The Land Grant College: Repositioning to Meet the Needs of a Rapidly Changing Food, Agriculture and Natural Resource System

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Abstract: *The land grant college of food, agriculture and natural resources constitutes a major historical innovation. Land grant colleges need to continue to do cutting edge science and education as well as maintain the outreach function to maintain state appropriations. Moreover, fund raising is going to have to be broader than it historically has been.*

Key Words and Phrases: *Land grant college, education, cooperative extension service, teaching, research.*

The land grant college is one of the greatest institutional innovations in the history of the United States. The genius of opposing the campus teaching function, the research function and an extension outreach function was truly a brilliant creation. It has done wonders for improving the quality of life in rural America, for increasing the agricultural productivity of this country and for protecting the quality of the environment. One of the strengths of the system has been its ability not only to serve in each decade of this century, but to reposition itself continuously to ensure that it is prepared to serve in the following decades in an effective manner. There is a great deal of introspection in the system right now as it struggles to prepare itself to meet the needs of the early 21st century, but I think introspection is healthy.

I would like to address several megatrends affecting our food, agricultural and natural resource system, and then turn to some thoughts about how the land grant college should reposition itself to meet the changing needs of this sector.

The first megatrend I would identify is: The consumer reigns supreme. American farmers have long viewed their jobs principally as producing whatever they like to produce. They have seen marketing or disposing of that production as someone else's job. If this were ever an appropriate attitude, it is no longer. Today, the consumer truly reigns supreme and is putting very different demands on the food system than ever before. The resulting changes include a different mix of food products purchased; greater demand for convenience foods; an increase in eating out; more concern about the nutritional quality of food; a perception that chemical residues from pesticides, pharmaceuticals and other products are a danger to the food supply; a more justifiable concern about microbiological contamination of food; and an increasing concern about how animals are treated in our food production system.

One or two decades ago, most consumers were not more than a generation away from the farm. Today, we have a generation of young people who know very little if anything about production agriculture or about agribusiness in the food system. They know their milk comes in rectangular cardboard containers, but they really do not know much about the dairy farm or the dairy processing system that puts milk on the supermarket shelf. We enjoy the safest, lowest-cost food supply of any country in the world, and yet there are significant misunderstandings and misperceptions about our food supply. We must remember that the consumer acts on perceptions. Perceptions are the only reality that matters when a consumer makes a decision. So if those perceptions are wrong, we have failed in our educational outreach responsibilities or in our classroom educational responsibilities. To the extent that those perceptions are correct, there are new challenges for us to be able to assure consumers in the future that they do, indeed, enjoy the safest, most nutritious food supply in the world, and that it continues to be produced at low cost—the lowest percent of per capita disposable income in any country in the world.

The second megatrend is the increase in globalization of this industry. Today, the output of more than one out of every three acres of farm land in the United States is exported, and these exports are essential to the economic health of the farm sector and the associated food and agribusiness sectors. It is very easy to lose track of the size of this industry today. The statistics show clearly that we are down under 2 percent of our population on the farm, but we often forget that there are more than eight people employed off the farm for every person employed on the farm. If we were to lose that one-third of our production that is exported, we would lose a great deal of employment—not only of farmers and farm land, but of many other people in the food and agribusiness sectors.

In the past, the United States has tended to export its products in raw form. However, one of the great revolutions since the early 1980s is the increasing fraction of higher-value or value-added products being exported. In 1981 you could say that more than 90 percent of our agricultural exports were raw, bulk commodities. Today, with the increase in exports of poultry and other meats as processed foods, we have passed the 50 percent line. More than half of our products are now going out in higher-value forms. This is great progress. But it is a dog-eat-dog, competitive world and if the United States is to compete successfully, particularly in the commodity export business long-term, we must remember that the low-cost supplier gets the sale. Principally, investments in research and infrastructure keep our costs of producing commodities as low as possible.

Just as in our domestic market the consumer reigns supreme, we have to remember that in the world market, the consumer also reigns supreme. The United States has probably been slower than countries like The Netherlands, New Zealand, Ireland and Denmark to understand that marketing by definition is export marketing. All of these are small countries, but they have done a lot more than we have, or at least a lot earlier than we have, to get people on the ground in foreign countries who understand the language and the culture, and who understand how business is done in those markets.

