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Possibilities of new technologies: Information technology

R. Rabbinge

**Department of Theoretical Production Ecology
Agricultural University / Scientific Council for Government Policy**



INTRODUCTION

Agriculture may be defined as the human activity that produces organic matter for food, feed, fiber and fuel with the sun as the major source of energy and land, water, nutrients and labour as the other components. For ages agricultural methods have improved through trial and error. The resulted in an increase in agricultural productivity per unit of acreage and per man with 1-4 kg grain equivalents per ha per year. In the beginning of this century that rate of increase accelerated and since a few decades yield increases vary between 50 and 150 kg of grain per ha per year. Since the World War II two 'green revolutions' marked by a discontinuity in rate of increase occurred. The first immediately after WW-II in the industrialized world, and the second 20 years later in Asia and South America. These green revolutions were caused by the synergism of knowledge from various disciplines, and the possibilities to apply that knowledge and insight in the farmers fields.

The evolution of agriculture from trial and error into a science based activity took place in only three decades. Agronomy is more and more based on insight in the basic processes rather than on experiments and experiences on system level. More and more Theoretical Production Ecology is used in agronomy as an interdisciplinary science that gains insight in the functioning of living production systems and uses that information to manipulate and explore those systems for human purposes.

Theoretical Production Ecology bridges the gap between the various basic sciences that study the physical, chemical and physiological processes that govern growth and production. Models may be used as an integrative tool. They help to make clear how specific and detailed information at the level of biological processes may be used to understand the functioning of a crop at system level. Thus simulation models can bridge the gap between the specialists and the generalist. Growth and production in agricultural systems normally takes place under conditions where various factors play an important role. Growth and yield defining factors such as incoming radiation and temperature and the crop characteristics (physiological, optical, geometrical and phenological characteristics); growth and yield limiting factors such as water availability and soil fertility,

2. Target selection for information technology

Communication technology, has mushroomed during the last decade. The same holds for data banks, or library systems. They are not discussed here extensively. The possibilities of these technologies are nearly unlimited. Communication technology (fax'es, E-mail) has been developed all over the world and is now widely accessible. Three target groups can be distinguished for information technology in agriculture: research organisations, farmers and policymakers. The target group "research organisation" may have access to the communication technology. It is vital for any research organisation to have sufficient access to these newly developed facilities. The costs decrease rapidly, so that within a decade all NARS will have access to the mainstream of communication channels. The availability of new communication technology has also increased the access to the big databanks and library systems.

The end user, the farmer, the ultimate adressant of research efforts is not in the situation that he or she can use the communication channels and sources of information. The technical possibilities are present, but their use depends on accessability, costs and knowledge level of users. Agriculturists/farmers may use various sources of information to improve decisionmaking. However this may hold for farmers in the industrialized world, it is definitely not yet the situation for farmers in the developing world. It will take a few decades before farmers and their organisations in the developing world will be in a comparable situation as the farmers in the industrialized world. The third target group for the information technology is the policy maker in agriculture and agricultural research. They have access to all types of information technology but are not fully using the possibilities of the technology yet.

3. Technology considered

The technology considered comprises basically three major groups of systems. 1. Communication technology; 2. Information technology, such as data banks, library systems etc.; 3. Computer technology. In all cases the hardware is readily available and used at various places. However,

to use the technology. It is for this reason that there should be a strong emphasis on training NARS in the use, development and application of information technology. There is no need to concentrate the basic service industry at the NARS but the CG-system as a whole should try to expand and intensify its activities in information technology. Information technology is not as asset that can be bought and used instantly. Therefore promoting hardware without delivering software and the training facilities to use them is useless.

Question 3 Will the technology by its nature tend to favour specific groups. Large versus small farmers, resource poor farmers, female led households.

Answer There is no technology completely neutral. This is definitely true for information technology. This technology will be favoured by rationalizing farmers. For small farmers, without any training or access to training the possibilities of using this new technology are very limited. For the research organisation, though, there are many possibilities and it is very clear that NARS and extension organisations should be stimulated to implement information technology in their activities.

Question 4 What new developments are anticipated in this field and what is the time frame of such developments? What are the main problems to overcome before these developments can materialize?

Answer In agriculture in the industrialized world, but also in many countries of the developing world for example in Asia and Latin America there will be a rapid implementation of information technology. The new technology may help in decisionmaking at farm level and ultimately also for tactical decisionmaking at crop level. Although this will not be common practice, there will be widespread use and application of the information technology in agriculture before

which combinations of Geographical Information Systems and crop growth simulations models are used to evaluate the potentials of various forms of landuse are available. They enable the development of scenario studies that may guide strategic decision making of administrators or policy makers.

Question 5 What is the most appropriate institutional level for the use of this technology; regional or national?

Answer There is no clear appropriate level. At each level the use of information technology seems appropriate. The objectives, the questions are different at various levels and therefore the used technology may be very different. However at all levels there are potentials.

Question 6 What division of labour is recommended for further research on this technology.

Answer In agriculture private enterprise supported by agricultural research will develop the appropriate technology. Implementation will take place through extension. It will, however take a considerable time before the spread in developing countries will take off. There is at this moment not a clear need, but that changes very rapidly. For example in many countries in Asia there will be a rapid introduction of the technology. That should be guided in one way or another. The CG-centres may help in that.

In agricultural research the introduction of the new technology should be guided by CG-centres supported by advanced institutes mentioned above such as IBSNAT and SARP Networks. There can be a clear division of labour. The advanced institutes should develop the modules and do the basic research that are needed by CG-centres and by the NARS. NARS and CG-centres should become familiar with the

When properly introduced, guided and used, information, technology has much to offer for developing countries in agriculture and agricultural research.

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