Symposium15 (S15): Horticultural Science in Emerging Economies: Issues and Constraints

Monday · August 12

Location: Metro Toronto Convention Centre, Room 103B

1100–1140
S15–O–1
PREPARING SMALL-SCALE ASIAN FARMERS FOR KNOWLEDGE-BASED HORTICULTURE

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Horticulture in the developing countries faces a number of pressing challenges, including continued population growth, widespread of poverty, limited scope for expansion of cultivated area, and increasing water scarcity. The globalized market of horticultural products will add additional challenges to small-scale farmers, especially in Asia. The newly emerged economy, however, can provide a positive impact to these farmers. They are better access to new opportunities and information, better linked with the local and international markets, and faster dissemination of advanced horticultural technologies. As the world economy is moving toward a new era, evolution of horticulture in the developing world is expected. Farmers need to know how to use new tools and technologies made available to them. Progressive farmers will play a leading role in testing and adopting new technologies and further spread to other farmers. The leadership of vegetable farmers in rural communities is being studied by AVRDC. Progressive farmers, the first group who adopted improved technologies, often demonstrate the benefits of new technologies and make an impact to the others. Vegetable farming families generally invest more to education and thus, generate income from non-horticultural sectors. It is further elaborated that a balanced nutrition is a key component for poverty reduction and overall rural development. The role of vegetables in diversifying production systems of small-scale farmers, and achieving diversified diets and nutrition improvement, especially in micronutrients, will be discussed. The potential contribution of indigenous vegetables for new products with value-added traits is emphasized. It is foreseeable that to prepare small-scale farmers to better response to the new emerging economy, new partnership or strategic alliance among the scientific community and private sector needs to be established.

1140–1200
S15–O–2
EFFECTS OF THE STRUCTURAL ADJUSTMENT PROGRAM ON THE PERFORMANCE OF THE COFFEE SECTOR OF ETHIOPIA: A CASE IN ALETAWONDO DISTRICT

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Since the beginning of the 1990's the Ethiopian economy is undergoing a transformation from a centrally planned to a more liberalized market economy. In line with this, a number of policy changes that influence the external as well as the internal structure, conduct and performance of the coffee sector have been undertaken. The study investigates the sector's performance and participants' trade behavior, encompassing local production and marketing, wholesale trade, processing and export of coffee. Data and information were collected from interviews with coffee farmers, local traders, wholesalers and exporters. The Structure-Conduct-Performance approach has been applied as the analytical method for the study. The results show significant changes in the structure, conduct and performance of the coffee sector after market liberalization. While lower taxes, abolition of quota and price regulations, and less restrictive licensing policy supported to raise the number of trade participants and allowed higher competition in coffee production and marketing, improvements are also exhibited in credit supply to traders, access to transport facilities and coffee processing services. However, coffee extension service, and credit and input supply to coffee production have been declined significantly. Also restrictive government regulations still limited vertical integration opportunities and possibilities between traders. Despite the existence of better competition and high quantity of coffee traded locally, lack of quality related price mechanisms and the decline in the coffee extension service have led to a dramatic decline in coffee quality and eventually restricted the quantity of the country's exportable coffee. As a result, despite a decade old structural adjustment program in the country, a significant improvement has not been exhibited in the coffee export performance yet.

1200–1220
S15–O–3
THE LAND ISSUE IN THE CENTRAL EUROPEAN AGRICULTURE AND HORTICULTURE. A CASE STUDY OF HUNGARY

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Land has been newly re-allotted in the Central European Countries in transition. Millions of people received small parcels, often in several pieces. These are mainly the heirs of the former owners, most of them no longer working and living in agriculture. Scattered land ownership is not suitable for efficient farming, since it can not be well equipped, mechanized and cultivated. Fortunately land tenure is much more concentrated than ownership. Some of the big farms have survived as renamed and restructured co-operatives or as different companies. In the small-farm sector, a significant concentration has also occurred, mainly in the form of rental agreements. Most Central European countries, including Hungary, are limiting the size of land ownership and prohibiting the buying of land by agricultural co-operatives, companies and foreigners. The Hungarian government wants to liquidate even the land rent of those Austrian farmers who farm efficiently on bigger land parcels at the Western Hungarian border who, however, have secret buying contracts. Most candidate countries are asking some years postponement of buying and selling freely the land after their entrance into the EU. The hindering of the buying and selling of land hinders land concentration and the development of efficiency.