These smaller exporting countries initially have run circles around us in exporting the more specialized, higher-value products. The United States is gaining fast in that area and I think this is tremendously to our credit, but we must not rest on our laurels. We must keep going if we are to be successful in being the major exporter, not only of low commodities, but also of value-added and processed food products.

The third megatrend I see is an increase in concern about the environment. This ties in closely with some of my comments about the role of the consumer. The increase in concern about the quality of the environment is real. There are some people who have wished it would go away or who have thought it was a flash in the pan, but that is naive. The concern permeates our urban population, and it also permeates a great deal of our farm population and even the agribusiness sector as well. Farmers, I believe, were the first environmentalists. Soil conservation is almost a religion with most farmers. They certainly care about the importance of ensuring the long-term productive health of the agriculture sector and its most important resource, the soil. But the concerns have to go further. Water—both water quality and water quantity—is probably going to be one of the most binding constraints in American agriculture and in world agriculture in the early 21st century. There will be an increase in competition among farms, manufacturers and private individuals and families. In some cases, cities will succeed in buying up farm land to strip off water rights and move the water, such as in some cases in California where they probably will move water down to the southern part of that state to serve the needs of urban residents. Agriculture is going to have to be very concerned about efficiently using water and returning it in a manner that is suitable for reuse by other farmers or for non-agricultural uses.

Air quality is increasingly becoming a concern, particularly among people who live close to large integrated livestock units such as hog operations. We must recognize that agriculture must co-exist with an increasingly urban population. There may be certain parts of production agriculture that do best in wide open spaces without urban encroachment nearby, but there also are research needs to ensure that livestock production units, as well as other production units, treat the air as an important resource whose quality must be protected.

So our concern about the environment is growing and real, and agriculture needs not only to be concerned about protecting its most valuable resource—soil—but also to ensure that what it does is consistent with maintaining the future quality of the overall natural environment.

The world demand for food is projected to double in the next thirty years, not so much from population growth, but from income growth. Population growth rates are declining. The current medium projections of the United Nations appear likely to be too high. But what people often forget when they talk about the growing number of mouths to be fed in the world is that the real kicker on growing demand for food is income growth, which empowers poor people to eat more meat, more animal protein in general, more fruits, more vegetables and more edible oils. As people move from a low to a middle level of income, the first thing they do is upgrade the quality of their

family lifestyles. They may put a tin roof on their house, they may buy a transistor radio for improved communications, they may buy a bicycle or a motor bike—but the first thing they spend that additional purchasing power on is food, particularly animal protein, fruits and vegetables. So that is the principal driver of the growing demand for food in the world market. It will cause the demand to double in the next thirty years, and as that demand grows, there are two options for how we can meet it. We can increase the number of acres under cultivation, or we can increase the productivity of soils already in use. There is not a great deal of unused land available on which we could expand production without slashing forests, and if we tried to double the number of acres under cultivation by cutting forests, we would move production onto a lot of erodible land that may not be particularly fertile for annual cropping. More importantly, we would have massive destruction of wildlife habitat and biodiversity, as well as reducing the beneficial effects of our forests on global warming. My point is that there is a strong relationship between agriculture and forestry, and between agriculture and the environment in general, which ties directly to the economic growth which is reducing the problem of poverty, but at the same time permitting people to increase their consumption of food.

The next megatrend I identify is the changing structure of farming, ranching and agribusiness. Consolidation is widespread in agribusiness today, and the average size of the commercially viable family farm or ranch has continued to grow. The time is rapidly approaching when 15 percent of the units we count as farms will be growing 85 percent of the nation's food and fiber. On the other hand, the other 85 percent of farms will collectively produce only 15 percent of our food and fiber. As a result of this increasing concentration of production in the hands of a smaller number of farm units, we are going to have a significant change in how we serve the needs of the bifurcated agricultural production sector. When we think about the role of extension outreach, we are going to have to worry about whether we are in the business of improving the social welfare of low income small farmers, or if we are in the business of contributing to the more efficient production of food and fiber. There is quite a bit of competition already in serving the needs of these large concentrated units. They hire consultants, they have a very sophisticated operation, and the input supplier is providing a lot of technology transfer to those larger units. But if the extension system is concerned about improving the efficiency of production in food and fiber in this country and in the world, it is those larger units that we are going to have to focus on. We have to find our niche relative to the competitors I identified.

