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Rob King

RISK ANALYSIS FOR AGRICULTURAL  
PRODUCTION FIRMS: CONCEPTS,  
INFORMATION REQUIREMENTS AND POLICY ISSUES

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## DISCUSSION--VARIABILITY: WHAT SOME PRODUCERS THINK AND DO

Stan Spurlock

I interviewed nine farmers in Washington County (the Delta region), Mississippi. Five were crop producers and four were crop and livestock producers--2 cattle and 2 catfish. Primary crops were cotton, soybeans, wheat, rice, and soybeans/wheat double-cropped. Minor crops were corn, milo, and pecans. Acreage ranged from 80 to 3500 crop acres but 6 of the nine respondents had between 900 and 1600 crop acres. All respondents were very cooperative, although one man failed to see why anyone would be interested in this type of information. Possibly, he was correct. I, however, would like to think that some important insights into current farm problems were elicited.

Table 1. Relative Importance of Variability,  
Mississippi Delta, 1983

Crops (9)	Livestock (4)
Commodity Prices	Costs of Operating Inputs
Weather	Inflation
Costs of Operating Inputs	Diseases and Pests
Diseases and Pests	Commodity Prices
Safety and Health	Costs of Cap. Eq.
Gov't Comm. Programs	Use of Leverage
Inflation	Weather
Costs of Cap. Eq.	World Economy
World Economy	Availability of Loan Funds
Cost of Credit	Cost of Credit
Use of Leverage	Safety and Health
Gov't Laws and Reg.	Family Plans
Availability of Loan Funds	Hired Labor
Hired Labor	Changes in Technology
Family Plans	Gov't Laws and Reg.
Changes in Technology	Gov't Comm. Programs
Leasing	

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Stan Spurlock is an Assistant Professor of Agricultural Economics at Mississippi State University.

I grouped responses in Section II of the questionnaire into categories having similar degrees of importance. These are listed in Table 1. Rankings by crop producers differed from rankings by livestock producers. Commodity prices and weather were the most important sources of variability for crop producers; livestock producers were more concerned with costs of operating inputs.

Table 2. Management Responses to Variability,  
Mississippi Delta, 1983

Government Commodity Programs  
Forward Contracting

Maintaining Financial Reserves  
Spreading Sales  
Pacing of Investments and Expansion  
Market Information  
Enterprise Diversification

Production Practice Diversification  
Maintaining Flexibility in Farm Organization

Idling Production Capacity  
All-Risk Crop Insurance

Hail Insurance  
Debt Management  
Use of Futures Market

Holding Inventory Reserves  
Off-Farm Activities by Other Family Members  
Utilizing Government Credit Program  
Off-Farm Activities by Farm Operator  
Maintaining Feed Reserves

Holding Credit Reserves  
Geographic Diversification

Management responses to variability are also grouped by similarities within each group (Table 2). Participation in government commodity programs was done primarily to obtain a guaranteed price. Forward contracting was done when prices were high enough to cover expenses. Financial reserves were used to protect against cash flow problems and to avoid high interest rates. Most of the cotton producers sold their crop through a marketing pool.

Others stored a portion of their crops. Pacing of investments and expansion was considered a must by most producers--apparently in order to survive. Market information was derived from many sources--electronic services, magazines, etc. The timeliness of information was noted as being important. Enterprise diversification referred to a wide range of responses. Both catfish producers recognized that low crop prices would mean low feed costs and increased profits for catfish. Crop producers referred to spreading labor and equipment and rotation systems. Production practice diversification included the use of different seed varieties and chemicals. One operator was considering irrigation. Flexibility was required to take advantage of profitable situations. Idling production capacity was done to improve long-run production. Crop insurance was used by four operators. The rest of the risk responses were used by less than four farmers.

During these two sections I had a feeling that many of the respondents were thinking about profit levels rather than variability in profits. In general, Sections IV and V seem to confirm my feelings. The respondents answered yes or no to the four questions in Section IV (Table 3), but most of them did not provide useful information, especially on questions 1 and 4.

Table 3. Managerial Strategies and Variability,  
Mississippi Delta, 1983

	Yes	No
1. Combine Responses	7	2
2. Offsetting Actions	3	6
3. Give Up Income	3	6
4. Influence by Others	5	4

Some answers were informative. A catfish producer on question #2 said that he switched from cotton to soybeans/wheat in order to be able to borrow money for fish food. For question #3, one crop producer said that idling acreage reduced short-term profits but reduced variability in the long run.

Section V appeared to provide better information (Table 4). Question #1 emphasized marketing and production problems--primarily on the timing of various activities. Question #2 was answered but reasons for their choices were not presented. Question #3 again emphasized marketing and production problems. Question #4 elicited several different sources of information. Five respondents did not have an answer for Question #5 although some answers were given.

Table 4. Information Needs for Dealing with Variability,  
Mississippi Delta, 1983.

