. The attention of the world has shifted away from the Asia-Pacific region, perhaps because of its perceived success in tripling cereal production in 40 years, and achieving high economic growth rates. In terms of numbers and percentages, however, food insecurity remains primarily an Asia-Pacific problem, as this region contains more than half of the world's population and two-thirds of its undernourished people.

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[1] *What Role Can Increased Productivity Play in Reducing Hunger in the Asia Pacific Region?* Report submitted to UNDP by Yasmeen Khwaja, August 2009

[2] *Thailand Millennium Development Goals Report 2004*, Office of the National Economic and Social Development Board and UN Country Team in Thailand, Bangkok, 2004

7. Moreover, progress towards the World Food Summit (WFS) target of halving the number of undernourished people between 1990-92 and 2015 and the first MDG of halving the proportion of people who suffer from hunger, has been disappointing in most Asia-Pacific countries.

8. The number of undernourished people in the region was actually higher in 2009 (642 million) than in 1990-92 (586 million), although this was partly the result of the food price crisis that culminated in 2008 and the ongoing global financial and economic crisis.[3] However the proportion of people suffering from hunger did decrease slightly, from 20 percent in 1990 to 17 percent in 2009. Given present trends, it appears highly unlikely that the region will be able to meet its hunger reduction target of 293 million by 2015.

9. Both WFS and the MDG targets define undernutrition in terms of a minimum level of dietary energy consumption. However energy is only one aspect of nutrition, and it does not consider the need for dietary balance. Nor does it take into account the different dietary needs of different population segments – particularly children and pregnant and lactating women. Human diets are balanced if they contain the required mix of macronutrients (carbohydrates, protein and essential fatty acids (EFAs)) and micronutrients, especially vitamin A, iodine and iron, which are required in small or trace quantities. Diets of the poor are dominated by carbohydrates, and significant amounts of whatever protein and EFAs they consume are converted into dietary energy. This is a highly significant food utilization issue.

10. Micronutrient deficiencies are widespread in developing countries, particularly among the poor. The most common of the resulting disorders are iron deficiency anaemia (IDA), iodine deficiency disorders (IDD) and vitamin A deficiency (VAD). IDA affects more people than any other nutritional condition and is particularly common among women and adolescent girls. It has a serious impact on work capacity and the mental development of children, with implications for the productivity of entire societies. VAD and IDD can have similarly devastating effects, although they are not found on quite the same scale.

B. CROP PRODUCITIVITY

11. The table below presents statistics on production and yield of some key food crops produced in the region. It covers the major sources of the three macronutrients, particularly for the poor: carbohydrates from cereals, roots and tubers; protein from pulses and cereals; and EFAs, primarily from oil crops.

Production and yield trends for key crops and crop categories in Asia-Pacific

Crop/crop category		Year					Annual Growth Rate 1997-2007
		1997	2004	2005	2006	2007	
Rice (paddy)*	Production (mn. MT)	528.9	547.2	571.0	581.1	599.9	0.8 %
	Yield (MT/hectare)	3.85	4.07	4.14	4.17	4.28	0.8 %
Wheat*	Production (mn. MT)	277.2	242.1	252.7	251.2	262.1	0.2 %
	Yield (MT/hectare)	2.74	2.74	2.77	2.92	3.01	0.5 %
Maize*	Production (mn. MT)	141.7	180.3	192.0	205.1	212.0	3.3 %
	Yield (MT/hectare)	3.39	4.04	4.17	4.27	4.29	2.0 %
All	Production (mn. MT)	980.1	1017.8	1066.6	1081.0	1121.2	1.1 %

[3] This issue is the subject of another discussion paper in this conference: *Experiences and policy lessons from the Region in dealing with the global food and financial crises* (Agenda Item 5), so this topic will not be further discussed here.

cereals*	Yield (MT/hectare)	3.12	3.37	3.44	3.53	3.63	1.6 %
Roots & tubers**	Production (mn. MT)	256.9	289.6	283.3	253.3	265.6	-3.7 %
	Yield (MT/hectare)	14.80	16.85	16.39	15.92	16.15	-1.6 %
Pulses*	Production (mn. MT)	25.5	26.4	27.2	26.1	26.2	0.5 %
	Yield (MT/hectare)	0.70	0.73	0.75	0.72	0.72	0.1 %
Oil crops**	Production (mn. MT)	46.8	66.1	70.6	73.0	74.9	5.3 %
	Yield (MT/hectare)	n/a	n/a	n/a	n/a	n/a	n/a

