

Communicating With Communicators¹

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Sixty years ago there were fewer than 100 million people in the United States. Half of them lived on farms and in communities of 2500 or less. The farm population was a third of the total, or 32 million. We had a farm labor force of about 12 million. By 1950 it was reduced to 7 million. Today, it's 4.6.

Back in 1914 each farm worker supplied food, fiber and other farm commodities for himself and eight other people. Today, it's 50. Less than five percent of our people are now on farms.

The day of the general farmer of my childhood days and yours is gone. New highly specialized operations are taking over. These changes pose for me and for you the greatest communication challenge the agricultural segment of this nation has ever known.

Who is our audience and what should our message be? For whom do we work, publish, print, broadcast and telecast today. Who receives your messages and benefits from your efforts? For whom do you program? What are you doing today over that of a year ago, or for that matter, ten years ago, that's different?

The past two or three years have gone down in agricultural history as a period of opportunity and record high incomes on the one hand coupled with constraints, conflicts, and contradictions on the other. Prices have skyrocketed for food and feed on the one side and for fuel and fertilizer on the other. There were real and emotional concerns for the use of land, energy, and water.

The agricultural situation in this nation today is unique in its 200 years of existence. Within a few months we have gone from surplus to scarcity; from overflowing bins to alarming food and feed shortages. One day it could be raisins; the next, beef steaks, eggs, beans, sugar, or milk. People across the land are getting anxious about food.

For the first time in 30 years, American agriculture and farmers are making big news. Some is good; other, adverse. The Wall Street Journal, beginning the week of October 9, and ending November 19, 1973, headlined a series of eight feature articles on agriculture as follows.

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“The U.S.A., long preoccupied with rapid urbanization, now is rediscovering its economic heritage and still its biggest industry—agriculture. News of food prices, grain exports, and supply and demand is in the headlines regularly, underscoring for citizens and national leaders alike the tremendous influence that agriculture has on the economic, social, and political well-being of America and the world.”

There was never a time when there were more actions and reactions to agriculture—its demands on land, water and energy, its contributions to society and to the accomplishments of agricultural research. There has been “overkill” in both directions. The important message is that we no longer have to use such tactics. Our voice can now be heard, and willingly, with a receptivity and respectability not heretofore experienced in the history of this land.

What are the opportunities? What are the constraints? Worldwide population increases of 2% per year coupled with rising incomes and affluency of many nations are a stress on existent food producing systems. For the first time in history there are hungry nations with money. They are bargaining for available food and feed grains. Developing nations with rising populations are living ever closer to the food margin. The more developed nations are striving to raise their standards of living by converting more grain through animal production to meat, milk and eggs. The USSR cannot consistently feed itself.

At home, societal, political, and environmental constraints on food producing systems have multiplied. Recent soaring of food prices is paralleled by price escalations in the essential resource inputs of energy, land, water, and fertilizer. Stabilization of food supplies and prices implies existence of food reserves (grain stocks), or idle production capacity which can readily be brought into production. Both are uncomfortably low.

The 1974-75 wheat picture was highlighted by a record crop, near record disappearance, record prices, and prospects for the smallest stocks in 25 years. North America remains as the only major export source of feed and food grains. Seventy percent of the surplus food on this earth is produced in the U.S.A. Food importing nations are building reserve stocks to insure their people's food supply. A new interest is emerging in the production of wool, cotton and silk as renewable resources as prices of oil essential for synthetic fiber production continue to escalate. Agriculture is getting to be so important, someone has suggested, it should no longer be left to the agriculturists.

Do you know that agriculture is the only major industry in this nation, with the possible exception of the petroleum refining and electric power generation where the energy output is greater than the input? This is true for crop production.

Furthermore—and here is the important message—the products of agriculture, forestry, fisheries, wildlife and range are renewable resources. Food, fiber (cotton, wool, silk) and timber are reproducible because solar energy and CO₂ fixation through photosynthesis, and biologically fixed nitrogen are free and essentially inexhaustible. We can go back to the land, the water, and the air—year after year and renew them, or reproduce the process. It is true that some nonrenewable resources such as fertilizers, chemicals, machinery, and fuel are needed, but the energy return is still better than two to one—even for the most advanced technological inputs.