1220–1240
S15–O–4
ENHANCING MARKET ACCESS FOR SMALL-SCALE HORTICULTURE PRODUCERS IN DEVELOPING COUNTRIES

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Rapid modernization of wholesale marketing systems in developing countries can easily result in lessened market access for small farmers and consumers. Regardless of whether harmful policy decisions are made unwittingly or deliberately, the result of restricting market access is the loss of livelihood for smallholders their suppliers, a narrowed range of products in the market place, fewer choices for consumers, and overall, a more inefficient food system. Expanding market access widens the range of products in the market place, provides more settings for commerce, and increases competition and market efficiency. Developing agriculture policies that increase market access requires policy makers to recognize and appreciate the full range of market channels associated with retail and wholesale horticulture. No fewer than 15 such market channels can be identified today in developed market economies. There is much to suggest that greater attention paid to improving these market channels will result in improved farm survival and improved access to food resources.

1340–1440
S15–P–5
CONTRIBUTION OF VEGETABLE PRODUCTION TO FOOD SECURITY IN THE UAE

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The United Arab emirates has achieved self sufficiency and a good degree of stability of vegetable production. This created an urgent need for providing health security to our population by supplying nutrition through balanced diet. Vegetables form the most important component of a balanced diet. We can grow a variety of vegetables all the year. The country is the GCC's second largest producer of vegetables next only to Saudi Arabia. Consequently our per capita consumption is quite high. At present vegetable research is being carried out at different parts of the nation institutions, one the Federal government

and 4 local departments. All UAE Coordinated Research Program of the Project Directorate of Research provides facilities for multidisciplinary area specific research on 23 vegetable crops offers a national grid for multiplication testing of technologies developed by different locations. The investment in vegetable research is insignificant compared to fruits such as dates and citrus so is the manpower development through intensive research efforts of testing 119 imported varieties in 16 vegetable crops have been released to local farmers. Some of these varieties have already made significant impact/contribution in revolutionizing the production of vegetables in the country, in addition to new varieties and several agro-techniques and plant protection measures against diseases and insect pests have been standardized and recommended. Some efforts are also in progress to achieve self sufficiently in seed production. Several biotic constraints pertaining to non availability of germplasm and its evaluation, diseases and insect pests, skilled manpower, abiotic factors such as limited availability of funds, physical environmental and soil factors and seasonal problems, socio-economic factors and limitations of infrastructure are limiting vegetable research in the UAE. The priorities of research in years to come have been identified as water resources, resistance to biotic and abiotic stresses for improvement of nutritional quality and processing, Seed technology research, development of technology for growing vegetables in protected environment, use of biotechnology, insecticidal residues and off season vegetable production.

1340–1440
S15–P–6
INSTITUTIONAL STRATEGIES FOR BUILDING A SUCCESSFUL GREENHOUSE HORTICULTURE SECTOR

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The paper describes the evolution of greenhouse horticulture in the Netherlands over the period 1950–2000. The description covers both a statistical review on areas, crop productivity and labour productivity as well as a qualitative analysis of the technical and institutional development. The analysis reveals the successive institutional strategies applied in the Netherlands against the background of the technical and socio-economic circumstances. The study was sponsored by the Chinese Ministry of Agriculture and the Dutch Ministry of Agriculture for the mutual interest of both countries. For China to improve the efficiency of horticultural production and for the Netherlands to improve the business opportunities for horticultural technology and expertise. However the conclusions are also useful for other countries who want to further develop their horticulture. Starting from technical and institutional changes the period 1950–2000 was divided in four distinct periods, each representing specific phases in the development path of Dutch greenhouse horticulture: 1945–65, reconstruction after World War II; 1965–80, mechanisation; cutting labour costs; 1980–93, application of computer technology; 1993–2000, conversion to demand-driven economy The technical, economic and social circumstances were quite different in these four periods. Accordingly the knowledge system paid attention to different subjects and took different positions in the development process. The subjects and positions concerned are further specified in the paper. Finally a method is presented to position horticulture in developing countries on the development path of greenhouse horticulture in the Netherlands. Once the current position on the development path is known, the matching institutional strategies applied in the Netherlands may provide food for thought.