1. Most Difficult Decisions				
	Timing of Activities in Crop Production		1	
	Marketing Crops or Catfish		6	
	Both Production and Marketing		2	
2. Importance of Decisions on Variability				
	More	Equal	Less	NR
	4	2	2	1
3. Decisions on Variability				
	Marketing			4
	Production			2
	Marketing and Production			3
4. Useful Information				
	Market Reports (Prices)			
	Government Intentions			
	Experience of Others			
	Research			
5. New Information				
	Proven Marketing Plan			
	More Research			
	Straight Answers From Extension			

In summary, I feel that some of the farmers had not perceived many types of decision-making in a risk-return framework. There is, however, a desire by farmers to obtain and use new management practices. If risk management techniques are to be used effectively, then more effort should be made to teach farmers how to use these techniques. Specific problems were identified through this survey. These problems involve production and marketing dynamics--when to spray, sell, etc. If other states (or regions) find similar problems, then coordination of research efforts is necessary. The main objective is to provide farmers with useful knowledge.

Risk Management by Arizona Growers:  
Some Preliminary Observations

Paul N. Wilson

Cotton and beef cattle production represents the major economic activities in Arizona's agricultural sector (Brantner). One hundred percent of the cotton produced in Arizona is irrigated on farms which, on the average, are the largest in the United States. Cow-calf production occurs on ranches of varying sizes with public lands representing upwards of 75 percent of the available grazing land to the rancher (Mayes and Archer). The manner in which the operators of these unique production units view their sources of variability and how they respond as managers to risk should provide valuable insights into the present status of risk management in Arizona agriculture.

The Arizona survey data was shared with a subcommittee of Southern Regional Research Project S-180, "An Economic Analysis of Risk Management Strategies for Agricultural Production Firms." Eleven other states also surveyed a small group of agricultural producers using a questionnaire developed by members of the S-180 subcommittee. The results from this twelve state pilot survey have been reported by George Patrick. The objective of this discussion paper is to share some preliminary findings from the Arizona survey conducted in the fall of 1983 which elicited risk-related information from cotton growers and ranchers.

Procedure

Originally, this pilot survey was to be conducted as a personal survey with ten to twelve agricultural producers. In Arizona's case a mail questionnaire was used because we (1) lacked time and staff to do the field work and (2) we were interested in testing a rigorous mail survey with Arizona growers. Mail surveys to agricultural producers in Arizona have had dismal response rates in the past.

Potential respondents were identified by county extension agents and contacted by phone to request their cooperation. All of the individuals contacted agreed to participate in the survey. The personal survey questionnaire was redesigned following the guidelines developed by Dillman. Using the Total Design Method (TDM) questionnaire format and follow-up procedures, one hundred percent of the questionnaires were returned within two weeks. Several producers did not respond to the income questions but otherwise all the information was provided. Eleven cotton

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Paul N. Wilson is Assistant Professor, Department of Agri-Economics, University of Arizona.

growers and five ranchers cooperated in this preliminary study. The results should be interpreted as tentative, subject to a more statistically reliable survey to be conducted later this year.

### Findings

Of particular importance for further research is the finding that Arizona agricultural producers will respond to TDM questionnaires if their cooperation is requested prior to mailing the survey instrument. This high response rate makes it possible to scientifically sample Arizona producers regarding their attitudes towards risk and management responses to variability. It is recognized that a more representative sample will produce a lower response rate, but it still should be significantly higher than the ten to twenty percent responses obtained in past efforts.

Sources of variability were ranked from 0 to 5 for increasing level of importance. A ranking of the most and least important sources of risk is as follows by type of producer:

<u>Cotton Grower</u>	<u>Rancher</u>
Most Important Sources of Risk	
Commodity Prices	Government Programs
Cost of Operating Inputs	Leasing
Weather	Livestock Prices
Inflation	Weather
Cost of Credit	Safety and Health
World Economic Situation	Family Plans
Least Important Sources of Risk	
Leasing	Changes in Technology
Changes in Technology	Hired Labor
Hired Labor	World Economic Situation
Use of Leverage	Availability of Loan
Availability of Loan Funds	Funds
	Diseases and Pests

The cotton grower consistently ranks cash flow-type variables (prices, cost of inputs, credit, etc.) higher in importance than the rancher. However, cow-calf operators regard leasing and overall involvement of the government in the agricultural sector as important sources of risk for their businesses, even more so than the cotton growers. This observation is not surprising given the important roles played by the Arizona State Land Department, Bureau of Land Management and the Forest Service in the ranching sector. Ranchers, who represent on average an older producer group, also rank family related concerns as being more important. Cotton growers, in turn, who export 90 percent of their cotton to Asian markets, rank the world economic situation as a critical source of variability.



Management response to variability by different sets of decision makers presents many interesting comparisons and are presented in Table 1. Only the highlights will be discussed. Cotton producers under the age of 45 who have a college education and less than \$500,000 of family net worth use management tools to reduce risk more frequently than their counterparts. All types of diversification and marketing alternatives receive low rankings by the rancher. Maintaining feed reserves and pacing investments are the major risk management techniques used by cow-calf operations.