Our agriculture and forests are a major source of energy production but are seldom considered as such in the same vein as electricity and fossil fuels. A recent report also shows that the ratio of kilocalorie return to input has decreased. It is generally implied that agriculture has become less efficient in energy utilization. It is said we are farming with petroleum. The release of land through higher yields, however, is ignored. The amount of land needed to produce a bushel of corn has been reduced by sixty percent since 1945. This has released vast acreages for the production of additional crops including soybeans.

Moreover, food production is more than just calories. Proteins, vitamins, minerals and flavoring compounds are a part of food. Even indigestible fibers and roughages play an essential role in human nutrition, digestive well being, and intestinal health.

Agriculture to a non-agricultural public still carries a message of conflicts in priorities. Many constraints have recently been imposed on our food producing systems. There are many roadblocks to abundance. Each year a million acres of agricultural land is lost irreversibly to airports, highways, shopping centers, factories and suburbia. Priorities are being established relative to water supplies. Irrigated land is agriculturally the most productive. It receives the most abundant, intense, and prolonged sunlight. The nation's capacity to produce food and feed is being eroded by environmental constraints or impact assessments which are often at cross purposes with food and feed producing systems. Banning and restricting the use of certain chemicals for food production and preservation has already increased costs of production and reduced yields and placed constraints on quality in some food-producing systems. Examples include chlorinated hydrocarbons for insect and weed control, dithio-carbamates for plant disease control, diethylstilbesterol as a feed additive for livestock, use of naturally occurring flavoring substances in food processing, antibiotics for poultry and swine production, and the control of plant diseases.

Let's be specific. The 1973 National Water Commission report concludes there is adequate productive capacity in the nation's agriculture to

meet food and fiber demands under various alternative futures at least until the year 2000. There is no need in the next 30 years, the report continues, to continue federally subsidized water resource development programs to increase the agricultural land base of the country.

The land use chapter of the first annual report of the Council on Environmental Quality gives no priority to land for agricultural purposes. The Council did, among ten recommendations, suggest preservation of buildings in neighborhoods of architectural quality and of historical significance; open space acquisition; identification of flood plains, wet lands, and areas for scenic, wildlife and recreational purposes; proper siting and environmental compatibility for subdivisions and new housing; reverse the degradation of coastal zones and the wilderness areas; the establishment of a national registry for research of natural areas.

A special Task Force report on land use sponsored by the Rockefeller Brothers Fund has just appeared. Recommendations are given to encourage protection and preservation of open spaces, historical areas, green spaces, natural ecosystems (whatever they are); ecologically sound recreational communities; cultural and aesthetic resources; a review of space for power plants, highways and airports. Again there is no mention of prime land for food production.

The section on land use of the Fourth (1973) and the Fifth (1974) Annual Reports of the Council of Environmental Quality recognized its value for agricultural purposes, although it still gives high preference to open space; landmarks; historic and scenic areas; preservation and protection of coastal zones; wetlands; recreational areas; valuable eco-systems; wildlife and endangered species. Concern is expressed about the availability of certain types of lands such as enough agricultural land to grow food and sufficient timber land to meet national pulp and lumber demands. There is still no national policy against converting agricultural or forest land to residential use. Nevertheless, the report concludes with these words, "On balance there seems little cause for concern over the availability of crop land, although a sharp rise in food exports could cause some short-term problems."

This nation has no land use policy, no water use policy, no energy use policy and no food use policy.

Food and Drug Administration regulations relating to the *Generally Recognized As Safe* (GRAS) materials have now been applied to the introduction of plant varieties. If the regulations are enforced, new varieties which differ more than 20% in nutritive value or 10% in toxic components must have FDA clearance. There are neither the test methods, the facilities, or the trained personnel to enforce these regulations. There is

currently an attempt through the National Academy of Sciences working with the FDA and USDA to secure an abeyance of the enforcement of these ridiculous restrictions until reasonable guidelines can be developed.

There is increased pressure to reduce the use of fertilizers based on nitrogen as a potential source of nitrate in drinking water, phosphate induction or eutrophication of lakes and streams, and the organic gardening thesis that plants grown with chemicals are harmful to human health. There are pending Environmental Protection Agency (EPA) constraints on feedlot effluents wherein all housed livestock irrespective of the size of the flock or the herd would be subject to point source pollution regulations.

Current EPA issues on general and restricted use categories for pesticides, field re-entry standards for organophosphate insecticides, and clearances of pesticide registrations for minor uses has resulted in a \$5 million appropriation by Congress to EPA to be contracted with the National Academy of Sciences for a thorough review of EPA and suggestions for improvement. It is concluded by the Whitten Committee that many of the EPA regulations, decisions, and policies of this agency have contributed mightily to current shortages and crises in food, fiber, and energy. Furthermore, there has been little scientific input into decision making.

