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Making 21st Century European Horticultural Education Fit-for-Purpose

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Abstract

Europe's horticulture has developed over two and a half millennia and during most of that time has been a substantial agent for the generation of knowledge and its transmission between and within generations. This article describes the current educational context within which horticultural provision is now set. Horticultural education must fit into the overall picture for provision. Topics considered include: widening participation, modularisation, internationalism, vocational skills and education, practice-based learning, consolidation and rationalisation, user pays principle, distance learning and electronic delivery. Provisions in Europe for Further and Higher education and private-charity are examined. The implications of the image problem of horticulture is analysed and the overall lack of fitness-for-purpose of horticultural education examined.

INTRODUCTION

Education, scholarship and knowledge gathering are basic human activities which develop civilised societies irrespective of gender, race, creed or colour. They are the cornerstones of civilisation and through them mankind becomes civilised. Horticulture is one of the oldest, if not the oldest, forms of knowledge gathering in the arts and sciences. It follows therefore, that horticulture was one of the earliest civilising influences in mankind's history. That influence runs a good deal deeper than understanding crop husbandry. Remember that one of the earliest of the Greek philosophers, Epicurus of Sámos (341-270 BC) was known as the "garden philosopher" because he taught in a garden. His optimistic philosophy that "individuals can live in serene happiness fortified by the continual experience of modest pleasures" surely grew from the serenity and peace of mind which he gained by an association with plants. Nonetheless, capabilities for growing food and medicinal plants were one of the biggest stabilising factors which

allowed the founding of societies and eventually national entities. Settled societies provide the conditions in which attractive, restful environments as micro-landscapes forming gardens and the macro-landscapes of large estates evolved. This delivered peaceful physical and mental well-being and healthiness.

Understanding plant responses to the environment and modifying them are the fabric of horticulture. The knowledge, ingenuity, invention, and adaptation required for propagating, growing, controlling, flowering and fruiting of plants was transmitted across generations. Initially knowledge transmission would have used verbal and experiential instructional and learning processes. These are still valid today but are built on huge bodies of knowledge in the sciences, technologies and humanities, see for example Dixon & Aldous (2014).

The horticultural teacher needs professional standing and authority based on accumulated knowledge and scholarship. The horticultural learner must desire knowledge this maybe of immediate practical application or is stored for future reference and use. Teaching and learning develops critical powers which ultimately question the knowledge offered. From that point onwards the distinction between teacher and learner is blurred. They educate each other generating further scholarship.

Europe's Scientific, Agricultural and Industrial Revolutions resulted in increasing demand for horticulture's products and opportunities for increasing their supply based on the application of scientific methods of enquiry. The late 19th and early 20th century saw the founding of research and development services specifically applied to horticulture in most European countries. Horticultural education began being supplied particularly by specialist further and higher institutions. Knowledge started being transferred via state funded advisory and consultancy services. In the two decades between the First and Second World Wars there was significant progress in the provision of horticultural education bolstered by novel research findings. This progress accelerated after 1945 based on the determination that never again would Europe suffer starvation and by increasing interest in the environment. Universities and colleges took responsibility for providing undergraduate, postgraduate and vocational and technical training that specifically targeted horticulture and/or horticultural science. Some of these research and teaching institutions also sought to provide extension and advisory services to the production industry. In both Western Europe and those countries which had been incorporated into the Soviet Block there was provision for horticultural education from technician to postgraduate levels and for the delivery of advice and consultancy to practitioners. From the 1980s onwards there have been marked changes in how and why horticultural education is delivered. Not least has this been influenced by the formation and expansion of the European Union (EU).

HORTICULTURE'S EDUCATIONAL CONTEXT

Horticulture has changed over the past generation and that has influenced educational provision. But more importantly change has happened because education as a whole has changed. There is nothing special about 'horticulture' so far as educational policy makers are concerned. It has to conform and is delivered by the same processes as all other disciplines. That does not stop horticultural educators from designing the best possible courses and qualifications for their students and fitting them for productive careers.

Widening Participation The largest single change in the past half century is the acceptance that education should be spread as widely as possible within populations. Education and wealth creation go hand-in-hand (Rinderman 2012).

