

*Benefiting Humankind Through Improved Application of Poplar Research  
and Technology*

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Thank you, Antonio, for the kind introduction. I am honored to be here this morning to open our technical session with an address to the importance of the work that you and I do in guaranteeing the future of the world's poplar resources and, perhaps more importantly, the well-being of those who depend upon these resources for their livelihood and a quality environment. I believe - and this is the heart of my address - that there is a critical need to bridge the gap between science and field application, and to make more direct, the link between research and a timely response in policy, programs, practice, and education. Before going on, I also want to extend my appreciation to Jim Carle of the FAO, to Eric Teissier du Crois, the International Union of Forestry Research Organizations' vice president of research, and to our conference organizers. Thank you all!

It was a Friday evening when Jim Carle asked me to share my thoughts on the significance of our work in *Populus*, and how vital it is that we effectively put our labors into the hands of those who grow and manage our

world's invaluable *Populus* resources. The following Sunday I was in church, in my hometown of Camas, Washington, and a prayer was offered that was especially meaningful to me. This prayer called for "...all who till the land (to) be blessed with favorable weather, abundant yields, and fair prices so that there may be peace and prosperity throughout the world." It is a simple prayer. But one that drew my thoughts to those who ultimately benefit most from the innovative practices that arise out of our scientific endeavors. As I see it, our greatest contributions will be realized by those rural societies that live closest to the land and are most immediately affected by its quality and its capacity to produce food, fiber, and a livable environment. I know many of you see this: The belief that if, at the end of the day, our work is put into practice in a suitable and thoughtful way we will have made an important contribution to world peace and prosperity.

Agriculture, forestry – our professional fields – they have long been the engines of economic growth in many of our countries. And technological innovation has been the mainspring that has powered the improvements in food and fiber production that have been necessary to keep pace with our world's growing population and material demands for a higher standard of living. According to United Nations' estimates, the world population now

registers nearly six and a half billion people. In 1960, it was three billion. Our world's population has more than doubled in less than 50 years! What a phenomenon! Yet during this time, the daily amount of food available for each person actually has increased from 2,400 to 2,800 calories! Why this quantum jump? How was this done? It wasn't an increase in arable land. The amount of land under cultivation remained essentially unchanged. Instead, it was the so-called Green Revolution that gave us new, high-yield cereal grains and innovative farming practices involving new inputs of fertilizers, pesticides, irrigation, and improved farm machinery. Together they boosted tremendous increases in crop yield. And, our major foods have gotten cheaper to produce; the cost of production of wheat, corn, and rice – by far the three most important food crops in the world - dropped sixty percent in constant dollars during this same period. Agronomists and plant breeders – our colleagues and predecessor - clearly served admirably on the front lines of this “revolution”, helping to shape - through the application of their science - the way in which we tilled our global soil.

Now in tomorrow's world, a favorite science writer of mine – E. O. Wilson of Harvard University – has written that societies will be divided not along lines of culture, race, religion, or politics but, rather surprisingly, by who

embraces science and has access to new technologies and who does not. Is he right? Who can really say? But if he is right, the implications for our world will be far reaching, especially in view of the growing disparity between rich and poor economies, regional overpopulation, and environmental degradation. Moreover, the traditional as well as the new agricultural sciences that address these challenges are becoming more complex and more powerful and, therefore, potentially more divisive if not accessible to our developing and emerging economies. We only have to engage our colleagues in molecular biology to sense how fast their science is accelerating toward greater knowledge and improved technology.

Innovations in these and other technologies – ones in which poplar and willow surely will play a pivotal role - will drive the development of sustainable practices in all countries, regardless of the sophistication of their current farming practices. But this will happen only if someone ensures that scientific discovery is carefully and expeditiously put into practice.

Let me ask if you agree that the time between the discovery of new knowledge and the application of the resulting technology must be shortened. The existing gap can make a huge difference. Let me give you a good example. One of the most remarkable achievements in world food

production was the replacement of open-pollinated corn varieties with hybrid ones. Hybrid corn was developed in 1906 by two American corn breeders, E. M. East and G. H. Shull. The new technology of hybrid varieties increased yields by upwards of 35% and eventually freed-up about 12 million hectares of land in the United States for the cultivation of soybeans that, along with corn, wheat, and alfalfa was destined to become my country's 4<sup>th</sup> most important crop. What a scientific achievement! Instead of using open pollinated varieties and growing 30,000 plants on an hectare, farmers were now able to cultivate hybrid varieties and produce much more grain by growing 74,000 plants on each hectare. The new hybrids also came with superior resistances to drought, disease, and lodging.