Considerations as to the impact of air pollution have heretofore been focused on man; not on crops and livestock. Air pollution in many parts of the nation seriously constrains the production of crops and may have adverse effects on farm animals. The high protein producing plants, the legumes, including field beans and soybeans, are particularly susceptible to injury from air pollutants.

Two one-hour documentaries sponsored by television networks have appeared within the past two years on American agriculture. (1) "The Rich Shall Inherit the Earth"² gives a story of large corporations which control the production, processing, and marketing of food; and (2) "Food—Green Grow the Profits"³. The message is that large corporations, often conglomerates with no background in agriculture, have gotten a strong hold on the production and marketing of the food we eat. It is known as agribusiness. Jim Benjamin, the producer, traveled across the country interviewing farmers who were squeezed out of business, and agriculturists who are altering the taste, shape and color of foods. A presumed highlight was the revelation that there is being foisted on the American consumer poisoned meat from chickens fed arsenic. Further, that federal inspectors were grossly intimidated. In defense, Secretary Butz along with Mulhern were

²Westinghouse Broadcasting Co., Inc. Group W.

³American Broadcasting Company

interviewed. They did not come across strong. Televised documentaries, shown on prime time, have not been kind to American agriculture.

The decision-makers and formulators of policy in the National Research Council, the working arm of the National Academy of Sciences, still think American agriculture is run by big business, that the family farm has all but disappeared, and corporate agriculture is that which holds sway in the corn belt. Nothing could be further from the truth, but the documentaries have had a telling persuasive influence.

The real message for the needs of agricultural research has not been reported to the nation. There is little appreciation by the American public for what agriculture is doing or could do. Among the 21 national problems warranting greater research and development efforts as reported by the National Science Board of the National Science Foundation, food production is not listed. The areas most favored by the public are pollution abatement, health care, power energy resources, industrial productivity, drug abuse, crime, and similar concerns. Furthermore, on a rating as to the good vs. the harm that science and technology have contributed, agriculture and food research are on the bottom of the list with a mere 2% favoring more good than harm. There is a complete absence of people even remotely connected with biology, let alone agriculture, in the top echelon of the NSF.

There are some exciting stories that could be written, spoken, and otherwise portrayed about agricultural research. They even border on science fiction but they are still real. Everyone is interested in food. There are so many local, national, and world food and energy conferences, committees, seminars, and task forces, past, present and future, one becomes lost in the maze. We seem to forget where it all begins.

Photosynthesis is the most important biochemical process on earth. By it, the sun's electromagnetic energy is converted to chemical energy stored in plants. It remains today as the world's most important renewable energy producing process. From it has come the great energy reserves, the fossil fuels, which we are now utilizing at an every accelerating pace. It is where calories come from. To meet current food and fiber needs terrestrial plants alone appropriate approximately 15 billion tons of carbon dioxide a year from the earth's atmosphere.

Man has, through the ages, evolved strategies for manipulating the plant and its environment to maximize this energy conversion process. It is called *agriculture*. The technologies include crop fertilization with mineral nutrients applied to the soil and foliage, spacing, irrigation, improved light receiving systems through plant structure modifications and leaf display,

variety development, improvement, and selection; pest control, training and pruning, and tillage. Ultimately, all agronomic, forestry, range, and horticultural practices are directed toward increasing the efficiency of the photosynthetic energy producing process.

Through photosynthesis the energy resources of the earth, the so-called "wealth of nature", can be increased. The result has not been an ecological disaster, but a marshalling of resources, most of which are renewable, for the lasting benefit of mankind. This has relieved 95 percent of the working force of this nation from food production; that other goods and services might be provided.

The second most important biochemical reaction on earth is biological nitrogen fixation. Worldwide, this process currently exceeds by seven-fold all chemical fixation for nitrogen fertilizer production. Energy from photosynthesis has recently been identified as the major limiting factor for symbiotic nitrogen fixation in the root nodules of soybeans. Energy, in this case from fossil fuels, is also the crucial factor in chemical nitrogen fertilizer production. The one is free; the other, very costly. Thus, a close linkage has been established between the accumulation of photosynthates and biological nitrogen fixation. Further, it is now possible to monitor the magnitude of biological nitrogen fixation under field conditions. This provides capability to maximize the process through varietal selections of crops and microbes; and the management practices of time of seeding, tillage, fertilization, spacing, and irrigation.