Modularisation The move from syllabus-based teaching to competency-based learning brought massive alterations in the way education is delivered. Syllabuses set out broad areas of teaching that provide students with an understanding of their subject in its totality and their understanding was tested largely by end-of-session examinations. Competency-based learning moved responsibility for learning towards the student by dividing the subject into sub-sets, termed modules or units. Modularisation offers:- easier of access by students of mixed ranges of ability to individual components of courses; flexible accumulation of qualifications over several years; ease of updating in response to technological and social change; the identification and provision of common elements in different courses and the motivation and clarity of purpose that can be engendered by short-term targets. It also simplifies the introduction of distance or electronic leaning. But as Parker (2005) asked in relation to horticultural education this system should not stifle independent and individual initiatives by teachers, termed "lone-ranger" approaches.

Internationalisation European partnerships arranged through European Union (EU) have instituted programmes aim at increasing staff and student mobility. One of the earliest to be established was the Erasmus (EuRopean Community Action Scheme for the Mobility of University Students). The Bologna and Copenhagen Agreements aim at increasing the benefits of a "knowledge society" and the EU has attempted to develop comprehensive European education models (Powell et al. 2012). A key outcome is a change to the bachelors-masters-doctoral degree process with each stage shortened to conform to the basic British-American pattern (3-4 years + 1 year + 3 years) compared with the open-ended approach favoured previously in much of Europe. Now the Member States will create links between their national qualifications systems and the European Qualifications Framework (EQF). A review of provisions and advances resulting from these initiatives as they affect horticulture is provided by Sansaveni (2010). At the Master level for example, some institutions participate in the "International Master in Horticultural Sciences". This is a teaching-network between of University of Bologna (It), Technical University Munich (Freising Weihenstephan, Ger), Humboldt University Berlin (HUB, Ger), Free University Bolzano (FUB, It), AGREENIUM (Angers, Montpellier, Fr), Corvinus University Budapest (Corvinus, Hu) and University of Natural

Resources and Life Sciences Vienna (BOKU, Aut). Each institution delivers specialized courses in specific fields of expertise. Students gain mobility and increased skills.

Vocational and Skills Education An objective is that Vocational and Skills training should be available throughout a professional's career in what is now termed 'life-long-learning'. This is intended to ensure that professionals continuously improve and upgrade their knowledge and skills in line with scientific discoveries and technological developments. Interest in vocational education and training (VET) is worldwide (McGrath 2012). Governments in developed countries (e.g. Organisation for Economic Co-operation and Development, OECD countries) consider VET as a means of increasing the education and skills of their labour forces and hence raising wealth whilst diminishing the cost of social welfare. For similar reasons, international aid agencies view the encouragement of VET in developing countries as a means of moving families out of poverty and deprivation.

Practice-Based Learning The need for practice based learning is regaining prominence in education and training. Frameworks for developing applied learning are emerging (Pridham et al. 2012) and are of particular relevance to subjects such as horticulture. Horticulture has evolved requirements for much broader and deeper scientific understanding related to expanding environmental and social dimensions of the discipline. Thus the provision of horticultural education and training needs to be fit-for-purpose for such students whose professional careers will extend into the 2050s (Dixon 2005a, b, 2001, 1991; Scott and Dixon, 2004) and beyond. Some of the finest examples of the provision of practice based education and training come from botanic gardens and similar institutions. This is seen in the Royal Botanic Garden Kew's Diploma course founded 1963. The advantage of these practice based qualifications is that they attest to a high degree of plantsmanship knowledge embedded in practical skills. Their merit can be increased immensely by linking them with formal science-based degree courses that provide students with a continuum of diploma and degree qualifications, as was devised by the University of Strathclyde, Glasgow and Royal Botanic Garden Edinburgh (Dixon 1993). On completion of these courses, students possessed an array of valuable qualifications attesting to their robust scientific and technical knowledge plus substantial practical abilities in plantsmanship.

Consolidation and Rationalisation National and international financial pressures in many countries have resulted in the restructuring and amalgamation of higher education departments and academic programs. This has led to a loss of horticultural identity that compromises undergraduate courses serving the discipline. Many institutions have consolidated horticulture, agronomy, and in some cases, soil science, landscape architecture, and other disciplines into more general plant science departments and/or degrees. Alternatively they oriented towards landscape design and management.

The User Pays Increasingly, the principle that the user pays is being applied throughout tertiary education and has been in place for at least the past twenty years in knowledge transfer for industrial purposes. The use of student tuition fee mechanisms of various forms brings with it the demands for customer satisfaction in terms of the education delivered and its applicability for future careers.