1340–1440
S15–P–7
URBAN AGRICULTURE IN KIVU : HOW ROOTS HELP POPULATION WITH LOW INCOME IN AFRICAN GREAT LAKES CITIES

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Built in 1900, the town of Bukavu is located in the province of South Kivu, in the East of Democratic Republic of Congo. At the start, it counted about 10,000 inhabitants. For the moment, its population is estimated to more or less 600,000 inhabitants. From the 1980's, former open spaces, outlying areas and lower lands of the town started being exploited to fill in the food deficit in families and palliate the lack of salary payment and the fall of the purchasing power. The advent of the two successive wars in DRC since 1996, left insecurity pockets in rural areas which used to provide food to urban ones : more than 80 per cent of households with law income get part of their food from agricultural activities in town and in its periphery and more than 75 per cent of the crops sowed are races and tubers, essentially cassava and sweet potatoes, completed by seasonal sowing of beans. For all these crops, leaves and roots are highly consumed. Women are particularly active in that sector (more than 86%) Unfortunately, farming practices are likely to favour the degradation of the urban environment if no urgent measure is foreseen. That is why thanks to close collaboration with the WFP office in Bukavu, we have undertaken a number of activities which aim at helping cultivators increase their productive capacity (of those crops) on small spaces. The feebleness of spaces available to each household and the high number of family dependents (average of 9 persons per family) justifies the preference given to races (roots) and tubers, of which tuber leaves harvest is often spread over a long period in a year. Today, our efforts aim at: facilitating partnership relation between farmers and other social actors; enlightening farmers on the decisions of the administrative authority in terms of protection of the environment and the management of waste; popularising farming techniques in a participative approach; valorising plants with multiple properties in urban gardens; developing a network gathering actors of the Eastern Congo towns as well as those in similar context in the neighbouring countries (Rwanda and Uganda).

1340–1440
S15–P–8
POSTHARVEST TREATMENTS ALLOW BRAZILIAN GROWERS TO EXPORT TOMATOES TO MERCOSUL COUNTRIES

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Shipping tomatoes to distant markets in the MERCOSUL area is a great challenge for Brazilian growers planning to export their product, since once fruit ripen they become more prone to mechanical damage, reducing commercial quality. Delaying ripening can be a useful technique to mantain quality throughout the transportation. This work was carried out to investigate the ability of 1-methylcyclopropene (1-MCP) to extend the shelf life of tomatoes at the pink stage. Tomato (*Lycopersicon esculentum* Mill.) fruit, cultivar Carmem, an extended shelf life variety (ESL), were harvested at the pink stage at commercial fields in Goianapolis, Goias, Brazil. After harvest, fruit with no external blemishes were graded for weight (250 ± 5g) and diameter (6 ± 0.5cm), and treated with coconut grease (applied to the stem end), wrapped in plastic films (coextrused polyolephin), 1–methylcyclopropene ($1000\ \mu g \cdot kg^{-1}$), and control. Fruit were stored for 10 days under refrigerated conditions (10 ± 0.5 °C; RH 90-95%) and every 2 days were analyzed for total soluble solids, firmness, weight loss and color (L*a*b*). It was verified that the fruits weight loss increased during the storage period. Fruits stored under modified atmosphere showed less weight loss compared to other treatments. Treatment with 1-MCP delayed fruit softening, at the end of the storage period, and treated fruit had a firmness 50% higher than control fruit. 1-MCP significantly delayed chlorophyll degradation and concomitant synthesis and revealation of carotenoids pigments. At the tenth day, 1-MCP treated fruit had a predominant green color when compared to other treatments. Soluble solids content was not significantly affected by the different postharvest treatments. It is suggested that tomato fruit, treated at the pink stage with 1-MCP, can be successfully exported from Brazil to any other country in the MERCOSUL, considering a trip up to 10 days.

1440–1520
S15–O–9
THE ROLE OF HORTICULTURE IN AFRICA: ISSUES, OPPORTUNITIES AND CONSTRAINTS

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The world's population is projected at 9 billion by the year 2030. Most of the increase in population will be in developing countries in Latin America,

Asia, and Africa, where chronic food shortages and malnutrition persist. Horticulture is underdeveloped in most African countries. The regions food priorities can be addressed by focusing attention on important horticultural crops and critical issues. Key issues include, food shortage, distribution, nutrition, competitive advantage of individual countries or regions, local and export marketing constraints, and industry strategic planning involving policy, institutional and technological innovations. This paper highlights the great potential of horticultural crops in alleviating food shortage and malnutrition in Africa, constraints, and the need to include nutrition education on agricultural research agendas. To compete in the export markets African countries need to produce horticultural crops or processed products that meet the export market standards, including specifications in importing countries, timely delivery, ample steady supply, grading, packaging, contracts or agreements to build trust, and good quality of product at arrival in the export market. The export marketing constraints and challenges, including poor communication system, lack of market infrastructure, agro-processing plants, marketing credit, proper market organization, proper pricing, uniform grading and standardization of weights and measures; inadequate and poor dissemination of market information, poor post harvest handling and low productivity. Opportunities for the horticultural industry in Africa, such as the development of indigenous vegetables, and orange-fresh sweetpotatoes, and the use of plant biotechnology, are also discussed.