* Computed from semi-logarithmic (exponential growth) regression for all years 1997-2007

** Computed from semi-logarithmic (exponential growth) regression for the years 2004-07

Source: Computed from FAOSTAT database

12. Four key points emerge from this table. First, yield growth has slowed considerably since the days of the Green Revolution: the rate of yield growth for all cereals in developing countries during 1970-90 was 3.9 percent; it is now 40 percent of that rate. Second, over the period covered cereal production has been growing more slowly than yields, reflecting declining harvested area (largely due to the alienation of land from agriculture and soil degradation stemming from past misuse). Third, despite the loss of land, the rate of growth of cereal production is now very close to that of population. However the rate of increase in rice and wheat production is still well below that of population. The overall cereals figure is boosted by relatively high production and yield growth in maize. This reflects both the wide availability of hybrid maize and the growth of urban and peri-urban poultry production, for which maize is a major part of the feed formulation. This in turn reflects a sharp growth in the number of (mainly urban) middle-income families, whose diets are shifting towards more consumption of animal produce, putting increasing pressure on cereal production. The fourth point concerns the poor performance of pulses. A meal of cereals and pulses (such as the ubiquitous *dal-bhat* of South Asia) is much more protein-efficient than a meal containing only one of them, because cereal protein is low in essential amino acids in which pulses are rich, and vice versa. The low rate of growth pulse production is reflected in many studies in the region, which show a trend of poor people substituting cereals for pulses. This mirrors changes in relative prices (which in turn reflects relative production performance), but the implication is that poor people's diets may be deteriorating in qualitative terms, even as they improve quantitatively.[4]

13. Most crops contain some micronutrients, but horticultural crops are generally the richest non-animal source. However it is difficult to obtain accurate statistics of horticultural production, particularly since there are so many different crops, often produced on a very small scale. FAO estimates that during 1997-2007 fruit production increased in developing and transitional countries of the region by 4.7 percent, while vegetable production increased by 3.2 percent over the same period. While this represents faster growth than that of staples, it is mainly a reflection of the growing affluence of the urban non-poor.[5]

[4] Yield figures have not been calculated for oil crops, as the sources of vegetable oil vary so widely (from field crops to tree crops) that such figures would not be very meaningful.

[5] Food ingredients such as flour can be fortified with a range of vitamins and minerals; alternatively, micronutrients can be distributed in such forms as vitamin A capsules and iron tablets. However these are expensive, short-term solutions. It is widely agreed that nutrients should derive from food. Iodine is something of an exception here, because iodine-poor soils, and therefore iodine-poor foods, are common in mountainous regions and in areas where soil iodine is periodically washed away by heavy rainfall and floods, as in much of the tropics. IDD is most easily countered by salt iodization, which does not require expensive delivery mechanisms.

III. Sources of improved crop productivity

14. FAO's main focus for crops is on sustainable intensification of production through an ecosystem approach. This was laid out in detail during the 22nd Session of the FAO Committee on Agriculture in June 2010.[6] The present APRC meeting provides an opportunity to add a regional dimension to the ecosystem approach. The objective must be to increase productivity while protecting the natural resource base.

15. From a technical viewpoint crop productivity (or, more precisely, land productivity) will be improved by increasing yields, increasing cropping intensity and/or reducing waste (e.g. post-harvest losses). From an economic standpoint it will be improved by increasing the net profitability of what is produced. In addition to the value added via technical measures, the value of output can be increased by producing more profitable varieties of the same crop, or by switching to an annual crop mix that is more profitable. In the case of subsistence production, productivity would be increased if the nutritional value of annual crop production were to improve quantitatively and/or qualitatively.