On the other hand, where there are problems of rural poverty in agriculture, those problems tend to be in the middle-sized family farms, because most of the smallest family farms earn, on average, close to 100 percent of their net family income from non-farm sources. I am speaking of the country as a whole; obviously there are exceptions in any generalization. In fact, one of the greatest success stories we have had in this country in reducing world poverty—and the same thing is true in Europe and Japan—is bringing off-farm employment opportunities to rural communities. If you look at American agriculture today, fully 75 percent of farm family income comes

from non-farm sources. In Japan it is more than 90 percent. In Germany it is in the 80s. That surprises a lot of people. In part, this is a function of a problem with the definition of a farm, which is still defined as any place that sells more than $1,000 worth of products per year. So if you are a 4-Her with a couple of steers or a 4-Her with a good-sized strawberry bed and a roadside stand, you would probably get counted in the average farm statistics in the United States as one unit, right along with the King ranch, which also counts as one unit. Our averages do not tell us a lot when we have this bifurcation in agriculture. We must decide how we are going to serve the two different parts of the industry, and we must ensure that there is a political base of support to provide the appropriations to allow us to do that.

The second major structural change in the agricultural sector currently taking place is increased reliance on contracting and vertical integration. I believe this is being driven in many instances by the failure of the existing marketing institutions, or at least the previously existing marketing institutions, to transmit the quality characteristics of the food products demanded by today's consumers back to the farm gate. There has been a failure to communicate the quality characteristics demanded by today's consumer. So we must replace that system with a system that can ensure a product of greater uniformity and predictability of quality to satisfy the demands of the consumer, whether that consumer is in Atlanta or downtown Tokyo or Johannesburg. The market must deliver the quality characteristics that are locally demanded and those characteristics are very different in different markets. An outstanding example is how consumers abandoned red meat and moved towards poultry and fish. The poultry industry responded early and increased its efficiency of production and lowered its unit cost, but produced a product that is completely predictable in terms of portion size and quality characteristics at the supermarket. With its "other white meat" campaign, the pork industry also responded and ensured the long-term competitiveness of its product. So we must recognize that the consumer is driving the system. Those marketing systems that do communicate the demands of today's consumer back to the farm gate are going to be successful, and they will probably involve a lot more contracting and vertical integration.

The last megatrend I identify is that agriculture is an increasingly high tech industry. American agriculture has enjoyed one of the fastest rates of growth in productivity of any sector of the American economy—or of any country in the world over the last century. The experiment station system has played a very important role in this growth, as has the investment of the private sector. In the 19th century, farm equipment design got a big start in the private sector because of patent laws. But today, there is a lot of catch-up in the private sector in increasing investments in the biological sides of agricultural technologies. There are many unresolved issues related not only to patent protection, but to intellectual property rights and how the role of the private sector and the public sector match one another, where basic and applied research ought to be done. The important thing is that we have recognized the payoff that comes from investing in agricultural research, both public and private, over the last century, and agriculture in the United States has benefitted tremendously with its

rapid growth in productivity relative to other countries and to other sectors in our economy.

In the last twenty years, however, investment in agricultural research, particularly in the public sector in the United States, has declined. We have not had a strong enough constituency for public investments in agricultural research. There is often the belief that the private sector is going to do it now. I happen to believe there is an appropriate balance. There are certain things the public sector cannot do as well as the private sector and vice versa. But the fact remains that public investments in agricultural research have declined and declined quite significantly after adjusting for inflation, and this concerns me greatly with regard to ensuring our future competitiveness. One footnote to this discussion: There is a worrisome anti-technology attitude developing among some consumer and activist organizations, both in the United States and abroad. I believe this is a very dangerous development because a great deal of agriculture's competitiveness depends on investments and research. Most importantly, how are we going to feed the world in the future, when thirty years from now we have twice as large a demand as today, without maximizing productivity growth on good, fertile, non-erodible soils? If we choose the route of increasing the area under cultivation, the environmental disaster that would result, I believe, is something we should do everything possible to avoid. Therefore, we have got to have the investments in research to maximize the rate of productivity and to develop technologies that are fully consistent with maintaining a quality environment.