1520–1540
S15–O–10
HORTICULTURAL GRADUATE EDUCATION IN DEVELOPING COUNTRIES: FACTS FROM THE EXPERIENCE IN COLOMBIA

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A feasibility study undertaken in 1995 showed the need to create a graduate degree in Horticulture in Colombia. The proposed program has been implemented from 1996 to date, with six groups of students graduated. The curriculum developed was oriented to provide the students with the tools and knowledge to create and manage their own companies. During the five years, the curriculum has had minor modifications, mostly in terms of hours per course. The area of management, not currently seen in horticulture programs but necessary for professional excellence, is a novelty for the program in particular. Courses on general farm management, human resources management, farm accounting and marketing were conducted as part of the objective of the program. Some of the obstacles, such as availability of skilled professors for certain areas as well as the advantages and disadvantages of professors being hired on an hourly basis rather than on a part-time/full-time basis are discussed. Also, the local university education system is described with its strengths and weaknesses and what modifications should be taken into account to make horticulture programs in Latin American countries more successful. Linkages to Universities worldwide are suggested, as well as how a scheme of institutional cooperation should be arranged and pursued. A review of some of the most important work from students is given. Finally, some of the priority areas for future local research are discussed, in search for development and funding with international cooperation.

1540–1600
S15–O–11
ADAPTATION AND ADOPTATION OF NEW BANANA CULTIVARS IN SOUTH WESTERN KENYA

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Six banana cultivars of genome (AAA) namely Valery, Lacatan, Giant Cavendish, Dwarf Cavendish, Nyarsausett, 'Ekeganda' (local-East Africa Highland Banana) and one genome of (AB) 'Apple' banana (local) were planted on station spaced at 3x3 metres in a complete randomised block design and harvested in three cycles to evaluate their production .The exotic cultivars were introduced to primary schools, training institutions and farmers at three different sites in the regions to test their acceptability.Farmer participatory on- farm trials were established to evaluate adaptabilityand acceptability these superior cultivars. Farmer management research methods were also evaluated. Results showed that three exotic cultivars out- yielded the two local cultivars predominantly grown by the farmers. The mean yield across the sites for Giant Cavendish, Valery, Lacatan, Ekeganda, Dwarf Cavendish, Nyarsausett and 'Apple' banana were 29.0., 27.4, 26.3, 22.2. 19.5,19.2 and 10.1 $t{\cdot}ha^{-1}{\cdot}yr^{-1}$ respectively The two local checks had a shorter average cycle. The farmers preferred Giant Cavendish and Valery as good cultivars on the basis of yield, taste and strong pseudostems, which do not require propping. The dessert cultivars of Cavendish sub group which are resistant to Panama disease (*Fusarium oxysporum* f. sp. *cubense*) were higher yielding than farmers local dessert type 'Apple' banana in Kisii, Kendu Bay, Suneka and Kenyenya area. Cigar end rot disease (*Verticullium theobromea*) was prevalent on Dwarf Cavendish, while Lacatan require propping to avoid wind damage at Kisii Regional Research Centre site. Economic analysis using the internal rate of return and net present value showed that it is very profitable to grow bananas. The adopted cultivars are being multiplied rapidly through tissue culture and then scaled up using farmer field school approach.

1600–1640
S15–O–12
CONSTRAINTS AND OPPORTUNITIES FOR TECHNOLOGICAL INNOVATION IN HORTICULTURAL CROPS IN PERU

Hugo Villachica, Julio Toledo

Research and Technology Transfer (RTT) in most Latin America countries has focused on traditional or basic food crops, and concentrated mostly on plant breeding. Lack of specialized human resources, solid budgets and continuity of investment have resulted in minimal attention to demands for new agricultural technology and services. In general, existing data on RTT in governmental institutions is not adequately systematized to be readily available and useful and needs to be integrated into processes or goods, which demands the existence of idoneus capacities in order to be offered to the market. Fruit and vegetable crop production, quality and profitability in Latin America are limited by internal factors including: a) importing policies and tariffs b) infrastructure deficiencies (roads, energy, etc.) c) inadequate storage and cold chain facilities d) credit cost and availability e) modern farm management skills f) ineffective producer organizations g) lack of dependable market information h) inefficient farm sizes and i) inadequate agricultural technology. Limiting external factors include: a) changes in the world economy, and b) economic and agricultural policies of other governments. The relationship between the agricultural sector and food consumers is in a transition stage, from a system based on mass production for direct human consumption or for export, to a competitive system based on technological innovation. Technological innovation is the key for productivity and for competitiveness. Nevertheless, the capacity to utilize this technology in order to realize possible competitive advantages is critical. Factors that were historically considered basic for Latin America agricultural competitiveness (including cheap land or hand labor), are losing their advantages to the capacity to interpret and adjust to, or create, demand. Off-farm profitability opportunities are increasing in those rural areas jointly occupied by farmers and consumers. Thus, research and development (R&D) and growers have to increase integration into the marketing system. Integration strategies for R&D in new horticultural crops require long term capital commitments from local and foreign investors In the traditional world of commodities, the orientation that predominates for R&D processes is to find solutions to production problems and to search for competitive advantage through productivity increases or by cost reduction. In today's scenarios, in which tropical fruit and vegetable crops are being established, the orientation should be toward the generation of new market opportunities. This does not mean that productivity and cost reduction themes are less important, but a change of emphasis. R&D should consider the occurrence of other aspects more closely linked to markets and product uses than to the products themselves. Marketing themes such as quality, harvest timing, conservation and processing possibilities, and tendency of the demand for these products drive today's markets. In many Latin American countries it is being proposed that R&D should be conducted by the private sector. However, the relatively small size of markets makes it practically impossible for the private sector to develop independently the required research and capabilities. Examples of successful technology development and application requiring joint public-private promotional collaborative efforts are discussed in the document.