16. Ecologically sustainable yield increases will require: (a) improving soil fertility (e.g. adopting more balanced and more appropriate fertilizer application techniques, improving soil structure, protecting against soil erosion, improving plants' access to nutrients and improving crop rotations); (b) increasing fertilizer use efficiency with an emphasis on integrated nutrient management; (c) using economic optimum seeding rates, adopting optimum timing for some or all field operations; and (d) adopting better disease- and pest-management practices. Development of new varieties that are high yielding and tolerant of key stress factors like drought, submergence and flooding, salinity, pest and diseases will play a critical role here. The intensity of these stress factors is expected to be amplified as extreme weather events become more common and their impact more devastating. Yield increases to be sustainable, must be achieved by avoiding soil-mining techniques of production that have plagued parts of the region in the past.

17. Cropping intensity can be sustainably increased by: (a) improving the efficiency of irrigation and drainage to extend the growing season, permit dry-season cropping and reduce risk (often also increasing yields); (b) introducing temperature control (e.g. surface mulches, simple greenhouses made of plastic sheeting on bamboo frames); (c) introducing short-season varieties and 'catch crops'; and (d) multiple cropping.

18. Waste can be reduced by: (a) improving soil health, (b) improving plant protection; (c) introducing mechanization so as to ease bottlenecks and improve quality and therefore value (e.g. threshing by machine is preferable to animal trampling for sanitary reasons); (d) improving storage; (e) improving crop-processing techniques; and (f) improving packaging and transportation to reduce physical damage to fragile marketed crops.

19. Crop diversification has advantages in both technical and economic terms. From a technical standpoint, compared with monoculture and constant repetition of the same annual crop rotation, it improves soil health, reduces pest loads and counters the spread of plant disease. From an economic point of view, crop diversification is a means of exploiting market opportunities, but in many developing countries of the region this will require serious efforts at market development (see below). In subsistence, or mixed cash-subsistence, systems crop diversification can play a valuable role in improving dietary balance, but to take full advantage of this would require a sustained awareness-building effort. The cost of this could be reduced if it were combined with existing awareness-building programmes in water and sanitation aimed at improving public health and therefore food utilization.

[6] *Sustainable Crop Production Intensification through an Ecosystem Approach and an Enabling Environment: Capturing Efficiency through Ecosystem Services and Management*; Paper COAG/2010/3

20. Given the preponderance of smallholder farms in the region, emphasis has to be placed on increasing productivity on these holdings. This is particularly urgent, in view of the increasing threats posed by biotic and abiotic stress, the vulnerability of small farmers to the effects of climate change, the theat of a possible repeat of the soaring food prices of 2007/08 and the need, which FAO has identified, to double food production over the next forty years.

IV. Emerging issues

21. Many issues have emerged in recent years that are important to the relationship between crop productivity and food security, but due to page restrictions, not all of them can be covered here. Two of the most important, climate change and the global food and financial crises, are excluded because they are the subjects of other papers presented at this conference. This paper will focus on two issues that seem more amenable to policy formulation.

A. BIOFUELS

22. Cultivation of bioenergy crops for conversion into ethanol and biodiesel has been widely promoted as a clean alternative to fossil fuels. Global production increased from 19 billion litres a year in 2000 to 52 billion in 2007. The question is whether increasing productivity in biofuels can help improve food security for the poor and hungry, as diversification into bioenergy crops seems to offer substantial opportunities for poor and marginal farmers to generate additional income through creation of new job opportunities and spin-off business enterprises.

23. However, matters are not so simple. The FAO publication *State of Food and Agriculture in Asia and the Pacific Region 2008 (A-P SOFA 2008),* presented at the 29th FAO Regional Conference for Asia and the Pacific, stated in its special section on biofuels that "an assessment of the impact of biofuels production on food security will need to consider in detail the inputs used in the biofuels production process, and how this use of inputs affects market supply curves for food production." It also pointed out that it was virtually certain that increasing biofuels production would result in higher food prices, benefiting farmers who had food to sell, but hurting net buyers of food, who make up the majority of the food-insecure in this region.

24. The *A-P SOFA 2008* concluded that the best option for now may be for governments to remain neutral towards biofuels, while maintaining the option of adopting "second-generation biofuels, when and if that technology becomes commercially viable". Member Governments are referred to that publication for further details.

