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Agricultural Crisis in Context: A Reformational Philosophical Perspective

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The Agricultural Crisis in Context: A Reformational Philosophical Perspective*

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1. Agricultural problems

Our culture, in which science and modern technology have tremendous influence in many fields, including agriculture, is, in comparison with the past, a materially rich culture. Yet it cannot be denied that the problems of our culture are great and that they are growing. At the moment it even looks very much as if the problems of our culture are becoming concentrated in the problems of agriculture.[1] Mountians of butter, lakes of wine, seas of milk, piles of meat, grain silos bursting at the seams, and so forth, speak of overproduction. The reverse side of this technical, economic, and political "success" is the great insecurity and anxiety of farmers about the future, the worsening of animal welfare, overfertilization, impairment of the soil, the appearance of various diseases of the ground, serious disruption of landscape, the deterioration and exhaustion of nature, and pollution of the environment.[2] Because agriculture has been wrenched loose from its ecological biotic context, the tension between agriculture and nature has increased.

Enormous advantages and these problems and threats represent two sides of agriculture, which has undergone changes in recent times. During the twentieth century agriculture has developed more and more in the direction of the rationality of scientific-technical control as expressed in the use of artificial fertilizers and pesticides, in the breeding of animals and plants in the creation of artificial conditions of life, and in the increasing use of technical means. The transition from "agriculture" to "agribusiness"—the so-called industrialization of agriculture—not only put the stamp of science and technology on agriculture but also transformed agriculture's connections with economic and political powers. As a result, agriculture became more intense and larger in scale. In effect, the problems were aggravated.

Concerning the correct approach to the development of agriculture there is in the meantime anything but agreement or unanimity. The confusion is reflected in the discussions of technical, intensive, extensive, integrated, enduring, adapted, biologically or ecologically responsible agriculture.

It is with this "crisis in agriculture" that the present article is concerned. I speak of a "crisis" because we are confronted by an accumulation of problems and because there is no agreement con-

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cerning the course that should be followed to resolve these problems.

The crisis is discussed in agricultural circles. Scientists, engineers, and politicians have joined in the debate. The Agricultural University in Wageningen is making a contribution. The main point to come out of the discussions is that there is a need for an integrated approach to agriculture and its problems. And rightly so, since an unintegrated, fragmentary approach will not work in the long run. In a widely discussed report[3] published by the Scientific Council for Government Policy (WRR) in the Netherlands, integration means emphasizing the coherent connection between a permanent, technically highly developed agriculture that is conservative in its use of energy, basic materials, nature, and landscape. I believe, however, that this view of integration is too narrow. Because of the nature and scope of the problem, we need a broader approach. We must examine the entire, interwoven fabric of a variety of cultural activities such as science, technology, agriculture, economics, and politics. But above all, within this broader context, we must examine critically the key role of science, and of technology based on science. For given the great importance of scientific-technical control in agriculture, it cannot be assumed beforehand that the causes of the crisis do not, in part, lie there.

From the perspective of Reformational Philosophy, I would like to contribute to the discussion. The problems signalized in the development of agriculture could have something to do with an implicit prescientific motive *in* science and an implicit prescientific view *of* science, and with their structural consequences for the scientific-technical control of agriculture. It looks very much as if there is a blind spot in agricultural circles respecting such preliminary questions. In this article I want first to challenge the silence surrounding the religious-philosophical backgrounds. Then, in going on, I want to investigate whether the reformational-philosophical idea of the structure of reality offers a normative framework for scientific-technical control—in coordination with economics and politics—that could provide a perspective for overcoming the crisis in agriculture and make it possible to speak of a responsible, meaningful direction for the development of agriculture.

2. Technicism

In my search for the causes of the problems of agriculture today, I begin with a discussion of the spiritual-historical background of the development of science and of the modern technology based on it.

Like a growing number of philosophers, I have become more and more convinced that the controlling spiritual force in the development of science and technology is *technicism*.[4] Technicism is our pretension that we can autonomously dominate the whole of reality through science and technology and thereby solve every actual problem and guarantee material progress. Even the problems produced by our technicism are to be solved with the same or with new scientific-technical possibilities. This technicism has come increasingly to dominate the ethos, our basic attitude in knowing and acting, in science and technology. In Western culture the influence of this technicism first found expression in the spiritual movement of the Renaissance. Its influence broadened after the Renaissance, so that it left its mark on Western philosophy and the development of science. Since then the Enlightenment, later positivism, and pragmatism have assured the dominance of technicism in our culture.[5]

Technicism has not always been of equal importance. Its growth and influence have been moderated at one time or another by the Reformation, the Counter-Reformation, and the Reveil as Christian movements but also by Romanticism and more recently by the counter-culture.[6]

To understand the consequences of technicism in technicization, it is necessary to pay some attention to the *method* technicism uses.

We saw that technicism is an effort to create a world that is obedient to man. The method employed we could call that of *deconstruction and reconstruction.* Without taking into account the given order of reality or the rich structure and mutual coherence present in this reality, humanity with the utmost consistency breaks everything down into its smallest components in order self-sufficiently to build reality up again with the help of the elements thus obtained. This "creative" reconstruction of reality in philosophy and science has its aftermath later, in practical scientific-technical control.[7]

Only during and after the Industrial Revolution does technicism begin to unfold in culture. Via industrialization the whole of reality is brought under the sway of an overarching scientific-technical control. Since the middle of our century agriculture too has become subjected to scientific-technical control

and now bears its stamp. People are endeavoring to solve problems old and new with the scientific-technical method.

3. Influence of the Enlightenment

I want to explain the substance and consequences of this technicism by looking briefly at the mind of the Enlightenment. In this movement, which arose in the eighteenth century, the spirit of the Renaissance as the unbounded confidence of people in their ability to renew life influenced the natural sciences. The pretension of human autonomy, of man as Prometheus—needing no God but sufficient to himself—fastens itself upon science. Inspired by the successful development of natural science, the heroic man of the Enlightenment supposes that he can overcome all problems and renew himself and society through natural science.