1640–1700
S15–O–12–A
TO BE ANNOUNCED

Tuesday · August 13

1100–1140
S15–O–13
THE HORTICULTURAL INDUSTRY IN TROPICAL AFRICA

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In recent times there has been a tremendous interest and increase in horticultural crop production with a consequent high demand for horticultural products in many tropical African countries. This is the result of many favourable factors including: i. the urgent need to limit importation of horticultural products to conserve scarce foreign exchange; ii. the realization of the nutritional importance of fruits and vegetables in the diet. This is coupled with increased standard of living and education; iii. increase in processing factories; and iv. the high export potential of many horticultural products. This has been the prime mover of the industry. Tropical African countries are now exporting, not only, fruits and vegetables, but also flowers. The horticultural industry is, however, beset by several constraints. The major economic and technical constraints are outlined and methods of overcoming them are indicated.

1140–1200
S15–O–14
FORMING A CONSENSUS IN AGRICULTURAL DEVELOPMENT ISSUES AND CONSTRAINTS: USING THE NOMINAL GROUP TECHNIQUE

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The nominal group technique has been used for stakeholder analysis and to identify issues and constraints in various crop production activities in planning Honduran agricultural development strategy. The nominal group process included stakeholders from the governmental and private sector, nongovernmental donor and development agencies, public and private academic and research institutions, and agricultural producers and producer groups. Specifically, the nominal group process was used for identification of constraints in production and profitability for particular commodity sub-groups. Using this four-step process, the facilitators of the sub-groups elicited feedback on constraints, clarified the responses, and then allowed a brief discussion of the issues. Then the sub-group members voted on the five most important constraints identified, and the top constraints were chosen using a weighted process. Next the participants voted on the ease of overcoming those same five constraints. The second phase of the nominal group process was a second meeting to review the first meeting results and to solicit from the stake-holders mechanisms to overcome the constraints identified in each sub-group. A consensus from stakeholders was formed on the constraints of production as well as mechanisms and methodologies to overcome the identified constraints which were then used at the national level to develop strategies in agricultural development. The nominal group process was also used for developing a consensus at the national level to identify the most promising agricultural and agribusiness investment opportunities that lead to a long-term sustainable use of resources, generate rural jobs, and improve standards of living. The nominal group process has been used to elicit information and to develop a consensus at the grassroots level that is used by team members at the national level in developing agricultural development strategies

1200–1220
S15–O–15
MANGO PRODUCTION AND MARKETING IN ZANZIBAR: POTENTIAL, ISSUES AND CONSTRAINTS

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The paper examines: 1) market prospects; 2) ability of exporters to expand trade; 3) potential of farmers to expand the supply of popular variety, Boribo mango through planting; 4) the role of government in stimulating production and marketing; and (5) the constraints like suitability of a few varieties for export, seasonal variability in output; pests and disease problems particularly the Mango fruitfly, *Ceratitis cosyra*, high freight charges, limited cargo space and lack of technical know-how on scientific management practices. It also identifies the steps undertaken by government to remove the constraints to promote exports, like expanding nurseries, pricing, extension and training and research. The establishment of a strong research and development base is regarded a key contributory factor influencing the success of the mango trade. This include finding ways of prolonging the shelf life of fruit so that it can be made available for longer periods in the international market. Recently there is significant demand for mango for export, mainly to Gulf countries. The demand for mango in Gulf countries is higher during October–March, which is the off-season for the major suppliers, India and Pakistan. Mango exports have been consistently rising from 16 tons in 1992, 36 tons in 1994 to about 100 tons in 1995 worth $60,000 of which $18,000 was earned by farmers. Mango exports are projected to reach 2,000 tons worth $1 million by 2007. Data on current production by area are provided.