Distance Education and electronic delivery Across education there is rapidly increasing use of electronic provisions (Gunawardena and McIsaac 2004). This is having effects and ramifications for horticulture as for all other disciplines and it would be a gross error for horticulturists to attempt to avoid it, in fact they cannot because the expectations of students will impose it even in the most conservative and reactionary institutions. Horticultural teaching and learning have grasped the opportunities offered by these facilities (Dixon 2005 b). Electronic technology may be used for simple short courses, individual assessments of teaching and learning as described by Mason (2005), or for extended provision of complete courses. Excellent courses in specialty topics such as arboriculture and turfgrass science have been developed for undergraduates who wish to pursue their studies on a part-time, home-based basis as developed for example by Myerscough College, Lancashire, England (www.myerscough.ac.uk). Courses are now delivered using tools such as the Virtual Learning Environment (VLE) and aspects of horticulture are suitable for Massive Open Online Course (MOOC) developments. These are online courses with unlimited participation and open access via the web. In addition to traditional course materials such as videos, readings and problem sets MOOCs provide interactive user forums that build a community of teachers and students. MOOCs are a recent development emerging since 2012.

CURRENT HORTICULTURAL EDUCATION IN EUROPE

Further Education

An empirical survey of the provision of horticultural education across Europe identifies a broadly similar general model of provision. In general education provided after the end of formal schooling is divided, using the British terms, between Further Education and Higher Education. Further education aims at equipping students with vocational knowledge and skills which allow them immediate entry into workplace careers. They may be partially employed or gain work experience as part of their studies. At the end of their education students should be fitted for technical and technologist posts with competence for practical operations and at the top end of these studies capacities for instructing and managing other employees. Higher Education is provided by universities and aims at providing academic credentials in terms of analytical and reasoning abilities based on research based knowledge. University education should not aim solely at fitting students for careers in a particular industry or profession. The boundaries between Further and Higher Education providers have become blurred over the last 20 years as the former aspired towards gaining degree awarding powers. Institutions which previously offered

solely non-graduate vocational education have been allowed to become universities in their own right. Educationally, this has been a response to demands that progression should be open-ended allowing the students scope for logical progression from one level to the next without artificial barriers. In this process institutions which previously concentrated on agricultural, horticultural and forestry courses as mono-technics have taken on a much broader remit and become forms of poly-technic. Economic forces frequently result in rationalisation and re-organisation where by institutions have amalgamated. In these processes horticultural courses tend to be lost.

Northern European countries excelled at producing students with vocational education combining a sound knowledge base with practical competencies. This culminated in experienced Masterships (*Meister*) qualifications which are highly regarded. In Austria for example, there is a basic apprenticeship system for students aged 15 - 18 / 16-19 years which may also include adult learners. This combines working in industry with periods of academic study. At the end students gain "*Gärtnerischer Facharbeiter*" (Qualified Horticulturist, literally). Within this are specialisations in for example vegetable production, ornamentals or landscape and garden design. Following a further three years of practical work in horticulture and additional qualification-courses there is an Examination for Mastership in Horticulture where successful students gain the award of "*Meister*" ("Mastership"). Professionally this is the highest educational level. In recent years this option became interesting for vocational and academic graduates as well. The "Mastership" is compulsory for those who wish to become teachers of apprentices. A variation of this system is offered by the Technical School for Horticulture (students aged 15-19 / 16-20). This offers a four year course one of which is taken in industry. Successful can take the "Examination for Mastership in Horticulture" after another year of practical work in the horticultural industry. A variation is the Higher / Secondary School for Horticulture entered after at least 9 years of regular schooling at age 15/16 - this school with a minimum of five years spent in Vienna at the Schönbrunn. After three years in the professional field the students can apply to be graduated "*Ingenieur/Engineer-diploma*" (Ing.). There is a parallel institution in Vienna – Klosterneuburg which specializes in viticulture and pomology. Both institutions are research centres in their fields of expertise. The research agendas are under the responsibility of the Federal Ministry of Agriculture, Forestry and Water management while the educational agenda is under the responsibility of the Federal Ministry of Education.