Influenced by the Enlightenment, via later positivism and pragmatism, the ethos of many natural scientists comes to bear the stamp of technicism. The nature of science is interpreted technicistically. Because no other norm than that of science itself is recognized[8]—for in the Enlightenment the boundaries and limitations of science are lost sight of—the way is left open for an unrestricted scientific-technical manipulation of reality. The results of natural science, which can be expressed in terms of comparative mathematical functions, render feasible the calculation and thereby at the same time the control of reality.

This all-dominating role of scientific thought means rejection of every non-scientific authority. Here occurs the break with God as the origin of all that is. To correctly understand this historical development, it is necessary to see that the definitive break with God is initiated by the so-called *methodological* atheism of science, which means developing science as if God is not there. This did not mean the scientist broke with God in everything, to be sure. Yet God and religion became private matters. For the scientist, belief in God as the Origin of all that is and acceptance of reality as creation no longer had any scientific significance. In science the given meaning and coherence were therefore set aside.

As a result of the secularization of basic Christian convictions, which was by now under way, and of uncritical adaptation to the line of the Enlightenment, in time the power of science was no longer relativized. On the contrary, with the secularization of Christian belief, resistance to the absolutization of science gradually diminished. In that spiritual climate it eventually became possible for positivism and pragmatism to demolish all resistance to unlimited scientific-technical control of reality. Methodological atheism in science led ultimately, via the scientific-technical control of culture, to an atheistic culture. This is to say that the greater the influence of secularized science and technology, the more the whole of reality comes to be regarded as materialistic through and through.

Initially the consequences of this development are impressive. Many are fascinated by it to this very day, so that this development is regarded as a path to unprecedented progress and material prosperity.[9] Yet it is important to discover that from the very outset of this development there was an underlying lack of direction, although this became apparent only later. We have already seen that in the scientific-technical control of reality, science itself is adopted as the sole orientation point. On the one hand, as a result of the break with God, human beings become the final point of support and therein the highest beings in reality. On the other hand, however, from the standpoint of science, human beings are regarded as the result of a materialistic development ascertained by science. "Lords and Masters," but, as the "chance product" of evolution, at the same time victims. Because human beings do not want to accept the consequences of "being-as-victim," their "lordship" continues to dominate. Yet undeniably—and in this we see the lack of direction referred to above—pessimism and uncertainty concerning the problems accompanying the continuing development are having more and more impact.

In the eighteenth century that was still hardly the case, for example, with a materialist such as Dietrich von Holbach. He holds that the world exhibits nothing but matter and motion, that it is an unending chain of causes and effects, and that knowledge of it becomes a key for human action aimed at controlling reality.[10] Many representatives of the Enlightenment were of more or less the same opinion. This is also true of Immanuel Kant, who—though no materialist—was under the influence of technicism nonetheless. With a view to controlling history, he asks if there is no Kepler or Newton to discover the natural laws of history.[11] As an ultimate

objective Kant envisions a union of physics and morality.[12] This means that via instrumentalization, natural science will come to function as a norm of practical action.

When this process grows stronger and broader in culture, and when the problems and threats increase as a result—as in agriculture today—and when we perceive that we can no longer make a self-evident appeal to science for a solution, then we become the dupe of our own culture work, and we are left without a good prospect for the future. Such a dearth of cultural direction is apparent in our time as we confusedly search for a way out of the crisis we have entered in the meantime.

4. Abstractions in science

To understand this outcome better we must see that under the influence of technology, reality has had to adapt itself more and more to the characteristics of science. The instrumental use of science has modelled reality after the characteristics of science. For a good view of the consequences of unlimited, presumptuous scientific-technical control, it is therefore necessary to examine the structure of science.

The principal characteristic of scientific knowledge is its abstractness. When scientific knowledge, given the influence of the Enlightenment, is made a self-sufficient instrument of control and when the reductions that are implicit in science are lost sight of, then these abstractions become, via the irresponsible use of science, characteristics of culture. That is to say that the abstraction of science, because of the inherent reductions, can lead, where there is large scale and unrelenting instrumental use, to the reduction and ultimately even to the destruction of reality and its meaning.

What are the *abstractions* characteristic of scientific knowledge? The way that leads to scientific knowledge has been called the way of *analysis and abstraction.*[13] More goes on along this way than analysis and abstraction—for example, hypothesis formation, experimentation, and so forth. Yet analysis and abstraction are the most characteristic. The scientist analyzes multifaceted reality, breaking it down into various functions or aspects. For scientific investigation he abstracts from the coherence of aspects, one aspect or function (for example, the physical, biotic, economic, etc.). The second abstraction is that the scientist within the context of the first, functional abstraction, sets aside the concrete, the particular or unique given but devotes attention to the general, the universal. The third abstraction is that the scientist distantiates himself from visible, observable reality and turns to the *laws* that *obtain* for this reality. One arrives, for example, at the formulation of a natural law that is satisfied by the phenomena investigated. A fourth abstraction, finally, is that the scientist should be unmindful of his own or others' interests and concerns, which is to say, as Van Melsen puts it,[14] that science must be disinterested.[15]

Within the framework of these abstractions scientists seek to acquire *theoretical knowledge.* From what I have discussed thus far, it can be said that the way of science is the way of the four abstractions. Every scientist has to learn to follow this way in order to arrive at good scientific results. To exaggerate matters somewhat, this means that scientists proceed in science with blinders on, and they must be aware of this. They exclude a great deal from consideration so that what they do investigate may be given painstaking and precise attention. Scientific knowledge acquired through analysis and abstraction is subsequently tied into a *system* of scientific knowledge. This tie is realized through logic. It is for this reason that we also say that scientific knowledge is logically *coherent knowledge.* If this knowledge is then expressed in mathematical relations, which might be called abstraction in the second degree, then—via information technology—scientific knowledge can be manipulated and, ultimately, so can the investigated reality itself.