1220–1240
S15–O–16
SOCIO-ECONOMIC AND ECOLOGICAL DETERMINANTS OF PRODUCTION OF HORTICULTURE CROPS–A CASE STUDY OF HIGH INPUT REGION IN INDIA

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The study pertains to Haryana, a high input and agriculturally advanced state of India. The results area based on a recently conducted survey of 200 farmers of 3 villages, which represent different agroclimatic zones of the state. Analysis of the data shows that farmers having large farm size, better economic standing and social status feel comfortable with horticulture production. They are still haunted by a feeling of insecurity regarding its marketing and in-time disposal. Though they are well aware about the risks involved, yet they consider it a better and more viable option as compared to dairy or other modes of diversification in agriculture. Farmers also feel that horticulture production, if given a proper boost by the policy makers and Government, can be a economically viable and ecologically sustainable proposition. There is an urgent requirement of intervention by the concerned institutions, agencies and organisation so that the horticulture farming can well integrate with traditional rice-wheat cropping system and can also become a poor man's choice.

1340–1440
S15–P–17
SMALL-SCALE PRODUCTION OF VEGETABLE CROPS IN HONDURAS: A CASE STUDY

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The basis of this case study is vegetable production for export by small-scale producers in Honduras. In the central region of Honduras, growers produce tabasco pepper (to be exported to the US as mash for pepper sauce) and Asian vegetables for the U.S. fresh market. The production of raw product shifted to Central American countries as costs, particularly labor, were relatively less expensive than in the U.S. The principal company for promotion of tabasco production and export started buying tabasco pepper from about 80 contract growers in 1981. Currently, they have over 450 growers producing raw product on 570 hectares. The buyer/exporter provides a number of services including technical assistance, propagation materials, transport from the grower's fields to the grinding station, financial loans to the growers and a guaranteed contract market price. The Asian vegetable industry started in the early 1990s with around 15 growers and 30 hectares in production of mixed vegetables. Currently, there are over 500 growers with two private companies and one growers' cooperative that buy from growers as intermediaries and export product. The

Asian vegetable market is a complex arrangement of many small-scale producers who harvest their product and sell on a contract or as need basis. The intermediaries transport the product from the grower's fields to postharvest handling facilities and arrange for transport to the export market. Tabasco and Asian vegetable growers completed an exercise to identify the constraints to production and profitability and formed a consensus on the most serious problems and the mechanisms to overcome those constraints. Although the markets for the two agricultural enterprises are very different, the constraints that were identified were similar. Both agricultural enterprises are examples of success stories of small-scale production by a large number of producers of a horticultural commodity to a distinctly different type of market.

1340–1440
S15–P–18
STATUS OF INDIGENOUS VEGETABLE UTILIZATION IN KENYA

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Indigenous vegetables are essential sources of proteins, vitamins and minerals to most Kenyan families. About 200 indigenous plant species are used as leafy vegetables in Kenya, majority of which are harvested from the wild or grow as weeds. However, a few have been fully domesticated or are semi-domesticated. The most important indigenous vegetables in Kenya include *Amaranthus* spp., *Solanum nigrum, Gynandropsis gynandra, Crotolaria brevidens* and *Vigna unguiculata*. In the past, there has been a decline in the production of indigenous vegetables due to a shift toward exotic vegetables which were thought to be of higher nutritive and social value, offer potential for export and are higher yielding. However, problems of environmental degradation, shortage of arable land, poor moisture availability, declining soil fertility, high cost of farm inputs and pest and disease severity have reduced the reliability of exotic vegetables and narrowed the food base of most households leading to an increase in starvation and nutrient-deficiency diseases. This has led to renewed interest in indigenous vegetables. Presently, there is a deliberate move by the government of Kenya, universities, researchers, and development workers to raise the awareness and importance of indigenous vegetables. Indigenous vegetable production is presently taught as a 3-unit course in the B.Sc. Horticulture program of Moi Univ.. Research on nutritional aspects including analysis of minerals, vitamins, dry matter, oxalates and the effect of sun-drying, cooking and blanching on vitamins have been undertaken. Studies have also been undertaken on agronomic practices including the response to fertilizer applications, intercropping, plant density, harvesting frequency and harvesting heights and the effect of deflowering on the competition between vegetative and reproductive organs. Leafy vegetable germplasm have also been collected, characterized, evaluated and conserved in the national gene banks. This paper describes the food value, uses, production, conservation, characterization, evaluation, agronomic practices and the genetic enhancement of indigenous vegetables in Kenya.