Germany has a broadly similar system where initial horticultural training is carried-out in something equivalent to vocational schools where most teachers have a basic academic degree. The courses are completely dedicated to practical training. Basic sciences are taught at a rudimentary level. In such schools all students are doing apprenticeship work in horticultural enterprises and are released for block course over a three year period. In the same colleges students may continue to become a master craftsman (*Meister*). This requires a further year of study preceded by two years in

industry. The numbers taking these courses is dwindling. Technicians are also trained in these colleges also in diminishing numbers. A relatively new development is the “*Duale Ausbildung*” where students work for 15 months in a horticultural company and subsequently start a degree course (B.Sc. - 7 semester course). During their university vacations they continue working with the horticultural company. The huge advantage is that the students get a reasonably good practical qualification and a university degree. Only Universities of Applied Sciences offer these courses. Similar but less nationally structured arrangements exist in other parts of Europe notably Spain, Portugal, Denmark and Sweden. Prior to modularisation Great Britain had a logical progression through certificate, diploma and higher diploma courses each of which contained requirements for participation by students in industry as a formal part of their education and training. This has been retained by some providers but elsewhere higher diplomas have been replaced with foundation degrees which are gained in a two year study period. Additionally, there are fewer opportunities for students to gain industrial employment or work experience. Various models of apprenticeships have been introduced in the last few years which aim at remedying the lack of practical competence in students as Great Britain tries to grapple with a traditional difficulty in recognising the merit of practical skills. Most courses relate to aspects of environmental and social horticulture. Few if any provide instruction related to crop production. In terms of population size and relative impact of its horticultural industry the Republic of Ireland and Northern Ireland combined is possibly one of the best education providers and can relate its structure to both the EU system and that employed in the United Kingdom.

Higher Education

Probably the most effective graduate programme in horticulture was that established in The Netherlands. A national agricultural and horticultural research and education system was established in 1876 (Spiertz and Kropff 2011). Initially, the emphasis was strongly on education and applied research. The higher professional school for teaching agriculture, horticulture and forestry at Wageningen and this was admitted to the status of technical university ('Hoogeschool') in 1918. Complementary to the university, a wide array of discipline-oriented research institutes and commodity-oriented research stations were founded; especially after World War II. Associating these with university education and providing students with opportunities for study in specialist locations where particular sectors of the Dutch industry were concentrated produced graduates with extensive and intensive practical and academic knowledge that allowed the Dutch horticultural industry opportunities for gaining commercial pre-eminence worldwide. A radical restructuring into one organization for research and education forming Wageningen University and Research Centre occurred in 1998 and provides for the needs of modern scientific approaches while still offering to produce wealth creators for industry.

France has recently developed a similar model to the Dutch system which is capable of serving the needs of their industry. Where students gain bachelor degrees following 3 years study, they can apply for a master degree (in 2 years). The French have retained the system whereby at high school and bachelor levels, the students' orientation can be general or technical (agri-horticulture for example). The French higher education system (master-PhD) includes two types of public and private institution:- either universities which have no selection at the entrance and offer generalised studies or the *Grandes Ecoles* or elite colleges. These are more professionally oriented with an entrance selection, they deliver the MSc in for example electronics or agriculture such as that offered by Agrocampus Ouest at Angers. This is the French National Institute of Horticulture and Landscape and is the only institution specialized in horticulture in France. They deliver the degree MSc (Ingenieur) in horticultural sciences specialized in: fruit & vegetables, food production and markets; optimisation of ornamental horticulture or sustainable plant management in horticulture and landscape. Connections with industry are strong and the students spend alternating periods between a company and Agrocampus Ouest). Students studying for Bachelor degrees in 3 years take specialised courses directed at:- Management of horticultural companies and Specialized Crops at Angers, or the Management of fruit and vegetable post-harvest at Montauban (Toulouse), or Production and commercialization of aromatic and medicinal plants in Marseille. The French also have Technical High Schools of which there are about 100 institutions delivering two-year degrees in Production Horticultural graduates become "superior technicians" going to work as growers or heads of production in companies. Below that are vocational schools from which students become practical technicians. This system is providing a wide variety of career options in both the private and public sectors.

In Germany the established universities (Berlin (Humboldt), Hannover and the Technical University (TUM) in Weihenstephan (Freising)) offer an Horticultural B.Sc. While the Applied Sciences Universities (UAS) at Berlin, Erfurt, Dresden, Osnabruck, Geisenheim, and in Freising-Weihenstephan also offer degrees in horticulture. But these may not offer equivalent academic rigour since the courses are shorter. This appears to parallel the divide in Great Britain between two-year foundation degrees (2-year) and full honours degrees (3 year). A multiplicity of institutions is listed by the UK Universities Central Admissions Service (UCAS) as offering degree level qualifications in horticulture and closely related courses. Mostly, these provide courses which are environmentally or socially orientated. As with further education there is little tuition in horticultural crop production. None of the research-based universities now offer full courses in horticulture although there may be some modules which contain relevant topics. Again Ireland (Republic and Northern Ireland) has a more comprehensive provision for graduate qualifications in horticulture. Traditionally European universities offered Masters degrees as their major qualification, although this is changing under the Bologna Protocol many providers still offer this qualification route. Information obtained from Portugal, Spain,

Denmark, Croatia and Sweden indicated that students are still offered opportunities to gain Bachelors and / or Masters level qualification in horticulture.