Only by means of the abstractions in question do we finally attain a good view of the traits and characteristics of scientific knowledge. Scientific knowledge is universal, functional, and, as knowledge of laws, enduring in its validity. These characteristics are, as Van Riessen has correctly observed,[16] *incongruent* with the fundamental characteristics of the fullness of empirical reality. In this reality everything is unique, is tied to everything else, and is constantly subject to change.

Any failure to understand—as in the line of the Enlightenment—that science through its abstractions distances itself from the full world of experience must mean the loss, when scientific knowledge is put to use as an instrument, of a great deal of the fullness of reality. A simple example will serve to

make this clear. In theory we know how to divide four apples among four children at a birthday party. Yet in reality this is never as easy as it seems. One apple is not another and the preferences of the children differ and change constantly. In our arithmetic we ignore the size and color of the apples. Yet in reality such factors are often decisive for the children. Naturally, the simple application of such arithmetic is not of earth-shaking importance. The case is otherwise, however, when the "instrumentalization" of science in agriculture transforms the fullness of reality on a large scale into the abstract, reduced frame works of science. Influenced by technicism, people developed the pretension that through science they can gain perfect control of reality. Every problem that appeared they were determined to solve through science. They decided to subject the whole of reality to their will through science, with a view to reinforcing human power and creating unprecedented and unlimited prosperity. Science was no longer the handmaiden of praxis; it came rather to condition and even to dominate it. That was especially so when the technical-scientific method of control became a willless plaything of economic and political powers. These powers made use of the scientific-technical power of control and thereby strengthened themselves and materialism in culture.

5. Technicization

When that happened on a small scale, the consequences were not yet serious. In the short run "success" even predominated. That is what made it so attractive. The construction of a kind of "counter-creation" in which people would be lords and masters of everything and be assured of unprecedented material prosperity blinded them to what they were actually doing. As the process of scientization and technicization increases in intensity and scope, the negative aspects become apparent and even preponderant. Reality is modelled after a reductive, logically coherent network. Abstract frameworks become so predominant that the fullness of reality is broken up atomistically and functionalistically. This is the deepest background of the dislocation of nature and the pollution of the environment.[17] The result of an unlimited scientific-technical control of inorganic and organic nature can lead ultimately to the destruction of nature. For the biosphere in which we all live is a supremely complex, unique whole. Steady reduction of plant species produces an unstable and thus ever more difficult situation to control. The need for technical control becomes greater. This gives rise to a dangerous, vicious circle.

While many are growing aware of this external danger of scientific-technical control, that control is still far from total when we turn to the influence of such control on farm crops themselves. Consistent artificial improvement of these crops with higher yields has a reverse side in the danger of creating too great a uniformity of the genetic profile. Genetic uniformity means a reduction of the variations in plants. The result, in other words, is genetic erosion and a diminution of the genetic base on which the world's food supply depends. Moreover, new diseases can result in catastrophes—as in the case of Florida citrus fruits—because as a result of the uniform genetic profile and thus of its restricted genetic diversity, resistance to these unknown diseases has been lost.[18] The seriousness of the development is illustrated by the attempts being made to compensate via artifical gene banks for the loss of many natural species of plants that has accompanied this approach.

Intensive animal husbandry confronts us with similar problems. In the bio-industry scientific-technical control of the abstracted functions of the animal has become so absolute that the animal itself in its intrinsic dignity is no longer taken into account. The animal is increasingly regarded as just another means of production. Biochemical processes in the animal that serve the desired production goal are strongly enhanced while life processes that are useless to the production process are reduced to a minimum. Pig breeding, batteries of chicken coops designed for large-scale egg production, artificial anemia in calves produced by means of dark, cramped stalls and an iron-free diet in order to obtain the white meat prized by the export trade, and the over-feeding of geese to achieve the desired result of enlarged livers needed for preparing *pate de foie gras* are the most glaring and painful examples.

The so-called procreative techniques are also a model of technicization. Artificial insemination makes possible the rapid spread of the desired characteristics of bulls. By means of embryo transplants it is now possible to achieve similar results with cows. The process can be accelerated

even more by the technique of splitting embryos. The sexuality of animals and their propagation have been consigned to technicization. Sexuality and propagation have been uncoupled from the animal by technical means. That the essence, the intrinsic dignity, the meaning or the well-being of the animal suffers and that here too genetic uniformity—the effect of a great number of genetically kindred animals—and genetic erosion can occur seems still to concern very few. Unless there is a change in attitude towards our relation to animals and towards animals as such, we can anticipate that the new possibilities of genetic manipulation via recombinant DNA technology will also be condemned to technicization. The point of departure will be not the animal itself or the full relation between human beings and animals but the reduced framework of scientific-technical control and of the utility to be gained for human beings.

When the same method of technicism, namely, the brutish deconstruction of the reality and its willful reconstruction, is applied to society via social sciences oriented to natural science, then society experiences the disastrous consequences. The dislocation manifests itself in fragmentation of the society and isolation of individuals, who thereby become estranged from their original position. Was, and is, that not often the cause of the dehumanization of work in modern factories, and is the same process not affecting farmers at the moment? Many farmers are being deprived of their freedom and responsibility, have to think of early retirement, and feel alienated from their land, their animals, and nature.

This grave process of technicization has its basis, as we have seen, in absolutized scientific-technical possiblities. Influenced by the materialism of producers and consumers, the economic and political powers that are founded upon technical power have strengthened the process of technicization. Moreover, they stimulate overproduction in many ways as well. For the sake of staying in the forefront of "progress," the renewal of scientific-technical control has been caught up in a global upward spiral and in the consequences of the technicization which can be catastrophic.