We are in the golden age of the biological sciences today with increasing developments in biotechnology and other parts of biology. We also are in a golden age in electronic-based information processing and electronic sensors, with technology such as geo-positioning systems, GIS systems and the microcomputer for both production management and business management. I believe there is great hope for the future of being able to ensure that the world is better fed than today, at lower cost, or at no higher cost at least, and without in any way encroaching on the quality of our environment. But that will only happen if we increase our investments in agricultural research relative to what we have been doing recently.

The other point that I view as a trend, at least of the last decade, is that there has been some erosion in the public image of the food and agricultural sector in recent decades. We face a major challenge to improve our communications with the increasingly urban public who understand less and less about where their food supply comes from.

So what is needed as we look to the future? Repositioning is a buzz word in modern management theory. It often is a euphemism for downsizing, and certainly with declining appropriations for research, extension and sometimes for teaching, repositioning has in some cases been equated with downsizing in the land grant university. But I prefer to talk about the need for redefining our focus and responding to our customers, whether those customers are students or users of extension education or users of research results. There will be a pervasive theme throughout these comments that a not-for-profit organization—whether it is my organization, Winrock

International; a land grant university; or a college of food, agriculture and natural resource sciences—must get out and listen to its customers and be sure that it is meeting their needs. Whether those customers are going to the supermarket and buying a pound of chicken, or sending their son or daughter to the University of Georgia College of Agricultural and Environmental Sciences, or lobbying for appropriations for agricultural research or extension, they must perceive that they are getting value for their investment. It may be an intangible value in the short term, and it may be easier in some ways to market chickens, but the not-for-profit world is going to have to act a lot more like the business community in repositioning to efficiently manage and deliver the products today's consumer wants to buy. That does not mean we in the colleges of agricultural and environmental sciences should not play intellectual leadership roles and try to lead the public. But if they are not willing to cause the appropriations to occur or the tuition to get paid, we are out of business. We cannot stay in business if we do not have appropriations and tuition payments.

So let's talk about teaching. Colleges of agriculture, food and natural resources—I tend to use that as a generalization for the many different names by which what were traditionally colleges of agriculture are now called—have been on a veritable enrollment roller coaster over the last fifteen to twenty years. In the Purdue school of agriculture, our enrollment peaked at 3,300 in 1977. In 1987, the year I became dean, our enrollment was 1,650, 60 percent less than the peak. When I became dean, my president said, "Bob, you've got about two or three years maximum to turn the enrollment around, or we're going to have to transfer teaching resources out of the college of agriculture to the rest of the university." I had a bonfire lit right behind me when I came into the job, as you can understand. We were in the second year of a 20 percent downsizing of the faculty and a 15 percent downsizing in extension field staff. So with this good news from the president when I took the job, I knew I had my work cut out for me to avoid an even deeper downsizing. One of the things we did was get out and listen to what our customers wanted. I viewed our customers as the parents who were sending their kids to Purdue and the firms who were employing our graduates. We asked them how we were doing and what they would like to see more of or less of. We interviewed our customers, both in formal and informal surveys.

From employers, we heard a strong message that they would like to see better communication skills in our graduates. There was not a single firm who hired our graduates that did not list better communication skills, both oral and written, as the number one priority. This was true not only for the school of agriculture at Purdue, but for schools of agriculture in general. There was also some concern that we tended to be excessively first-job oriented in the training experience we provided. Less than half of all college graduates are working in the field of their major ten years after they graduate. Every academic department puts many demands on their graduates. They require many specialized courses to get a degree in that department. But the reality is, less than half of graduates are going to be working in the field of their major ten years later. Knowledge is changing so rapidly and research is changing the technologies we use so rapidly, much of what we know is going to be out of date in ten years anyway.

So I concluded, and still believe today, that we need to provide a broader educational experience with more liberal arts and humanities, especially courses that instill communication skills.

Most important of all, I concluded that we must provide the student a basis for life-long learning. I think it is our responsibility to give them the necessary skills to make them credible to a first employer so they can get that first job, and we in colleges of agriculture have a fantastic track record in placement. At Purdue, only the school of pharmacy had a better placement record than the ag school by October first, which was our snapshot date for placement of our graduates from May and from August. Even engineering was always left poorer than agriculture, which is something I always like to brag about. But we also have to recognize that we have not very efficiently packaged the material in each major. If we repackage the course offerings every five years and do not just teach courses the way they have always been taught, I think we could increase the efficiency of educating the student. We could communicate what is needed about the science and practice of the discipline the student is majoring in so he or she will be credible to that first employer, but if we also offer a broader educational experience, providing better communication skills and a basis for life-long learning, we will have done a better job.