But how was East and Shull's important new discovery of 1906 moved into American agriculture? Slowly. Very slowly. In fact, it wasn't until some 14 years later in 1920 that hybrid seed first became available, and then only in very limited quantities; less than one percent of the total seed sales that year were of the new hybrid type. Farmers and amateur seedsman – the precursors of today's large seed firms – were the makeshift method by which hybrid seed was initially disseminated. Ultimately, 40 years past before hybrids were readily available throughout the United States.

I believe we could have done better than this. And later we did with sorghum. One of the earliest hybrid sorghum varieties – RS610 – was developed in 1958 and breeders immediately put it into demonstration plots in head-to-head competition with the best locally-adapted, open pollinated varieties so as to promote its rapid adoption. The result: A marvelous demonstration of hybrid vigor. The yield of hybrid sorghum was shown to greatly exceed the best open-pollinated varieties and – and this is remarkable – the sorghum industry was fully transformed with hybrids in just 3 years. A viable seed industry that had developed in the wake of the hybrid corn experience and was now in place to grow, clean, bag and sell hybrid seed. In essence, the sorghum industry followed the path opened by the corn industry. Today, it remains a powerful example of how important it is not just to create new knowledge but, rather to launch new knowledge and its technology effectively and quickly into practice.

Now I'd like to ask you to consider the following proposition. Just as we are recognizing the importance of sustainable farming practices at this conference, I suggest that, as scientists, we also ought to think in terms of how we can best sustain our research. We ought to contemplate how the

effective application of our research throughout the world will ultimately guarantee the continuity of our research programs.

In my country, forestry research - including poplar - historically has been conducted by the public sector. However, a continuing decline in public funding is interrupting the flow of new technology into the poplar-growing industry. Yet, with another domesticated tree species – loblolly pine - several regional university-industry partnerships have successfully weathered these changing times and have maintained momentum in research and development. Let me give a good example. In the southeastern United States, the N. C. State Pine Tree Improvement Cooperative has literally remade the pine-plantation industry over the past 50 years by developing inventive ways that emphasize the industrial transfer of new technology. For example, elite breeding populations are created out of the domesticated pine genetic resources to speed the development of new varieties through accelerated breeding and testing. Wood production has been increased 30%; mean annual increments of 21 cubic meters per hectare are now achieved with the cooperative's best genetic material. The emphasis on genetics - a science – combined with tree breeding - an application of that science - is an approach that is paying big dividends on a shared investment in forest

productivity. Virtually all forest products companies and all state forestry agencies in the area now have active tree improvement programs that participate and benefit. Some programs are entering their third generation of selection and breeding. But more to the point, it is the integration of university scientific expertise and inventiveness with industry expertise in advertising and applying new technologies to plantation management that has sustained research for over 50 years and has led to such a substantial changes in pine productivity.

Could a similar type of partnership thrive using poplar and willow? Perhaps operating on a global scale? I think it could, and I think now is the time for us to begin discussing such a partnership. Doing so will forge a sustained connection between our science and its application that is so vital to the welfare of a growing and, in many cases, an impoverished world.

Risto Seppala, IUFRO's president, spoke of a vision where a science-based approach is used to perfect the way in which the world's forests are managed under a sustainable precept. It is a great vision and one in which poplars and willows hold a special place: No other genus is so intimately tied to humankind with its unrivaled place in environmental amelioration, agro-

forestry, and its traditional uses in paper, furniture, veneer, energy and, let's not forget, the beauty they bring to our world. Inarguably there will continue to be so many varied and diverse opportunities for scientific investigation and research partnering, but I believe that the future of poplar and willow cultivation will be written primarily in terms of the degree to which the technology of advanced germplasm is made available throughout the world. Building a center that ensures the worldwide availability of improved *Populus* germplasm has long been a personal passion of mine. As chair of IUFRO's *Populus* genetics working unit, my principal goal will be to ensure that quality genetic material is available to emerging and advanced poplar programs around the world. I see as my key responsibility, the creation of a partnership that effectively coordinates the future breeding, testing, and deployment of improved genetic material. You can look for regular updates on the state of knowledge in *Populus* genetics using IUFRO's Global Forest Information Service.

In closing, let's not forget that we are the leaders to whom the world's scientific and agricultural societies will turn for guidance in pursuit of a brighter future. Working together with science as our tool, I believe we can play a pivotal role in actualizing the simple prayer I referred to earlier:

achieving peace and prosperity throughout the world. Thank you for your time and attention. It's been a privilege to share my thoughts with you.