As a result, the contradictions at the world level are made all the more painful.[19] While forty percent of the world's population lives in poverty and is underfed, in the United States, for example, fifteen billion dollars is spent annually on all kinds of diets for losing weight and—just as indicative of the harsh contrast—twenty-two billion is spent on cosmetics.[20]

In the meantime the powers, assisted in part by the newest information technologies and biotechnology, increase in scale and intensity and become less accessible to scrutiny. Together with the tangible problems of technicization, these powers condition the crisis and its accompanying lack of direction in agriculture. Unlimited scientific-technical control is counterproductive. The consequences of the Enlightenment have become a peril.[21]

6. Dynamics and dialectics

Sometimes people see only a portion of the problems of technicization and never get beneath the surface with respect to a diagnosis and therapy. Such is the case when it is said "the quay will turn the ship" or "damage and embarassment will teach us wisdom" or "we'll learn as we go." The relative truth of these superficial pronouncements obscures the fact that irreversible damage is being done. Just think of the loss of kinds of plants and animals and of the threatening collapse of the biosphere. Moreoever, in the absence of adequate insight—under the pressure, for example, of national and international competition—the danger is great that people will yet again seek the solution to such problems in the acquisition and self-sufficient deployment of the newest scientific-technical possibilities, such as information technology and biotechnology. At first this may meet with success - which makes it so seductive—but in the long run we will be confronted with a reinforcement of the older problems and with new and greater ones.

It is the neomarxists Max Horkheimer and Theodore W. Adorno who, in their *Dialectic of the Enlightenment*,[22] have reached a deeper understanding of the cultural crisis and made clear that in scientific-technical control the "enlightenment" of reason has changed into its opposite and in this way—that is the dialectic—caused blindness and darkness. The dialectics of enlightenment has become tangible in hopeless cultural tensions. Unrestricted scientific-technical power proves to be ambivalent. The power acquired through science and technology turns against us. A self-sufficient science has brought about an increase in power but at the same time alienation from that over which power is exercised. For agriculture this means that

nature, plants, and animals are recognized only to the extent that they can be controlled and produced. In other words, "enlightenment" relates to things and to reality as a dictator does to people. He recognizes them only to the extent that he can manipulate them.[23] People and nature become the victims of such "enlightenment."

If it is true—and it is true—that in its development, autonomous reason succumbs to blindness, then from it we can also no longer expect a meaningful perspective for the future. The lack of prospect and direction will persist as the appeal continues to be made to enlightened reason. But is there really nothing more or different to be said?

In Reformational philosophy the dialectical process is viewed in a different light. The dialectic has its deepest ground in the religious human claim to the absolute self-sufficiency and independence in science and technology. Such human autonomy is, however, a pretension. Reason is not founded upon itself nor can it be its own support. This dialectic goes on to work itself out in an unrestricted power called forth by people which turns against them and nature. But such a process can not last indefinitely because the dialectical cultural tensions evoked in this way remain tied to reality as God's creation. The cultural dialectic is a parasite on God's creation. Thus the unrestricted scientific-technical power of control eventually encounters limits. The existing problems and threats demonstrate that.

In the circle of Reformational philosophers it was Mekkes who expressed this development of the dialectic in such a way that he was at the same time able to indicate a perspective for the future. He says that the original dynamics *of* the creation are converted through the pretension to autonomy into a dialectics *within* the creation.[24] Needed before all else, therefore, is attunement to the dynamics of the creation. This does not mean rejection of science and technology—and, for example, also not the rejection of information technology and biotechnology—as such. In the perversion of the creation in these sectors of culture, a great deal has been brought to light that is of lasting value. That is equally true for much of what has been developed through the scientific-technical control of agriculture. Recognition of the dynamics of creation requires reorientation and renewed reflection on the motive and norms for human activities involving science and technology in culture. Science and technology must be driven from their primary position so that they occupy a place not of domination but of service.

7. Reorientation necessary

As we saw, technicism as the spiritual mainspring in the grand, coherent complex of science, technology, agriculture, economy, and politics is stamped by the motive of *power.* This central motive differentiates itself in science as the motive of *knowledge is power* and in technology as the motive of *technology for technology's sake*, or as the motive of *technical perfection*: what can be made must also be made.[25] In agriculture, harvesting with the help of scientific-technical power changes ultimately into *exploitation* and *predatory cultivation*. Via a materialistic economy in which only the power of money and *material profit* matters, and via a *materialistic politics* the cultural powers are strengthened in a mutual alliance and give the appearance of being fully autonomous. The convergence of the powers proves disruptive of nature and culture in its effect, and human beings are swept along towards catastrophe as a result.

When one proceeds from a recognition that in keeping with God's Revelation we are meant to do his work in culture *coram Deo* and be guided in doing so by the normative character of the dynamics of creation and that we are not, as in technicism, ourselves the center of reality but in his cultural activities should deny ourselves in love towards God and his neighbor, then the motives for the various cultural activities receive a different content. Instead of the central motive of power, in which everything we do revolves about ourselves, we have the central *motive of love*, which produces divergence in our various cultural activities. Thus, implicitly, what ought to matter in science is *growing in wisdom*, in technology *building and preserving*, in agriculture *harvesting and keeping and maintaining*, in economy *stewardship*, and in politics *serving and advancing righteousness and public justice*. The variously qualified responsibilities and their irreducibility are safeguarded. Such divergence leads to a meaningful disclosure—in the sense of development—of cultural activities.

The possibilities that a differentiated elaboration of the central motive of love presents for resisting the diminution, levelling, and reduction of cultural development in the materialistic sense and for

ameliorating or even preventing the problems that accompany such development I shall not expand upon here for all the cultural activities mentioned. Given the dominant role of science and of scientific-technical control in agriculture, I shall focus mainly on a view of science different from the prevalent one. Then, in keeping with that, and by making use of Reformational philosphy's doctrine of structures, I shall go on, as I promised at the outset, to sketch a normative and coherent framework for developing modern agriculture responsibly and at the same time teaches us to see the meaning of agriculture. This perspective is diametrically opposed to the process of technicization described above.