We also found that the international perspective is very important. This is a global business today. Agribusinesses are more and more global in their outlook and in their practice. More and more firms in the United States are foreign owned. More and more U.S.-owned firms are operating all over the world. One chief executive officer of an Indiana company told me they could not afford to hire graduates of American colleges of agriculture because lack of languages made the risk too high. Instead, they hire from a Dutch agricultural university because 90 percent of its graduates have had an internship overseas, and all speak English, French and German. Some may have Russian or Japanese, too. So even if they do not have the right language for the country to which they are to be assigned, there is a high probability they can learn a foreign language quickly.

Well, that hurt, because this was the chief executive officer of an Indiana agribusiness company. So we set about internationalizing our curriculum, introducing more international content into the core courses and into all of the courses, not just adding electives that were specialized international courses. We added a requirement that two liberal arts or humanities electives must have an international focus. Beyond that, it is important to create and underwrite opportunities for faculty members to enable them to get a broader perspective through international sabbaticals. It is also critical to get more students into overseas experiences for at least a full summer of study abroad or an internship in another culture. Even if it is an English speaking country, it is better than not going abroad at all. Obviously it is better if you can add a foreign language skill to that experience, but some kind of overseas experience is important to ensure the competitiveness of graduates of the land grant college of agriculture, food and natural resources in this modern, global industry in which they are going to work in the future.

I believe we are going to see a reduction in the number of Ph.D. programs in the United States in coming years. Certainly, twenty Ph.D. programs in the United States in any discipline would be enough. We currently have too much fragmentation, too many small, no-name Ph.D. programs that cannot place American graduate students two states away. The programs are more than 50 percent filled by foreign students, and foreign students do not deliver political support in state legislatures. A good-sized foreign student population on a campus does increase cross cultural experiences for students who cannot go overseas, but the fact remains that a large foreign student population does not deliver the votes in the state legislature to ensure continued appropriations, so I believe there is likely to be a weeding out of Ph.D. programs.

In the area of research, I would like to give you an example from the first semester I was dean at Purdue. I spent a lot of time out in the state listening to our constituents, and too many of them said they did not think the Purdue school of agriculture was on the cutting edge of research anymore. I knew better. Certainly we had centers of excellence, but the folks out in the state did not know about them. As we evaluated that experience, we concluded that all the incentives were for our good researchers to be publishing in their scholarly journals in technical jargon. Their research results were completely inaccessible to the lay public, and there was no incentive whatsoever, particularly for your basic researchers, to tell the lay public in language they could understand what they had done for the state lately. So in a time when we were downsizing the faculty 20 percent, I added two professional science writers to our ag communications staff. That went down a little hard with some of the faculty, but I will tell you, it paid tremendous dividends. Too often we beat out of a Ph.D. student any capacity to communicate in plain English before we will give them a Ph.D. And if we do not tell our voters and taxpayers what we have done for them lately, especially in research, we are in trouble. I am absolutely convinced you can get public support from the lay public for basic research as well as for applied research if you communicate effectively in plain English. If you explain how basic research may hold the key to solving problems that are important to the state, the lay public will understand.

In our research, we may have become too disciplinary and too focused because of our incentive structure. Basically we have two criteria in most universities for promotion based on research: 1) the number of refereed articles in professional journals, and 2) the success in obtaining grants. But I believe we also must provide more incentives for multi-disciplinary research. Too many of today's problems are too complex for the lone ranger from a single discipline to solve. Somehow we must provide incentives for our research faculty members to participate in multi-disciplinary teams. For promotion and tenure, we must recognize publications with long lists of authors, and the sole author publication should not get a lot more points than a publication with twenty authors. I believe we will see an increase in dependence on competitive grants, and a reduction in support from formula funds. There is a perception in Congress, and in some of our lay leaders who influence Congress, that there is too much duplication in formula funding.