B. WATER SCARCITY AND WATER QUALITY

25. All indications are that water resources are becoming scarcer, especially in this region. Water resources in South Asia will be strained due to climate change impacting the melting of Himalayan glaciers that feed key rivers and altering the monsoon that provides 70 percent of annual precipitation in a four-month period. Over extraction of groundwater for irrigation has depleted aquifers, leading to water shortages. If current predictions of rising sea levels are true, this will endanger long and densely populated coastlines and cause intrusion of saltwater in the aquifers deep into the agricultural plains and low-lying islands. In the Mekong river basin the dry season is predicted to increase by two months. Scarcity of water may become more of a constraint to grain production than scarcity of land. Irrigation accounts for 90 percent of developing-country water withdrawals, but in the future will have to face increased competition from withdrawals for non-agricultural uses. The challenge will be to produce more food from less water. This can be achieved only if appropriate strategies are in place for surface water storage, improved groundwater management, more precise and timely application of irrigation water, water saving in irrigated rice paddies and much more efficient use of soil-stored water by managing land cover and improving productivity of rainfed agriculture. A 10 percent increase in irrigation efficiency could increase irrigated area by 10-15 percent and boost production by 20-25 percent.

26. There are also concerns about arsenic contamination of groundwater, particularly in areas where groundwater is recharged by rivers whose sources are in young mountain chains like the Himalayas. There is evidence of contamination dangers to plants in these areas when they are grown under irrigated anaerobic conditions, as with tubewell-irrigated rice. However, clear evidence of an impact on human health at current levels of arsenic contamination has yet to emerge.

V. Challenges in achieving crop productivity growth

27. The productivity of agricultural resources (land, labour, water) in most developing countries of the region is low, and improved technology is needed to raise it. Perhaps paradoxically, this actually represents an important opportunity, because the greatest productivity gains can often be achieved where the baseline position is lowest. Increasing crop productivity is often thought of as comprising a set of technical problems that are amenable to technical solutions. This is certainly an important dimension, but there are also key economic, social and institutional aspects, which can be particularly important if the food security needs of the most disadvantaged groups are to be addressed. The five key strategic challenges are outlined below.

28. Changes in agricultural land use can significantly contribute to both climate change mitigation and climate change adaptation. Examples of mitigation include soil carbon sequestration and reduction of methane and nitrous oxide emissions, particularly from rice paddies. Examples of adaptation include adoption of cropping systems which have the ability to cope with extreme climatic conditions without catastrophic impact on yields.

A. DEVELOPING SUSTAINABLE TECHNOLOGIES

29. New varieties are required that have characteristics such as high yield, shorter duration and resistance to biotic and abiotic stress. Other than genetic modification, which is controversial, no breakthroughs have been made on this front since the Green Revolution. However biotechnology (which is more than just genetic modification) offers considerable scope for genetic improvement of crops. An emerging need is that of factoring climate change resilience into new cultivars. More environmentally friendly methods of pest and disease control must be found within an Integrated Pest Management approach. In view of increasing water and fuel scarcity, irrigation technology must become more efficient, more targeted and less soil-polluting. Given the rising cost and increasing scarcity of chemical fertilizer, plus the environmental problems historically caused by imbalanced use of chemical fertilizer, new approaches to integrated soil fertility management are needed that will increase land productivity while reversing soil degradation and eliminating water pollution by runoff. More appropriate agricultural machinery is often needed to ease labour bottlenecks while avoiding labour displacement.

B. IMPROVING TECHNOLOGY TRANSFER MECHANISMS

30. In many countries in Asia-Pacific mechanisms for technology transfer are slow and inefficient, so that there are many technologies ‘on the shelf’ which have never reached the farmer. If this is allowed to continue, there is little point in investing in new research and development. There are three major hurdles to be crossed. One is the fact that in many developing countries in the region procedures for releasing new varieties are unduly lengthy and bureaucratic, sometimes taking as long as 20 years. The second is that seed multiplication for non-hybrid varieties is economically unattractive to larger actors in the private sector, while public-sector seed production agencies are plagued by inefficiencies and debt. Non-hybrid varieties are attractive to the farmers, since they can use retained seed, but initial seed supply and periodic seed replacement remain major constraints. Third, it is often argued that the public agriculture extension system in most developing countries is seriously understaffed, underequipped and

underfunded. This is true, but perhaps a more fundamental problem lies in the fact that their organizational capital, is often poorly designed to deliver on their mandate (see E below).