8. Growing in wisdom

Thus the question which must first engage us is that of how science should be valued in a view of life in which there has been no break with the divine Origin and in which the preordained meaning of the reality to be investigated and the coherence of meaning in the diversity of that reality are not disesteemed but accepted.

By *meaning* in this connection is meant that all that is, the beings, in origin, in existence, and destination are dependent upon and directed to God, the Origin of all.[26]

In scientific praxis in which this meaning is acknowledged, the question concerning God will therefore have to be posed again in all seriousness. As a result of abandonment of the connectedness of all that is to God, the distinctive character of things, of entities, is rendered incomprehensible. Beings, people, things, plants, and animals are consigned to a self-sufficient science. Given the influence of technicism, they can be disesteemed and misformed as technicization occurs.

To avoid that, the first consequences will have to be a rejection of so-called methodological atheism. For on the basis of methodological atheism, science is carried on "as if God is not there." This attitude is often accepted even in Christian scientific circles. During the thirties Dooyeweerd fought it tooth and nail. The view of methodological atheism is of course just a variant of the self-sufficient "nature" of the old "nature and grace" scheme. Influenced by positivism, many engaged in scientific research surrender to the so-called objective facts. What, after all, they ask, could be more independent of the Christian religion than the investigation of objective facts? Acceptance of this view as a *fait accompli* Dooyeweerd called an important step towards the spiritual disarmament of Christianity in the field of science. For it would then also have to be accepted that science as "theoretical truth" has an inherent validity of its own. One thereby rejects the divine world order—God's Law as obtaining for reality, Van Riessen would later say[27]—which makes it possible to grasp the "facts" in their structure. This world order—which is the same thing as the normative dynamics of the creation—also guarantees the indispensable mutual interconnectedness and coherence of aspects, which science studies.

Precisely because scientific investigation of the given order of reality takes place within, and because the scientist himself is subject to this order, we recognize that science is piecework. Science as an activity within God's creation can never attain a complete grasp of this reality. The creation is at bottom a mystery that we must respect and that forms an unexceedable limit for science. Taken together, this means that abstract scientific knowledge is determined, limited, relative, provisional, and open.

Implicit in the rejection of the independence of science, moreover, is the acknowledgement that there is room for methodological pluralism and thereby for alternatives in the development of science. To conduct science in the light of divine Revelation does not exclude reason but makes it serviceable to the progressive renewal of science. Yet this alternative science remains equally abstract. However valuable new developments in science may be, they cannot, structurally speaking, be expected to provide the solution to our problems.

Only when living in the Truth and recognizing that the Origin and meaning of reality precede science and color scientific practice (this is attunement to the normative dynamics of the creation) is a technicistic science rejected and is science placed in a correct relation to the fullness of empirical reality. Science needs to be integrated into the fullness of empirical reality, and experience will be deepened in this way. In other words, scientific knowledge serves our *growing in wisdom*. Science thus regarded contributes to increasingly comprehensive insight. Reality is then not abandoned to functionalism or to a meaning determined for it by human beings, such as its *utility* as a functional reality for a

materialistically oriented society.

With that, the instrumental use of science is no longer accepted as a matter of course. The scientization of reality, which culminates in technicization, is brought to a halt. Scientific-technical control and technology are then no longer simply the result of science. Science must not function as the superhighway in cultural action. Enriched by science, a comprehensive insight which fosters responsibility leading to creative, prudent action grants science only the function of a useful service road for practical action, and thus also for the advancement of agriculture.

To obtain growing wisdom and a more serviceable science, we must integrate the abstractions mentioned earlier with pre-scientific experience. In the interpretation of scientific knowledge, we must take account of what stands outside it. That pertains first of all to the abstraction of the functional in relation to the coherence of reality. Justice must be done to the whole of reality, which has more aspects than the one investigated by any particular science. To approach the solution of a problem through a particular science will accordingly not suffice, especially nowadays, when problems have become so many and so complex. A multidisciplinary approach to problems has become mandatory. Yet a multidisciplinary approach to problems has become mandatory. Yet multidisciplinary cooperation as the sum of many kinds of particular scientific knowledge is not in itself a guarantee that justice will be done to the many-sidedness, coherence, and concreteness of reality. Awareness that this is so arises only when it is realized, as the result of contrasting a multidisciplinary approach as a generalizing approach to a specialized approach, that scientific knowledge is marked by more than one abstraction. Thus there is the abstraction of the general, the universal. Often this abstraction is misappraised, that is, universal scientific knowledge is mistakenly identified with knowledge of concrete, individual reality. This reality, however, consists of particular, unique entities. Restoration of the abstraction of the universal contributes to an enriched knowledge of this unique reality, so that this reality is no longer abandoned to this abstraction, nor does science pretend to comprehend and control this uniqueness.[28] Scientific knowledge may in that case also not be exhausted in instrumental use, but must be serviceable to knowledge of and action involving the given particular , unique entities. In this way, for example, recognition of the unity of crops or animals will limit the scientific-technical control of them.

The views of Koningsveld deserve separate consideration in this regard.[29] In order to solve the boundary problems of agriculture, as he calls them, as crisis phenomena, he desires another, new scientific approach. He has in mind knowledge which does not increase what we know but which makes us wiser. From the compartmentalized approach to problems represented by the single-field specialist, he wants to move to an integrated systems approach to problems. This new agricultural science would have to assure that technical development and its societal (cultural, economic, political) consequences are both investigated in relation to each other. This new science would be expected to contribute to both knowledge and the needed practical societal insight.

In advocating this integral approach Konigsveld also clearly wants to address normative questions, since in agriculture human decisions and actions play a central role. He wants to rationalize the norms involved with a view to contributing to the urgently needed wisdom.