1340–1440
S15–P–19
ORNAMENTAL PLANT PRODUCTION IN CROATIA

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Ornamental plant production in Croatia has an 80-year tradition. Majority of production is located along Adriatic coast and inland, near bigger cities. Climatological conditions are under the influence of both the sea and continental air masses. Croata mostly has a good water and soil quality as well as developed transport and telecommunication system. After the Second World War, an ornamental plant production was mainly organized on big scale companies, owned by the state. Starting from the nineties the production moved on private, family farms. Today, production of ornamental plants is mainly executed under protected environment while the production of ornamental trees, shrubs and rose seedlings is organized outdoors. Primarily grown are cut flowers, especially chrysanthemums, carnations, roses, gerberas, and bedding plants. Currently, Croatia is oriented on the import of ornamental plants; in the last eight years Croatia has imported ornamental plants in total value of 110.8 million USD. Data on import of ornamental plants is showing that there is marketing niche for this sort of product. At present, Croatia has 62 ha of undercover production area, mostly without modern equipment. The ornamental plant production is suffering from lack of investment in the new technologies and there is no serious and systematic approach of state policy to this segment of agricultural production.

1340–1440
S15–P–20
PRIORITIES FOR HORTICULTURAL RESEARCH IN PAPUA NEW GUINEA

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ABSTRACT UNAVAILABLE

1440–1520
S15–O–21
HORTICULTURE SECTOR OF MOLDOVA IN THE TRANSITION PERIOD TO THE MARKET ECONOMY

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Moldova, being the second smallest Republic of the Former Soviet Union, was one of the main suppliers of horticultural products for USSR markets. It formerly produced and exported annually 1.5 million tons of fruits, 0.9 million tons of grapes, 1.2 million tons of fresh vegetables. In 2001 the total yield of grapes was about 400,000 tons, 252,000 tons of fruits and 320,000 tons of vegetables. Vegetable growing has particular significance since it provides canneries with raw materials. Vegetables, like other farm products, are an important export item. Formerly an exporting country, Moldova became an importer of horticulture products. Per capita consumption of horticultural products dropped significantly, especially for vegetables: from 123 kg/inhabitant in 1990 to 62 kg in 2001. Can the horticulture sector of Moldova succeed in the period of Land Reform and transition of the country to the market economy? The answer lies in its opportunities rather than in its failures. Moldova, in terms of soil, climate and its geographic neighbors, can become a recognized source of high-value horticultural products, maintaining the leading position regarding exports of fruits, vegetables, grapes and their respective processed products, which is providing the biggest part of income of the budget of Moldova. The Government of Moldova considers that horticultural production is of national interest. Horticultural products offer a competetive advantage compared to other agricultural products. This sector is regarded as vital with respect to food supply, source of income and employment for the Moldovan people. Moreover, due to its good reputation in the former Soviet markets, Moldovan products still offer significant market potential. It requires only limited investments and time to upgrade this sector.

1520–1540
S15–O–22
IMPLICATIONS AND PROSPECTS OF PROTECTED CULTURE AS A NOVEL TECHNOLOGY TO FOSTER HORTICULTURE IN SRI LANKA

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Horticultural crop production in Sri Lanka faced serious setback during last decade due to changing world economic trends. As a remedy, protected culture was recently introduced to vegetable crop production in Sri Lanka. Although expected yield and quality improvements were achieved, other prospects of protected culture were beyond reach mainly due to tropical nature, lack of technical support and less developed infrastructure. Therefore this study was conducted to comprehend the present status, major constraints and improvement needs in greenhouse vegetable cultivation in Sri Lanka. Relatively young (30-50 years old) farmers with some education and experience in general agriculture are involved in protected culture. Almost all greenhouses are barrel shape plastic houses and located closer to farmers' dwellings. Vegetable crops such as tomato, green cucumber and bell pepper, are cultivated as mono crops with spatial or temporal separations. A few male members of the family

mostly conduct unskilled operations. Skilled laborers are hired on task-based at a fairly higher wages. All greenhouse crops are irrigated but micro irrigation methods are very scarce. Other technologies are comprised with the use of hybrid seeds, inorganic pesticides, improved sanitary measures, plastic mulching, plant training, hydroponics, grading and packaging. Planned cultivation, improved harvesting and postharvest practices, excessive mechanization or automation etc. are very scares. The majority of the produce is sold to low-priced markets in the conventional channels. Consequently, the greenhouse farmers have not been able to use the inputs more than 63% efficiently. However, positive return to scale confirms the further improvements by investing on selected inputs. The greenhouse vegetable growers have been able to obtain greater yields and high quality produce compared to open field agriculture. However, high degree of uncertainty still remains due to technical inefficiencies and marketing problems. Promotional program, to eliminate the constraints indicated by farmers and supporting groups, would enhance this subsector to become one of the leading income generator in Sri Lankan economy.