C. DEVELOPING MARKET CHAINS

31. Rural-urban marketing linkages in much of the region are underdeveloped. This creates high transaction costs and generates local monopolies, which together: (a) depress farm-gate prices for produce; (b) increase the prices farmers must pay for inputs, equipment and services; and (c) increase food prices for food-insecure urban consumers. Improving marketing infrastructure, enhancing enforcement of quality standards and facilitating a competitive market for inputs, equipment, services and produce can achieve huge reductions in transaction costs and create a competitive environment, thereby providing incentives for farmers to produce a surplus, increasing traded volumes and lowering food prices for the urban poor. An issue to be confronted here is the growing power of supermarkets in the region, which often buy directly from farmers. How can small farmers best tap into this market?

D. TARGETING THE EXCLUDED

32. A major shortcoming of the traditional technology transfer model in much of the region is the fact that the extension system concentrates on the better-off (or 'progressive') farmers and bypasses the others – especially women farmers, small and marginal farmers, ethnic and other minorities, and those in marginal areas. This perpetuates the situation where the lowest productivity is found on the farms of people who are excluded from the development mainstream, despite the fact that they are among the most food-insecure. These farmers represent a huge potential reservoir for increasing productivity, but tapping this potential means that a range of support measures be made available. The point is not that other farmers should be neglected, but that previously excluded farmers should be mainstreamed.

E. DEVELOPING INSTITUTIONS

33. The need to reform government extension services in many countries in the region often also applies to public-sector agricultural research institutes. Like the extension service, their organizational capital is often very inadequate. Problems arising from this include research prioritization based on researchers' professional interests rather than national nutritional needs, and hence resource allocation being too scattered to achieve critical mass. This is often exacerbated by inappropriate staff reward systems. In both research and extension systems, incentives are key to achievement.

34. Institutional development at the grassroots level is critical to creating efficient market chains and ensuring that small and marginal farmers are in a position to benefit from them. Farmers need to be able to take advantage of scale economies if they are to benefit from developing market chains, and this entails fostering the development of inclusive, farmer-owned grassroots institutions. Such institutions could usefully fulfill three functions, namely to: .(a) improve the bargaining position of farmers vis-à-vis traders, (b) help farmers meet market requirements and market disciplines, and (c) act as an intermediary between the extension service(s) and member farmers.

VI. Strategic policy options

35. This section examines the policy reforms needed to achieve the various technical, economic, social and institutional conditions required to meet the challenges outlined in the previous section. Naturally the policy response needs to be fine-tuned to fit national requirements. No specific policy options on environmental sustainability are discussed here, because this is not an area for a policy in its own right, but a cross-cutting concern that should inform all agricultural policy-making.

A. MAKING AGRICULTURAL RESEARCH MORE RELEVANT

36. In a situation where research resources are extremely scarce, prioritization of the research agenda is absolutely critical. Too often research prioritization exercises have involved only crop scientists, so that the research becomes supply-led instead of demand-driven. A consultation process is needed that involves all stakeholders – farmers, consumers, agribusiness, policy-makers, and a wide range of professionals. Care must be taken to include the views of the most food-insecure. This exercise should identify 'hot spots' of food and nutritional insecurity, in spatial, societal and seasonal terms. This last dimension is vital in areas of mono-modal rainfall distribution, because these tend to have a marked hungry season. The research agenda must then be prioritized to meet these needs. However, it may not always be the best policy to try to address such issues directly. For example, if a country has strong comparative advantage in producing one or more high-value export crops, concentration of resources on these may generate large-scale employment to fund food imports, and may be a better path to food security than autarky. The prioritization exercise must include baseline surveys of key variables and quantified targets, so that progress towards the targets can be measured. Regular monitoring and periodic evaluation is a key part of this.