The quest for an alternative scientific approach, the plea for multidisciplinary cooperation and integration and for growth in wisdom, are laudatory from my standpoint, as must be clear from what I have said thus far. The problem that remains is that the norm for wisdom is sought once again in rationality, however fuller or broader, more many-sided and comprehensive, this rationality may be. A rationality of social reflection supersedes that of the current scientific-technical dimension. The question concerning the ground of rationality is thereby still answered in terms of rationality itself.

In order absolutely to preclude the self-sufficiency of any kind of rationality whatsoever, Reformational philosophy acknowledges that rationality is imbedded in the given, supra-subjective and supra-arbitrary normative structure of reality itself. This normative structure precedes the discussion of rationality and is therefore of great importance for determining the place of reason and thus of science.

At the same time, it is this normative structure that can offer a way out of the crisis in agriculture, without requiring rejection of science, technology, and scientific-technical control.

9. Integral framework of norms

Therefore I shall proceed to consider this normative structure. This structure—which Mekkes referred to in summary as the dynamics of creation—consists of a great number of normative principles that are distinct from yet coherent with each other. Their direction is not only "horizontal" (or immanent) but also "vertical" (or transcendental). Required of us is that we work these normative principles out responsibly, into norms to function as guides or signposts for responsible cultural action. Troost has described them clearly in the following terms: "In stippled lines and chalk marks God has provided in the normative structure of creation— the principles of creation—the beginning of cultural development. Through our cultural response we may fill in these stippled lines."[30] The development of agriculture is also marked by this response structure.

Taking the way of the normative structure begins with accepting the motive, described earlier, from which we must carry on agriculture, namely, that of *harvesting and keeping and maintaining*. Such "keeping and maintaining" extends to preserving and improving the productivity of the soil and conserving a healthful biosphere, for example. Current agricultural practice, however, has often produced the opposite effect. The perception that agriculture *ought* to fit the given situation in which nature, environment, and landscape are found has been too little present. It means seeking to maintain diversity in flora and fauna and to conserve or create a variegated landscape. Thus modern agriculture should be *adapted agriculture*. Where dislocations have already arisen, as much as possible should be done towards restoration. This means, of course, that I will plead at the very least for a conservative agriculture. Such an adapted agriculture should further a broadening of production accompanied by protection of the landscape and environment. And there is another point: within agriculture itself, that is, internally, there should be an integral approach to the interdependence of the ground, plants, microorganisms, animals, and human beings. Besides being *adapted*, agriculture ought therefore also to be *ecologically responsible*.

When agriculture proceeds from this starting position, biological agriculture and scientific-technical agriculture need not oppose but can complement each other. At the moment they mutually exclude each other. On the one hand, some over-estimate the scientific-technical control of agriculture. On the other hand—often reacting to the perils—others plead for an organic or biological agriculture inspired by a romantic view of nature. This opposition can be avoided and eliminated if the scientific-technical control of agriculture takes into account simultaneously, as it develops, a great number of mutually coherent norms.

I shall proceed to summarize briefly these normative principles and their elaboration into norms,[31] and I shall restrict my discussion of their importance to agriculture and its scientific-technical control of a few salient points.

The *cultural-historical norm* is that of differentiation and integration, of continuity and discontinuity, of centralization and decentralization, of large scale and small scale, of uniformity and pluriformity. The various components of this norm must not be understood as contradictions. To concentrate on the scientific-technical method and agricultural technology on one side of this norm to the exclusion of the other side is to pursue a one-sided and ultimately dangerous course. The problems of agriculture today can be understood largely in terms of a one-sided emphasis on integration, continuity, centralization, largeness of scale, and uniformity. Moreover, this one-sidedness fosters an agricultural development that results in overproduction. Satisfying both components of the cultural-historical norm would yield a more balanced development of agriculture. Then there should also be room for creativity and innovation, which would find expression in new crops, crop rotation, improved quality, new purposes (industrial, for example), and the use of new scientific knowledge and of new methods of working up and processing products.

Where the cultural-historical norm is satisfied, a richly variegated agriculture can arise. But even then the following normative principles and their responsible elaboration into norms must be satisfied.

Agriculture is disclosed and its meaning is at the same time deepened when the lingual and social norm is satisfied. The lingual norm is that of *information*. This means that information must be provided in a clear, public way about every agricultural action or renewal. Only then can those who are engaged in agriculture or who use its products shoulder their specific responsibilities in evaluating and deciding. To this norm is therefore attached the

social norm, namely, the norm of *communication* or interaction. Without open communication, those who participate in agriculture cannot discharge their common and individual responsibilities. Consideration for information and communication means that the responsiblity of all who are involved in the agricultural process acquires more substance.

The economic norm of *efficiency* must also be respected in agriculture, but not one-sidedly. The existing one-sidedness is attributable mainly to the application of an economic science—overly narrowed by the efficiencies of a scientific education insufficiently leavened by the humanities (*beta-efficiency*)—in which only goods that earn money determine what "value" is. Yet we should consider the economic norm in its proper place in the integral framework of norms. We may not apply this economic norm to the production process. We should also deal economically with raw materials, energy, nature, environment, landscape, animals, and even with people, involved with the agricultural process. If we narrow the economic norm to the production process alone, then instead of a good development we get a dislocation of agriculture. If, however—in conjunction with the norms described above and those still to be enumerated—we apply the economic norm on every side, then we prevent any excessive development and the overproduction that accompanies it and we correct the underdevelopment that exists in our dealing with and managing nature. We acquire greater concern for nature and the environment, for scarce raw materials and energy, and we come to realize that to function economically within agriculture is not the whole of human life. Both the farmer and the laborer must be recognized in their responsibility.

