

## **The Near Future of Agriculture: Opportunities for the Youth**

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### **Summary**

A large number of the challenges to agriculture and farming that will need to be resolved by 2050 will need to be met by today's youth.

The challenges today are the urgent need to eradicate hunger and extreme poverty. However, in addition, agriculture and farming faces many challenges in the near future. Some of these, as cited on many platforms, include feeding a possible human population of 9 billion people by 2050. A majority of this population will live in large urban conglomerates. This is while agriculture has to cope with climate change, diminishing access to natural resources such as fertile land and water, loss of agricultural biodiversity and rapid trans-boundary spread of diseases and pests of agricultural importance raising concerns of food safety, nutritional security and human health and highly competitive global markets for agricultural commodities etc.,. However, at the core of all challenges, is the issue of the sustainability of agriculture and farming now? And, what can be done to ensure sustainable agriculture in all its dimensions in the near and long term future? And, how will the young agricultural professionals meet these challenges? And, what are the opportunities do they have?

These are questions that the presentation examines and suggests answers.

The young agricultural scientist and researcher now needs to become an individual which has at least the following 4 characteristics of being a trans-disciplinarian, scientist/innovator-entrepreneur, dealer in complexity and an internationalist to meet these challenges. And having these characteristics will enable her/him to make use of the new opportunities that are emerging in agriculture.

The opportunities the young scientist in agriculture with these four characteristics has are in leading the "evergreen agricultural revolution" which is to make agriculture and farming sustainable in its entire meaning while feeding almost 9 billion people projected in 2050. She has opportunities in dealing with the complexity of this new agriculture which use land, soil, water, energy etc in an eco-friendly and sustainable way and in bringing in new agricultural knowledge services and technology related enterprises that are global in scope.

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### **The Challenge**

A large number of challenges to agriculture and farming will need to be met by the youth today. Those who are now about 25 years old will be on the verge of possible retirement around the age of 60 years in 2050.

The challenges today are the urgent need to eradicate hunger and extreme poverty. However, in addition, agriculture and farming faces many challenges in the near future. Some of these, as cited on many platforms, include feeding a possible human population of 9 billion people by 2050. A majority of this population will live in large urban conglomerates. This is while agriculture has to cope with climate change, diminishing access to natural resources such as fertile land and water, loss of agricultural biodiversity and rapid trans-boundary spread of diseases and pests of agricultural importance raising concerns of food safety, nutritional security and human health and highly competitive global markets for agricultural commodities etc.,. However, at the core of all challenges, is the issue of the sustainability of agriculture and farming now? And, what can be done to ensure sustainable agriculture in all its dimensions in the near and long term future? And, how will the young agricultural professionals meet the challenges? And what are the opportunities do they have?

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In my opinion, the young agricultural scientist and researcher now need to become an individual which has at least the following 4 characteristics to meet the challenges. And having these characteristics will enable them to make use of the new opportunities that are emerging in agriculture.

#### **1. The New Trans-Disciplinarian**

The food crises of the 1960s were met by a set of disciplines derived from application of genetics, statistics, biochemistry etc. The complex challenges of the near future will need to now consider new scientific trans-disciplines. We will need to use biotechnology, nanotechnology, information and communications technologies, space sciences and materials sciences, amalgamate and mix them appropriately and use them in innovative ways to resolve the new challenges. And what does this mean for the young agricultural professional today?

Translated, the young professional will need to embrace firmly, pioneer and train *on their own* in the new trans-disciplines at every opportunity. They will not have mentors, guides and teachers for these new trans-disciplines.

For example, the young professional who wants to develop new varieties of a crop that can cope with temperature increases will need to mine “big data” for genes that contribute to coping with

higher temperatures and simulate the performance of new crop variety in a super computer prior to using biotechnology and nanotechnology tools to produce the seed or plant. The young professional may also want to use geographical information systems to demarcate areas where the new variety will optimally perform and use new materials developed through application of material sciences to create ambient environments with appropriate soil nutrients and water use.

The young professional will then also need to contribute to the formalization and institutionalization of these new trans-disciplines in the society and make them relevant and useful for the local communities. This, in turn, would mean defining the trans-disciplines through documentation such as writing books (or blogs), getting them accepted to be taught in School and University Curriculums, setting up new amalgamated laboratories and departments in existing academic or in new institutions, become and train future researchers and teachers and bring innovations that contribute to the communities that support the Institutions.

The Norman Borlaugs and Yuan Longpings of the future will be those agricultural professions who harness and contribute to establishing the new Trans-Disciplines.