B. IMPROVING THE EFFICIENCY OF TECHNOLOGY TRANSFER

37. Policies on the release of new varieties need urgent examination in many countries, where a better balance must be struck between the twin risks of premature release and foregoing the benefits of varietal upgrading. The lack of interest on the part of larger seed companies in producing seeds of non-hybrid varieties has contributed significantly to the slow pace of varietal replacement, which in turn is impacting negatively on productivity growth. The inefficiency that generally charaterises public sector seed agencies has produced similar results.. Hence policies must be found to identify and promote a third way. In many parts of the region promising results have been obtained through the use of participatory varietal selection, usually under a project approach.[7] Under this approach farmers are asked to evaluate new varieties under their own growing conditions. This has often resulted in rapid adoption, which has encouraged some farmers to become specialist seed producers, thus easing the supply constraint. The recent growth of small and medium scale enterprises in the seed sector also deserves support at the policy level, and an enabling environment needs to be created in which such enterprises can flourish.

38. Problems of supply have emerged with other inputs, especially agrochemicals. Many governments have subsidized these to boost production, only to find that financial constraints have produced huge pent-up demand, resulting in rationing through illicit payments. The adoption of a private-sector approach has solved this particular problem, but given a weak regulatory enforcement environment, it has often resulted in adulterated or otherwise substandard products. An attractive policy option is the full involvement of farmers' organizations in enforcing quality control standards, because the farmer is the one with most to lose through weak enforcement. The question of extension services is in large measure institutional, and will be covered later. Another area of weakness in the traditional model is that it is top-down, i.e. instructions flow downward through the hierarchy, while accountability flows upward, with little or no input from the farmer. Is privatization the answer? Except for industrial crops, where extension is provided by the company that buys the produce, attempts to privatize extension services in developing countries have not been very successful. Empowering farmers, especially disadvantaged farmers, to make demands on the system seems a more promising policy option.

[7] This involves offering a range of varieties of a crop to farmers for evaluation and comparison in their own fields. Generally specific varieties emerge as the variety of choice in particular areas.

C. DEVELOPING MARKET CHAINS

39. Research and extension organizations in developing counties tend to be highly production oriented and have little expertise in areas such as market research or market chain analysis, so that a partnership approach is required. Government policy can play three key roles in developing market chains. The first is in constructing and maintaining transport and marketing infrastructure. However this will be inefficient unless a policy of full stakeholder consultation is adopted, so that farm-to-market roads are routed, and physical marketplaces sited, where they best serve the needs of buyers and sellers. The second is the removal of unnecessary barriers to trade. These include removal of taxes on the movement of agricultural produce and inputs, setting the opening hours of government markets at times that are convenient to market users, and dismantling regulations that restrict the flow of produce and inputs within the country. The third area is establishing rules on food safety and laboratories for food analysis to ensure that food reaching both the domestic and international markets is fully compliant with internationally accepted phytosanitary standards.

D. TARGETING THE EXCLUDED

40. Most countries in the region have committed to a Poverty Reduction Strategy Paper, with benchmarks for reducing poverty and food insecurity. This explicitly rejects the 'trickle-down' assumption in favour of targeting. Implementing such an approach will normally require staff reorientation, but it will also require a range of measures to bring the excluded into the mainstream. Very poor farmers are undercapitalized, and this should influence credit policy (for example, making it easier for women to obtain credit). The excluded are typically risk-averse, so policies will need to be adopted to provide a significant measure of insurance. The excluded are typically illiterate and non-numerate, which effectively debars them from holding office in farmer organizations, which in turn impinges on policies of adult education. Their knowledge of nutritional requirements is low and their hygiene practices poor, so adult education must cover these areas as well. An overstretched extension service cannot be expected to provide the intensity of inputs that all this requires. Partnerships with civil society will be required, as will donor-funded interventions.

E. DEVELOPING AND FOSTERING INSTITUTIONS

41. Institutions possess four types of capital: tangible, human, organizational and political. The first comprises physical assets and budgets. The second comprises the staff, their expertise and above all their attitudes. The third are the management structures and practices, and the degree to which they are aligned with the mandate. And the fourth is the support the organization is able to muster among political leaders and the public at large: this is largely a function of how well the other three forms of capital are deployed.

42. Public-sector research and extension systems in developing countries tend to suffer from shortfalls in all four forms of institutional capital. Donor-funded projects have frequently concentrated on building physical assets and training staff, both of which are quite easy to do with the type of financial resources a donor brings. Providing for running costs and changing attitudes ('can do' approach, concern for client welfare, general professionalism) are more difficult. Changing management structures is equally challenging, and key to these is the incentive system. However some countries, such as China and Viet Nam, have succeeded in incentivizing their pubic agricultural technology transfer systems.