Biological nitrogen fixation is the second process where the resources of the earth, or nature, can be extended. It is where protein comes from. It is also free. It is essentially an unlimited resource for the production of needed protein in human nutrition. The immediate results could be realized in the protein-rich legumes (peas, beans, lentils, pulses).

A critical research need and partial answer to the energy crisis would be to increase the efficiency and enhance the magnitude of food producing systems. Regulation of yields of major food crops should be a worldwide objective of top priority. An increase of only one percentage point in the efficiency of energy conversion in the green plant would have a remarkable impact.

It is a sad commentary that among the energy options currently listed for the future in the leading articles of the most prestigious scientific journals, and in the deliberations of the congressional subcommittees on energy and the White House Council for Environmental Quality and the National Energy Office, maximization of energy production through photosynthesis and biological nitrogen fixation as "renewable resources" are not even mentioned. For the short run, the emphasis is on nuclear fission and

utilization of coal reserves. Geothermal energy, solar energy, and nuclear fusion are suggested as possibilities for the year 2000 or thereafter. The one process, namely, photosynthesis, whereby the nonrenewable fossil fuels which have heretofore provided the primary energy base of the nation and world is not on the list. There is a real communication gap, and it still persists, between agriculturists who look to photosynthesis as a renewable energy resource which can be further maximized and those, including Mr. William Simon and Mr. Ralph Nader, who consider solar energy only in terms of thermal effects for heating water and the photoelectric effects on solid state materials.

Food, fiber, timber, and energy may be considered as one. The products of agriculture, forestry, and the range can all be viewed, alternatively, as food or fiber, on the one hand, or as energy, on the other. Agricultural products and by-products constitute a vast energy resource. Increased productivity enlarges that resource.

The tens of millions of tons of agricultural commodities now being exported abroad also represent a massive export of energy. How much energy is exported with each bushel of wheat, corn, or soybeans? A bushel of corn will produce three to four gallons of alcohol. Our food shipments abroad make us a major energy exporting nation.

It takes seven to ten pounds of grain to produce a pound of beef, and millions of people want to eat beef. Three to four pounds of grain are required to produce a pound of pork, and two pounds for chicken. Those in human nutrition may well question the dietary need for all this meat. Reduction of the present "wasteful conversion" of grain to meat should be a high research priority. Annual per capita food consumption in this nation approximates the equivalent of 2,000 pounds of grain. In India and Bangladesh, it is 400-500 pounds. Based on calorie equivalents, it is 11,000 per day. Obviously, we do not consume such enormous amounts of grain. Most of it is inefficiently converted to the meat, milk, and eggs which we eat.

I have been agitating for a press day, a day for farm broadcasters, at the Michigan State University Agricultural Experiment Station. An open house if you will! We ought to tell everybody about agriculture, our most important, exciting and newsworthy industry. Tell it to 42,000 students, 5,000 faculty and service personnel, congressmen, legislators, townspeople, reporters and farm broadcasters. How many of you have taken a day off to tour research projects of any Agricultural Experiment Station and see the scientific achievements of any land-grant university? You get your stories secondhand.

What are the big stories in agricultural research at Michigan State University? One could start with the introduction recently of two new varieties

of corn with multiple disease resistance; two red kidney beans, Mecosta and Montcalm, both resistant to halo blight; a new winter injury and disease resistant short stature wheat variety, Tecumseh, and a high yielding variety of oats.

Perhaps, it could be hybrid and seedless parthenocarpic pickling cucumbers, 92% of which were machine harvested in 1973—a new record for the state and nation. Sweet cherry mechanical harvesting coupled with a harvest and chemical (ethephon) loosener, placed Michigan in 1973 as the leader for the nation. Eighty percent were sprayed with ethephon and 95% harvested mechanically. In the agricultural engineering area automatic teat cup removal has been achieved in milking of dairy cows. A new cherry pitter has been designed, a strawberry capper, and a fully mechanized strawberry harvester was demonstrated at a special field day, June 21, 1974. A new grain dryer has been designed which reduces to one half the energy required to remove water from corn.