The normative development of agriculture is fostered, in the next place, when we do justice to the norm of *harmony.* Because of excessive surpluses, overfertilization, and exploitation we are doing everything but satisfy this norm at the moment. Consideration for it, in continuity with the preceding norms, means that agriculture should grow in a balanced way. This norm means, for example, that new technological possibilities should never be introduced in a revolutionary way. This norm of harmony should also be taken into account in the multifaceted relation of nature, human beings, and culture, and it is of course particularly pertinent in the harmonious management of landscape.

In respecting the norm of *justice*, we must resist every possible injustice that could arise from the development of agriculture. Engineers, advisors, farmers, employees—all must ask themselves if their contribution to agriculture does justice to the plant and animal kingdoms, to the sources of raw materials, to consumers, society, culture, and so forth. This norm of justice belongs to agriculture intrinsically. Where it is ignored, politics must take appropriate countermeasures.

All the norms mentioned thus far are disclosed and deepened when people abide by the ethical norm of *caring and loving*—caring for and loving everything that has to do with agriculture, and in that, caring for and loving the many neighbors as well, nearby and far away, and the many "natural" fellow creatures. Where love creates a tie only with the scientific-technical control of agriculture, however, people get so far off track that the situation even becomes threatening. If this norm is not respected in all its facets, the farmer becomes increasingly estranged from his land, from nature, and from the animals.[32]

The final norm which scientific-technical control of agriculture must satisfy is the pistical norm of faith. This norm of *faith* in the narrower sense is the confidence that the normative framework thus described, taken as a guide, provides the prospect of a responsible development of agriculture, one in which the problems and threats will not have been fully eliminated, to be sure, but one in which the problems can be kept within limits. Forever since the Fall into sin, all cultural work has exacted a price. Cultural work is never a primrose path. For agriculture, it is literally as well as figuratively true that "thorns and thistles" will ever accompany it. Yet within the sketched integral framework of norms, the problems of agriculture will never become unbearable or insurmountable. That this is so is owing to the transcendental directedness of the norm of faith, the directedness towards the meaning and fulfillment of all in the kingdom of God. If, however, on the foundation of technicism and belief in scientific-technical control we seek to overcome all problems on our own, then we set in motion the law of the counterproductive effect, and the problems will grow into dangerous, unbearable tensions which may even spark catastrophes.

Before concluding, I want to observe the context in which the development of agriculture is taking

place. In a "free market economy," if by "freedom" is meant "freedom in responsibility," the described normative framework would have to be followed. Reality teaches, however, that the economic powers tend rather to strengthen technicism and technicization. For this reason many have looked instead to politics. But a materialistic politics reinforces the same process. Nevertheless, because the institution of the state concerns all and because restrictions can be placed upon the economic enterprises, politics is the arena in which to oppose derailments. Of course, politics must in that case be attuned to the described normative framework, so that in keeping with the nature of politics, righteousness and public justice will prevail. That cannot mean that the existing agriculture is to be intensified in a more restricted area, since in that case technicization would be limited spatially but intensified in the smaller space. Given the present dislocated situation, a brake will have to be put to the technicization process. For via politics we can choose a technology that is less directed towards increasing profits, intensification, and corporate economic efficiency, is more friendly to the environment, nature, and animals, and does not eliminate marginal terrains and agricultural jobs and threaten the livability of rural areas. We must also recognize that such a national politics can only be effective if from the standpoint of righteousness and public justice it is supported in the international political arena. The dilemma of surpluses and famine at the world level could be ameliorated.

10. The meaning of agriculture

With that I have come to the conclusion or summary. Technicism as an expression of human self-sufficiency has strengthened itself with modern science and manifested itself in our scientific-technical culture, including modern agriculture. Modern agriculture has thereby been surrendered to technicization. Therein are concentrated, as we have seen, the problems and threats of modern agriculture.

Technicism and technicization can be overcome through a renewed reorientation to the Origin and by posing again explicitly the question concerning the meaning of all that is, in the light of divine Revelation. In that light we see illuminated a normative creation structure which forms the basis for an integral normative framework within which a meaningful perspective for the development of culture and agriculture is possible. In harvests of food in which nature is carefully protected and conserved, fertility maintained and improved, and the landscape responsibly managed, agriculture serves to meet the most basic needs of all people. Then science and technology no longer rule but, like auxiliary hands, serve agriculture.

The tension between the overdevelopment of scientific-technical control and the underdevelopment of our management of nature and the environment is eliminated more and more as we move in the normative direction. This perspective demands effort and struggle in science, technology, agriculture, economics, and politics in each sector of culture according to its nature—but it offers hope of reducing the threats, limiting the problems, and overcoming the crisis in agriculture.[33]

Endnotes

1 By agriculture I understand not only arable farming but also market gardening and animal husbandry. Traditionally, agriculture has been mainly devoted to the production of animal and vegetable foods (and such things as flax for linen and raw materials for the paint industry); added more recently have been new developments in the production of industrial raw materials and even of goods for the environment.

2 On these problems see (1) The report of the National Council for Agricultural Research (NRLO), *De Nederlandse landbouw in het spanningsveld van functies* [Dutch agriculture torn between functions] (The Hague, 1986), and (2) Lawrence Bosch and William B. Lacey, "Agricultural Policy: Issues for the 80s and Beyond," in *Agriculture and Human Values* vol.1, no.1 (1984): 5-10.

3 *Bouwstenen voor een geintegreede landbouw* [Building blocks for an integrated agriculture], WRR (The Hague, 1984) and a follow-up study from 1986, *Speelruimte voor een geintegreede landbouw: verkenningen met behulp van een model* [Latitude for an integrated agriculture: Investigations with the assistance of a model].

4 For a more extensive discussion of technicism see my study *Tussen technische overmacht en menselike onmacht—verantwordelijkheid in een technische maatschappij* (Kampen: Kok, 1985), pp.9-17. This book is to be published in English under the title *Threatening Technology* (Jordon Station, Ontario: Paedeia Press, forthcoming).