43. The grassroots farmers' organizations whose function was outlined earlier would be very different from the traditional government-initiated farmers' co-operative. It would be a farmer-run and farmer-owned institution. The government's role would primarily be one of providing an enabling environment in which such institutions could take root and flourish. The task of fostering their creation would be more suitably played by civil society. Such institutions are beginning to spring up in Asia – Nepal provides an example of a 'least developed' country where they have been successful. It is not that government has no role to play other than an enabling one – for

example in the Nepalese case, the Department of Agriculture has helped by providing market infrastructure. The key to the success of these institutions is profitability, because this provides incentives and fosters sustainability.

F. STRENGTHENING AGRICULTURAL POLICY ANALYSIS CAPACITY

44. This is not a strategic policy option in itself, but it underpins a government's ability to formulate and implement policies effectively. Policy analysis links policy formulation to policy implementation by using data to provide a comprehensive situation and trend analysis which is then used to provide policy options, shape policy decisions and design policy instruments. The latter can take a wide variety of forms – laws, regulations, institutions, taxes, subsidies, etc. – but if a government does not have adequate policy analysis capacity it is unlikely to be able to design efficient instruments and therefore unlikely to be able to implement its policies effectively. The actual policy analysis should normally be outsourced in order to ensure independence, but the government needs a core group of policy analysts who can translate high-level policy statements into an analytical agenda, write terms of reference for the independent analysts, evaluate their findings, interpret them and communicate them to policy-makers.

VII. Conclusions and recommendations

45. There are some notable exceptions, but most countries in the region, and the region as a whole, are not on course to meet either the WFS or MDG targets with respect to food security. Moreover, these targets relate to energy intake only and do not consider the need for dietary balance in terms of both macro- and micronutrients. *The Conference may wish to recommend that efforts to achieve food security through sustainable agricultural development be stepped up and that nutritional security be considered an indispensible element of this.*

46. Yield growth has slowed to around 40 percent of what was achieved during the Green Revolution, yet per capita food production has been increasing, mainly due to reduction in population growth rates. However production of staple foods, particularly pulses, but also rice and wheat, has grown less rapidly than the average. There is evidence, at least in South Asia, of substitution of cereals for pulses, which seriously reduces protein efficiency and therefore dietary balance. Horticulture is the main source of micronutrients for the poor, and production has increased, but at the moment much of this produce is consumed by the urban non-poor. There is a need to increase seed production and marketing efficiency so that the food-insecure may also benefit. Many existing techniques can be used to increase crop productivity via increased yields, increased cropping intensity and reduced waste. Crop diversification is particularly valuable for both agronomic and nutritional reasons. *The Conference may wish to recommend that special efforts be made to increase productivity of crops that are of particular relevance to the diets of food- and nutritionally-insecure people, namely starchy staples, pulses, oil crops and horticultural produce. A supplementary recommendation might be that seed production infrastructure for these crops is in special need of attention and support.*

47. Too often in the past productivity increases have been achieved in the region at the expense of degrading the environmental resources upon which agriculture depends, so that achievements were often short-lived. *The Conference may wish to recommend strengthening the FAO work to promote under its strategic objective A the sustainable intensification of crop production through an ecosystem approach. Specifically increased use of local diversity, conservation agriculture, complemented with elements of SRI for rice growing areas as well as with other best practices such as IPM, IPNM, IWM would be the core technical components of such an approach.*

48. Amongst emerging issues, two – biofuels and water scarcity and quality – require urgent policy attention. *The Conference may wish to recommend that urgent action be taken to prepare national plans to address each of these issues.*

49. Improving crop productivity has important technical dimensions, but ignoring equally important social, economic and institutional dimensions often prevents technologies from reaching the farmer. A five-point strategy can be identified to deal with this: developing new technology, improving technology transfer, developing market chains, targeting the excluded and developing institutions.

50. **New technology** is needed across the board, including breeding crops for climate change resilience. New varieties can be developed using biotechnology with or without genetic modification, according to national policy. More environmentally friendly methods of pest and disease control must be found. Irrigation technology must become more efficient, more targeted and less soil-polluting. New approaches to integrated soil fertility management are needed which will increase land productivity while reversing soil degradation and eliminating water pollution by runoff.