1540–1600

S15–O–23

PRODUCTION AND ECONOMIC CHARACTERISTICS OF THE FRUIT SECTOR IN CROATIA

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Fruit crops account in total for some 5% of the value of Croatia's gross agricultural output. A large part of the fruit area comprises small, extensive orchards that provide fruit mainly for own-consumption with some being sold in local markets. The most significant crops in value terms are apple, plum, olive, melon, walnut, peach, pear, cherry and sour cherry. The sector has two distinct sub-sectors: old orchards, often on small scattered plots, producing low quality fruit; and younger orchards planted much closer, on dwarf rootstock producing high quality crops. In the study was used the Domestic resource cost method (DRC) as a method that measures international competitiveness by comparing the cost of domestic resources (valued at social prices) used in producing the particular fruit with the value added (total revenue less cost of tradable inputs) of that fruit. Modern orchards are planted on dwarf root stocks which permit more trees to the hectare, fruit earlier in the tree's life span and do not grow to a great height thus permitting easier harvesting than older rootstocks did. Crop yields have improved through modern management techniques and the economic viability of the orchard is thus greatly enhanced. The DRC calculation for apples shows that the better producers with modern orchards and above average yields are competitive. Greater competitiveness will require a better farm structure with larger orchards, less fragmentation, a more competitive input supply sector and a more effective credit market. Also, cooperatives should be developed to allow farmers to get scale economies and other benefits in marketing of fruit.

1600–1640

S15–O–24

WORLD TRENDS DRIVING HORTICULTURE EXPANSION IN EMERGING ECONOMIES

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World agriculture has been undergoing a quiet revolution in the past 20 years. A number of important factors have driven this revolution. As population growth has gradually decreased and incomes have improved there has been a decline in the growth of cereal production and a rapid rise in horticultural crops production. From 1985 to 1995 world cereal output increased by 6 percent while vegetables and melons jumped by 47 percent and fruit and berries expanded by 25 percent. Ornamental production also grew rapidly. The worldwide move toward free market policies, reduced trade barriers and free trade agreements have produced a rapid expansion in horticultural product trade. Other factors driving the expansion of horticultural crops are constant product improvement through breeding and tissue culture reproduction, lower real product costs and year-round availability. Delivered product costs have been reduced through lower cost shipping, reduction in spoilage through improved cold chain management and integrated supply chain management by rapidly expanding mass retail merchandising multinational companies. With rising demand for year-round supply in industrialized and newly industrializing countries, there has been a rapid expansion of production in countries that can supply product during winter months in the northern hemisphere. Emerging economies have benefited and others will benefit from these trends. Producers and exporters in emerging economies often have the advantage of lower cost and greater availability of labor, land and water and in some cases lower shipping costs due to location near major consuming nations. Rapid expansion in trade has also been related to diversification of consumer diets with organics and new products like kiwi, mango, and avocado. There is also a growing trend toward rapid replacement of older varieties of traditional fruits with new improved and branded products. These trends enhance the demand for well-trained horticulture industry managers, and for research and outreach programs, especially in emerging economies.

1640–1700

S15–O–25

DOMESTICATING PRIORITY MIOMBO INDIGENOUS FRUIT TREES AS A PROMISING LIVELIHOOD INTERVENTION FOR PEASANT FARMERS IN SOUTHERN AFRICA

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The economic importance of indigenous miombo tree fruits and their contribution to nutrition in southern Africa is increasing. Ethnobotanical surveys indicate over 75 indigenous fruit trees (IFTs) are consumed in Malawi, Tanzania, Zambia and Zimbabwe. This paper puts ICRAF's tree domestication strategies in southern Africa into perspective by identifying knowledge gaps and opportunities and stimulating debate in improvement and domestication of wild fruit trees. The paper identifies deficiencies of the applicability of conventional approaches to tree domestication and is a flexible, pace-setting mechanism for strategy development. Several workshops, surveys and participatory approaches were used understand users' and stakeholders preferences and echnological opportunities. In a priority setting exercise, IFTs were ranked in each country for improvement and domestication by farmers, marketers, consumers and other stakeholders. These Include *Uapaca kirkiana, Strychnos cocculoides, Parinari curatellifolia* and *Sclerocarya birrea*. Range-wide and targeted collections of *Uapaca kirkiana* and *Sclerocarya birrea* germplasms were made in 5 to 8 SADC countries and evaluated in multilocational provenance/progeny trials established on station and on farm, in four countries. To gauge farm management and dissemination pathways, over 5000 farmers in the pilot project are planting IFTs. Studies on nursery production, vegetative propagation and farmers' adoption, management and perceptions of indigenous fruit trees species will be detailed. A participatory cloning approach was developed for Uapaca kirkiana, a 'spearhead' species for Malawi, using vegetative propagation tools. Improved cultivars of IFTs with acceptable fruit precocity and desirable fruit traits will create the incentive for cultivating indigenous miombo fruit trees. Market research, economics of production, product development and farmer empowerment in fruit processing are used as key components of the strategy.