5 Outside the free world the influence especially of Marxism must also be taken into account.

6 Concerning the problem of Christianity's responsibility for technicism and its consequences, see *Tussen technische overmacht en menselike onmacht*, pp.33ff.

7 See E. J. Dijksterhuis, *The Mechanization of the World Picture: Pythagoras to Newton* (Princeton Un. Pr., 1986).

8 See H. Staudinger, *Chance and Risiko der Gegenwart—Eine*

Kritische Analyse der wissenschaftlich-technischen Welt (Paderborn: Schonung, 1976),p.64.

9 See C.F. Von Weiszacker, *Die Tragweite der Wissenschaft* vol.1 (Stuttgart, 1966), p.107.

10 See D. von Holbach in *System der Natur oder die Gesetze der physischen und moralischen Welt* (ed. 1841), p.68.

11 See H. Staudinger, *Chance and Risiko*, p.68.

12 See H. Staudinger, "Christentum und Fortschritt," *IBW-Journal* 9 (September 1971): 1-12.

13 See H. van Riessen, *Wijsbegeerte* [Philosophy] (Kampen: Kok, 1970), pp.77-109; and E. Schuurman, "Wetenschap en wijsheid" [Science and wisdom], *Civis mundi* 23, no.4, pp.188-93.

14 See A.G.M. van Melsen, *Wetenschap en verantwoordelijkheid*, Aula 413,p.174ff.

15 This abstraction is a norm for the practice of science. Where one does not respect this norm, as in applied scientific research, it is necessary to note its importance explicitly.

16 See H. van Riessen, *Wijsbegeerte*, pp. 98ff.

17 See E. Schuurman, "De religieus-wijsgerige achtergronden van het milieuprobleem" [The religious-philosophical backgrounds of the environmental problem], in *Natur en mens* (Wageningen: Pudoc, 1984), pp. 23-31.

18 See J. Blom, "Landbouwwetenschap" [Agricultural science], *Intermediar* vol. 22, no.41 (1986), pp. 31-33; P.R. Mooney, "The Common Bowl: The Not-so-renewable Renewable Resource," *Development Dialogue* nos. 1,2 (1983), pp. 7-23; H. Hobbelink and J. Oppewal, "Machtsconcentratie onder zaadveredelaars" [Concentration of power amongst seed developers], *Intermediar* vol. 20, no. 5 (1984), pp. 43-45; M. Groen, J. Blom, and C. Hartmans, "Biotechnologie in de landbouw" [Biotechnology in agriculture], *Intermediar* vol.23 no.34 (1987), pp. 55-65.

19 Compare J. de Hoogh, "EG-Landbouw: Stand techniek schept overschot" [Common Market agriculture: Crop technique creates surplus], *International Spectator* vol. 41, no. 6 (1987), pp. 277-83.

20 See A. Kamsteeg in a feature article in the *Nederlands Dagblad* of 28 February 1987: "Het zwarte paard" [The black horse].

21 See H. Staudinger, "Die Aufklarung und Ihre Krise im Denken der Gegenwart," *IBW-journal: Zeitschrift des Deutschen Institut fur Bildung and Wissen* vol.23, no. 1 (1985): 20ff; cf. J. Klapwijk, *Dialectiek der Verlichting* [Dialectics of Enlightenment] (Assen: Van Gorcum, 1976) [An English translation of this work, made by Colin Yallop and provisionally entitled "Reason Reversed?" is being prepared for publication by Professor Klapwijk.]

22 See Fischer, *Taschenbuch* (1969), pp. 12ff.

23 See H. Staudinger, "Die Aufklarung aund Ihre Krise im Denken der Gegenwart," p. 5.

24 See J.P.A. Mekkes, *Radix, tijd en kennen* [Radix, time and knowing], (Amsterdam: Buijten & Schipperijn, 1971), pp. 32, 78ff.; E. Schuurman, *Technology and the Future: A Philosophical Challenge* (Toronto: Wedge Publishing Foundation, 1980), pp. 333ff.

25 See Genesis 11:6 "...now nothing will be restrained from them, which they have imagined to do."

26 On the being-as-meaning of reality, see H. Van Riessen, *Wijsbegeerte*, pp. 165ff.; the most pregnant biblical expression with respect to this being-as-meaning we find in Romans 11:36: "For of him, and through him, and to him, are all things."

27 See H. Van Riessen, *Wijsbegeerte*, pp. 142ff.

28 See E. Schuurman, "Wetenschap en wijsheid," pp. 191, 192.

29 See H. Koningsveld, "Landbouwwetenschap als systeemtheorie" [Agricultural science as systems theory], *Landbouwkundig Tijdschrift* 98 (1986): no. 12, pp. 22-26.

30 See A. Troost, *Geen aardse macht begeeren wij* [No earthly power do we desire] (Amsterdam: Buyten en Schipperheyn, 1976), pp. 35,48.

31 See E. Schuurman, "De ingenieur in het patroon van waarden en normen" [The engineer in the pattern of values and norms], *De Ingenieur*, vol. 98, no. 4, pp. 17-28; see also "Guideposts," in *Earthkeeping—Christian Stewardship of Natural Resources*, ed. L. Wilkinson (Grand Rapids: Eerdmans, 1980), pp. 255-79. See further *Responsible Technology*, ed. S.V. Monsma (Grand Rapids: Eerdmans, 1986), pp. 58ff.

32 The words of Proverbs 12:10 would in that case no longer apply: "A righteous man regardeth the life of his beast."

33 See U. Zijlstra, "Tending God's Garden," *The Reformed Journal* (July 1978): 9-11 and "Toward a Sustainable Agriculture," *The Christian Farmer* (published by the Christian Farmers Federation of Ontario) (1983): pp. 7-16; and C.P. Lutz, ed. *Farming the Lord's Land: Christian Perspectives on American Agriculture* (Augsburg, 1980).