51. *The Conference may wish to recommend that investment in crop research be increased, on condition that a rigorous priority-setting exercise be conducted, involving all stakeholders – farmers, consumers, agribusiness, policy-makers and a wide range of professionals – in order to make future research more focused and more attuned to national priorities. The prioritization exercise should include baseline surveys of key variables and quantified targets, so that progress towards the targets can be measured.*

52. **Technology transfer** mechanisms in many Asia-Pacific countries are slow and inefficient, so that many promising technologies have never reached the farmer. This renders new investment in research and development almost pointless. Three key problems are: excessively lengthy procedures for releasing new varieties, lack of profitability in the production of seed of open-pollinated varieties, and lack of organizational capital in government extension agencies, which are often poorly designed to deliver on their mandate.

53. *The Conference may wish to recommend the following measures: (a) Urgent re-examination of policies on release of new varieties to see whether a better balance can be struck between precipitous and overcautious release; (b) Consideration of new approaches such as participatory varietal selection in order to encourage the emergence of a new class of specialist small-scale seed producers; (c) Measures to empower farmers' organizations to conduct quality control testing on agrichemicals; and (d) Measures to empower farmers, especially disadvantaged farmers, to make demands on the extension system, so that it becomes demand-driven instead of supply-led.*

54. **Market chains** in developing countries tend to be weak and inefficient, creating high transaction costs and local monopolies that drive down farm-gate prices and inflate prices for urban consumers. There is a pressing need to improve these, thereby providing incentives for farmers to produce a surplus, thus increasing traded volumes and lowering food prices for the urban poor.

55. *The Conference may wish to recommend the following measures: (a) Formation of partnerships between public-sector research and extension organizations and private market research institutions to improve market chain analysis, including analysis of the supply chains of supermarkets, where appropriate; (b) Adoption by the government of the participatory principle when providing farm-to-market roads and market infrastructure so that the producers and traders have an input into their design; (c) Review of the tax and regulatory frameworks to eliminate unnecessary barriers to agricultural trade; and (d) Establishment of rules on food safety and laboratories to ensure that food meets accepted phytosanitary standards.*

56. **Exclusion** of certain farmers has been a major shortcoming of traditional technology transfer in much of the region, because the extension system has concentrated on 'progressive' farmers. Hence women farmers, small and marginal farmers, ethnic and other minorities, and those in marginal areas have been ignored, perpetuating their situation of low crop productivity and food insecurity.

57. *The Conference may wish to recommend the following measures to bring excluded farmers into the mainstream: (a) Ensuring that all farmers, regardless of gender, ethnicity, etc., have access to affordable credit; (b) Providing a measure of crop insurance to counter risk-aversion; and (c) Linking into adult education programmes to equip such farmers with the skills they need to fully participate in farmer institutions and programmes and to improve their hygiene, sanitation and food utilization.*

58. **Institutional reform** of the public research and extension systems of many countries in the region is overdue. Their management structures and practices are not designed to deliver on their mandates, and inefficiencies abound. Inclusive grassroots farmers' organizations need to be fostered in order to enable them to improve the bargaining position of farmers, help them abide by market disciplines and serve as instruments of empowerment that can make demands on public institutions charged with supporting agriculture.

59. *The Conference may wish to recommend the following measures: (a) Reform of public-sector crop research and extension systems in order to make their management structures and practices more closely reflect their mandates; (b) The nurturing, through a partnership approach, of inclusive farmers' organizations by providing an enabling environment.*

60. Policy analysis capacity is vital to the formation and implementation of efficient and equitable policies, but it is in critically short supply in agricultural ministries in many countries in the region. In most countries the policy analysis should be outsourced in order to ensure independence, but the government needs a core group of policy analysts who can translate high-level policy statements into an analytical agenda, write terms of reference for independent analysts, evaluate their findings, and communicate them to policy-makers.

61. *The Conference may wish to recommend the following measures: (a) Outsourcing of policy analysis to independent outside bodies; and (b) Creation and retention of professional policy analysis capacity within agricultural ministries.*