One last important thing we must do in to reverse the declining public support for agricultural research is work to make strong advocates of the interest groups with the capacity to deliver multi-billion dollar appropriations in Washington. When deans and vice presidents of agricultural colleges go to Washington to lobby for Hatch appropriations, they are there with a vested interest, and they will get a good hearing, but it will not be anywhere near as effective as the reception the Georgia Agribusiness Council, the soybean association, the poultry producers association, the peanut producers association or the cotton producers association would receive. These special interest groups can carry the importance of investing in research not only to Washington, but also to the state capitol. They can argue effectively that this research is essential for the long-term competitiveness of our industry and for our ability to continue to export $60 billion worth of farm products from the United States this year—and to increase our exports of agricultural products from the United States to $90 billion worth twenty years from now.

Finally, I really believe the extension mission is one of the greatest assets a land grant college has when a dean or a president goes with hat in hand to the state legislature. The extension functions have served us well in agriculture, home economics, veterinary medicine, forestry and all the traditional areas under the Cooperative Extension Service umbrella. I think the land grant university could benefit if the rest of the university also adopted the land grant vision of not just teaching in the classroom on campus, but also having outreach to the state. Engineering certainly has much it can offer to the industrial sector of a state. Schools of management have much they could offer. Education schools have a great deal to offer with the public education system experiencing the keen pressure it is under today. The land grant university needs to broaden its perspective and service to the state, and I believe there are two things that will sustain state appropriations. One is the reputation of the college or the university for quality teaching of undergraduates, and the second is a perception of service to the state. If the university does those two functions well, it will also receive appropriations for graduate education and research. In the reality of today, higher education is competing intensely with K-12 education, with welfare programs, with Medicaid, with construction of prisons. Those are the competitors that your dean and president have to confront when they go to the legislature for appropriations, and they must be able to project an image of service to the state and of quality undergraduate teaching if they are going to get not only those appropriations, but also funds for research and graduate education.

The parts of the land grant university that traditionally have had the greatest state support are agricultural and environmental sciences and associated food issues. But with the changing needs of society, there has been an increasing need to respond to a new agenda of social problems, including urban youth, youth at risk, the problems of a single head of household, and environmental problems. The Cooperative Extension Service has suffered in part because it has not cultivated a sufficient political constituency to sustain appropriations in those newer social areas, and often the farm and agribusiness sectors feel they have been abandoned by extension. The extension

service historically has been able to deliver the votes in support of appropriations, but their traditional constituents are not convinced that extension is there to serve them today as it has been previously. As a result, this has created budgetary problems for extension, and I think this is one of the important challenges. The land grant university must continue to effectively serve the needs of the farm and agribusiness sectors, while at the same time meeting the other, newer demands of the state, and part of the challenge is to find a way to generate the political support to sustain the appropriations.

Some of the new areas extension has moved into do not have the strong research base extension historically has relied on—and extension without something to extend can be a real problem. This type of activity certainly does not have as high a payoff as when the research and extension functions are closely linked and dependent on each other—extension bringing the problems back to the researcher and taking the research results out to the state. If extension continues in the direction in which it is now evolving, there needs to be a much stronger research base in these new problem areas, and it is also important that it continues to get research results out to the commercial agriculture sector in the traditional areas of agriculture, forestry and natural resources.

In summary, I continue to believe that the land grant college of food, agriculture and natural resources is one of the great institutional innovations. The leadership of land grant colleges today is doing a lot of soul searching, but this system is effectively repositioning itself and moving toward the 21st century. If we are to continue to meet the needs of the agricultural sector in the future, the teaching, research and extension functions must be very closely linked. We must be sure our incentive structures are appropriate, so that we not only continue to do cutting edge science and graduate education, but also keep our eye on the outreach function and the undergraduate teaching functions, which—when we come to the end of the day—are those with the greatest potential to deliver state appropriations in support of the public university. Finally, fund raising is going to have to be broader than it historically has been. State and federal appropriations will not provide sufficient support. We are going to have to turn more to private individuals, corporations and foundations, and we are also going to have to rely more on competitive grants from both public and private sources. But I believe that if we are perceived as addressing the problems of the early 21st century, bringing the best that modern science has to offer, the land grant college of food, agriculture and natural resources will continue to be viewed as a great asset that efficiently and responsibly responds to this changing agenda of new industry issues.

Notes

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