Private – charity provision

The Royal Horticultural Society (RHS) in Great Britain has administered courses for over a century which delivered by public sector education institutions. These extend from very basic skills training certificate to the graduate level Master of Horticulture (M. Hort.). The latter qualification testifies to knowledge, business capabilities and competence comparable with a Master of Business Administration (MBA). It is a very demanding course with no assistance from educational institutions the students are very largely self-guided with some electronic assistance from tutorial staff. These courses are gaining popularity especially the M Hort because it relates with industrial demands and its cost is less than that required by universities.

HORTICULTURE'S IMAGE PROBLEM

Bogers (2006) *inter alia*, suggest that horticulture has a poor image, with the negative perceptions associated with poor remuneration relative to levels of profitability in the industry, the extent of manual work, and a lack of awareness of the range of career opportunities (Matthews and Falvey 1999). This image was cited by academic programme administrators as the most important factor leading to lack of interest in agricultural sciences as a career by USA high school students (Anon 2009b). Public understanding of horticulture is poor and many people are unaware of where their food originates from and the multi-faceted nature of the horticulture industry. Horticulture was listed as the second most “useless degree” by Newsweek magazine (LaWell 2011). The returns from the European Survey indicated that these perceptions are shared by administrators in higher education across Europe. Comments from Germany, Portugal and Austria in particular illustrated that horticulture is regarded as a “low-grade” subject possibly too closely related to industry and the generation of companies’ wealth. There is a strong tendency for horticultural departments to be closed or amalgamated with biological science departments. In countries such as Great Britain horticulture is not seen as an academic subject which can generate significant returns in the research evaluation exercises which have operated since the early 1990s and consequently it is not worthy of funding. Bogers (2006) identified that, from the European perspective, stronger advocacy measures of the horticultural sector are clearly needed and the industry should take responsibility for making its educational needs clear to government and other funding bodies.

FITNESS-FOR-PURPOSE

The first question here is “what is the purpose of horticultural education?” Why should society indulge in providing education in horticulture. This means that

horticulturists must demonstrate to the general tax-paying public that there is some kind of need for them. Contrast this situation with the perception of the general public for medical doctors, they have no difficulty in demonstrating that they are required by society. Hence in turn university administrators have no problem in accepting the need for medical faculties and bio-medical research parks. Horticulturists must be much more astute at telling people why it is necessary that they should exist. The urbanised general public appreciates the end products of horticulture in the supermarkets, parks, historic gardens, botanic gardens and macro-landscapes but does not connect these with the people who make them possible (Doyle et al., 2009). The International Society for Horticultural Science (ISHS) publication *Harvesting the Sun* (Hewett et al., 2012) makes the case very eloquently but this needs to be constantly repeated.

Making horticultural education fit-for-purpose now requires a far wider and deeper perspective compared with what was sought half a century ago. This is true on all fronts, Production, Environmental and Social. The discipline has expanded its frontiers and at the higher levels demands people of unusual intellectual capacities. It is no longer tenable to consider horticultural education simply in terms of plant related knowledge with a sprinkling of business or environmental awareness added for good measure.

The next level of questioning needs to be on the topic of “what do students of horticulture need to possess?”. Industry will very rapidly provide a list of characteristics required such as: Science and technology knowledge, information and communication technology abilities, numeracy, literacy, company understanding, market understanding, business acumen, people skills, innovation, drive, community and environmental awareness, social awareness, scoping skills, knowledge integration skills.

IS HORTICULTURAL EDUCATION FIT-FOR-PURPOSE?

The emphatic answer is No! If it were Fit-for-Purpose then there would be no problems in convincing students that horticulture is a career path worth taking and it would be straight forward in gaining money and support for teaching and research departments. If horticulture wants to survive academically then it has to improve its abilities for convincing the public and politicians that it is worthwhile. Time to do this is getting short because currently we have lost or are losing the “teachers needed to teach the teachers”.

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