Non-protein nitrogen can furnish all the protein needed in typical mid-west rations based primarily on corn silage for growing and fattening beef cattle, dairy heifers and dairy cows producing under 45 pounds of milk daily. NPN can furnish 50-60% of the protein supplement for high producing dairy cows. Almost half a million tons of urea are now fed annually to livestock. Forty thousand tons of ammonium solutions were added to silage this past year. Rations can now be designed to make the ruminant animal essentially non-competitive with man for both energy and protein and without loss in production.

Current prices for feed grains and protein supplements puts new emphasis on hybrid wheat and high lysine corn. All seed is sold almost as soon as it becomes available.

A continuous fermentation process has been developed for converting whey into a high-value crude protein feed supplement for ruminant animals. The process is applicable to use of other low-value waste products. A system for recycling dried poultry waste has been developed, whereby it comprises 20% of the ration with no loss in egg production.

Do you know that considerable progress has been made in increasing litter size in swine, twinning in beef cattle and crosses of domestic breeds of sheep have been made with the Finnish Landrace to double and even triple the number of lambs per lambing; that calf mortality has been significantly reduced by feeding with colostrum; that fatty livers in poultry result from ingestion of excess dietary energy; that the effectiveness of Prostaglandin F₂ has been demonstrated for control and synchronization of estrus in mares and dairy cows; that you can vaccinate offspring of farm animals before they are born to immunize them against disease?

An environmental monitoring network for agricultural pest management has been developed and partly implemented. Collapse of a cereal leaf beetle population occurred this past year with larvae parasites. Control of internal breakdown of Jonathon apples in storage has been achieved with a post-harvest calcium chloride drench.

Other exciting areas include land use inventories and value assessments for specific areas for policy formulation; estimates of recreational carrying capacities for campgrounds, forests, and inland waters; and the establishment of the significance of insect vectors in recreational areas in disease transmission, namely, encephalitis and dog heartworm.

An outside reporter, David Hacker, on location at Michigan State University wrote the big story of the genealogy of hybrid carrots for the headlines and the front page of the NATIONAL OBSERVER, February 16, 1974.

The responsibility of a scientist or a research director no longer ends with a technical report to his colleagues in a professional journal. Far too many scientists would rather accumulate data or bury it in technical jargon than transmit an interpretation to the public. It is a tough assignment for a scientist to write or speak in a manner so those with a high school education can understand.

Currently we are wrestling with the principle of popularized versions of technical reports of the National Research Council of the National Academy of Sciences. A case in point is the report to the nation of the Committee on Agricultural Production Efficiency which may be labeled "Our Daily Bread." The message in this document is so far reaching we may go to a special editor and a private publisher, if necessary, to get the popularized version in print.

We should keep an open door policy with information people, especially farm news editors and broadcasters. You can both speak and write better than we can. We need to seek your help as well as you ours.

It is time we began to extol the accomplishments of the State Agricultural Experiment Stations and label our affiliation with our Agricultural Experiment Station. We need your help! A feature article on chocolate cheese appeared January 12, 1974 in the NATIONAL OBSERVER. There was one on hybrid carrots February 16, 1974. Both were originals from the Michigan State University Agricultural Experiment Station, picked up by an outside reporter. The State Agricultural Experiment Station which provided the human resources and funding was not once mentioned. Most people still believe that any discovery in agricultural science comes from the U.S. Department of Agriculture.

The volatility and spiralling of food prices; conflicts in the use of land,

water, and energy; constraints being imposed upon food producing and preservation systems by regulatory agencies and society in general; adversities of weather on a global scale; demands of hungry nations with money for the food that we have as the major world source of food and feed grains; an unprecedented current record in food exports to nations abroad, related not only to need but a newly found affluency and income and desire to build up reserves—all this coupled with the most efficient food producing and handling systems ever devised by man and the envy of all the world, and all renewable resources at that—is a story that we must tell. We all share in that responsibility.

Characteristics and Course Recommendations of Agricultural Communicators: An Update

Eugene Kroupa and James Evans

Our recent national survey of agricultural communicators was designed to reveal more about these professionals and obtain their academic course recommendations and other suggestions for college students preparing for similar careers.¹ Our preliminary report, prepared for an AAACE convention before all responses had been returned, was necessarily incomplete. Therefore, the intent here, is twofold: (1) to report the impact of additional returns on preliminary findings about course recommendations and (2) to summarize selected characteristics of the Extension and agricultural college communicators who took part in this study.

¹Eugene A. Kroupa and James Evans, "New Directions in Agricultural Communications Curricula," *ACE Quarterly*, Vol. 56, No. 3, July/September 1973, pp. 28-38.