### **The emergence of Scientist-Innovator-Entrepreneur**

Till the middle of the 18<sup>th</sup> Century, before the so called industrial revolution, the scientist pursued science largely to fulfill his (or rarely her) academic curiosity. The pursuit of science was not a career but a pastime, mostly of the rich. In the middle part of the 20<sup>th</sup> century, a new concept evolved where the pursuit of science was considered also as being a pursuit to contribute, largely altruistically, to the material development of the human race. The scientist was linked to development and progress of human kind and nations. In the 21<sup>st</sup> Century, this has further evolved into another pathway. In addition, the scientist and the innovator now has to consider herself as also an entrepreneur, be it to get funding for research or an innovation or to sell ideas and expertise for private income.

This new pathway has resulted in many thousands of scientist-innovator-entrepreneurs. While Bill Gates and Steve Jobs are very famous and rich because of their scientific and technical expertise and generate or lead innovations, the new trans-disciplines also offer avenues for the young agricultural professional to be an entrepreneur. For example, the “agricultural or farm productivity optimizer” who can optimize productivity at the national, regional, provincial, village, farm or even plot level or the one who specializes in optimizing energy, water or any other resource use at various levels. The trans-disciplines coupled with the new pathway for scientific endeavor bring a myriad of new opportunities for the young agricultural professional.

Another example of a new entrepreneurial area could be in developing “apps” that can be used by farmers and small and medium entrepreneurs as also consumers. These apps, using tools like “phablets” (phone tablets), cloud computing based and use 4G and other higher broad band connectivity. They could be map based using public geo-spatial data and include a wide variety of functions such as for logistics and transport of farm and agricultural inputs, produce, forecasting, traceability, market price, consumer preferences and targeting etc at a very local level say of 10-15 kilometer radius in rural areas and lesser in urban areas.

I have personally experienced two young people become agri-information and knowledge services entrepreneurs. One, a friend of mine, Sunil Khairnar, developed AgriWatch (<http://www.agriwatch.com/>) that now provides information on bulk agricultural commodities. He sold AgriWatch for almost USD 5 million. The other, Sumit Patel, collected and created a database of Poplar and Eucalyptus plantations on small plots in Kheda District of Gujarat which has now evolved into a major agro-forestry business.

There will be many among you who can use the changes that are occurring in technology and in entrepreneurship and become very successful.

It is for this reason that YPARD, GCHERA and GFAR stressed that the capacity to develop entrepreneurship should form a key component of future agricultural education.

### **The Dealer in Complexity**

Agriculture and its management has always been complex. However it is only in very recent times where the complex nature of agriculture is being recognized. Along with this recognition is its corollary, that simple solution to resolve complex agricultural problems do not work. However, the new trans-disciplines also give the tools and techniques to deal with complex problems and offer more holistic solutions.

The opportunities for resolving complex problems are in many areas of agriculture, agricultural development and research and farming. For example, solving the complexity of supply chains for fresh agricultural products to specific consumers in urban conglomerates or of making a national agricultural research system deliver an outcome necessary for agricultural development of country in time. So the recognition of complexity in and of agriculture brings new opportunities for the young agricultural professional, the opportunity of being a specialist in dealing with and resolving complex problems with new tools, techniques and processes.

The young scientist and technologist of today will now need to build new capacities to tackle complexity through complex systems theory and complexity management and these are new areas for their future. Unfortunately, current educational systems at primary and secondary levels do not prepare those who enter agricultural sciences to be able to fully understand and use these new paradigms. The young scientists now need to strive for changes in educational systems so that they meet the needs of the near future.

### **The Internationalist**

Agriculture is ever increasingly becoming globalized. The driving force is of course trade in agricultural commodities but contours of new businesses in agricultural technology beyond seed and machinery and knowledge based services are emerging. For example, in India, call centers and knowledge based services that manage farms remotely in Canada and USA have emerged. Agricultural and Farming experts use new information and communications tools including closed circuit video, sensors etc., to monitor farms at plot levels and intervene with appropriate actions.

This requires not only understanding foreign farming systems but also legislation and standards such as for biosafety, food safety, traceability and good agricultural practices but also foreign languages, culture, societal norms, local human behavior etc. It is possible that very soon, higher agricultural Institutions will need to include subjects that enable their graduates to be “Internationalists” in farming and agriculture and teach foreign farming systems, their management, technology, knowledge and skills needs.

### **Conclusion**

There are exciting times for the young agricultural professionals in the offing. The key challenges for them are in embracing new areas of research and specialization, becoming entrepreneurial and not be afraid of complex problems and of an ever increasing need to understand foreign environments and needs. They need new skill sets and because they have no one experienced to share these skills with them they will have to develop these new skills themselves. This is another opportunity the near future of agriculture brings to them.

I wish you all the best. Thank you.