Table 1. Rankings of Management Responses to Variability

Management Responses to Variability (Scale 0 to 4 for increasing importance)	Sets of Decision Makers							
	Cotton Grower	Rancher	Age ≤ 45	Age > 45	Family Net Worth 499,000	Family Net Worth 500,000	Education ≤ 2 Years College	Education > 2 Years College
1. Enterprise Diversification	3.5	1.8	3.2	2.5	3.3	2.8	2.0	3.3
2. Geographic Diversification	1.2	1.3	1.9	.8	2.0	1.2	.6	1.6
3. Production Practice Diversification	2.8	.8	2.5	2.0	3.3	2.0	1.6	2.5
4. Maintaining Feed Reserves	.5	2.5	.6	1.5	.7	1.2	2.2	.5
5. Spreading Sales	2.9	2.3	2.6	2.6	1.0	3.0	2.8	2.5
6. Forward Contracting	3.2	.3	2.9	1.8	2.7	2.3	.8	3.1
7. Use of Futures Markets	2.0	1.5	2.2	1.6	1.7	2.0	.8	2.4
8. Market Information	3.3	3.5	3.1	3.8	3.7	3.4	3.6	3.4
9. Government Commodity Programs	3.0	.8	2.2	2.2	2.3	2.2	1.2	2.7
10. Hail Insurance	3.1	.8	2.6	2.0	2.3	2.3	1.2	2.8
11. All-Risk Crop Insurance	1.6	.3	1.2	1.1	.7	1.3	.8	1.4
12. Maintaining Financial Reserves	2.8	1.7	2.6	2.5	3.3	2.4	1.8	2.9
13. Holding Inventory Reserves	1.1	1.7	.5	1.9	1.7	1.1	2.0	.8
14. Holding Credit Reserves	3.0	2.0	2.4	3.1	3.7	2.5	2.6	2.8
15. Debt Management	1.9	2.2	2.2	2.1	3.0	2.0	1.8	2.4
16. Utilizing Government Credit Programs	1.6	.7	1.8	.9	2.0	1.2	.8	1.5
17. Maintaining Flexibility in Farm Organization	3.2	2.2	3.2	2.6	3.3	2.8	2.2	3.3
18. Idling Production Capacity	2.3	2.3	1.8	3.0	3.3	2.2	3.0	2.1
19. Pacing of Investments and Expansion	3.7	3.2	3.6	3.4	3.0	3.6	3.2	3.6
20. Off-Farm Activities by Farm Operator	1.8	1.0	1.9	1.4	2.0	1.5	.8	2.0
21. Off-Farm Activities by Other Family Members	1.3	.8	1.6	.9	1.0	1.3	.8	1.4

Younger producers are more willing to consider diversification and marketing strategies such as forward contracting and hedging as risk management tools. Older growers are more likely to use credit reserves to reduce their vulnerability to economic instability. Farm and ranch families with less than \$500,000 in net worth appear to be more willing to diversify through their enterprise mix, geographic area of production or production practices. These producers also use financial and credit reserves to a greater extent. College educated growers use a wide variety of risk management tools, much more so that their colleagues who have completed less than two years of college.

A final highlight is the consistently high ranking of market information. Cotton growers and ranchers rely on farm magazines, U.S.D.A. publications, private reporting services and university agricultural publications to assist them in planning production

and pricing their commodities. Several producers remarked that they did not believe everything they read in these publications, but they nearly unanimously agreed that this information was important in managing variability.

### The Next Step

The above results are encouraging enough to warrant a more complete and statistically reliable risk management survey of Arizona's agricultural sector. Cotton growers, ranchers and dairymen will be included in the new scientifically drawn sample. A similar mail TDM questionnaire will be used along with random personal interviews with a selected number of respondents. The results should give us some meaningful insights into management methods that warrant our increased interest as researchers and public servants.

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MANAGEMENT RESPONSES TO RISK -  
SOUTHCENTRAL WYOMING MOUNTAIN VALLEY  
CATTLE RANCHES

Carl E. Olson

The management responses to risk and variability by cattle ranch operators in Southcentral Wyoming are heavily influenced by the resource and climatic characteristics of the area. The growing season is short, the nights are very cool and the area is semiarid, all of which combine to restrict cropping alternatives to irrigated hay and pasture and native range. Thus, extensive livestock production is the most feasible agricultural activity.

Typical Ranch Organizations

The basic commercial agricultural operations in the area are cow-calf or cow-yearling ranching. The cow-calf ranch organization is one in which cows are bred to calve in late winter and early spring. The calves are weaned and sold in the fall weighing approximately 400 pounds. The ranch has to feed the basic breeding herd (cows, replacement heifers, and bulls) approximately 5 to 6 months during the winter. Thus, the ranch needs to produce or purchase 1.5 to 2 tons of hay per cow unit in the basic herd for winter feed.

The cow-yearling operation differs from the cow-calf operation in that the calves are kept and fed through the winter; summered on native range or pasture and normally sold in early fall weighing 650 to 750 pounds. Again, the livestock inventory will need approximately 1.5 to 2.0 tons of hay per head of breeding stock and 1 to 1.2 tons of hay per head of yearlings carried through the winter.

The size of the livestock inventory carried on any ranch is determined by the balance of grazing and hay forage available. The operator will normally establish the inventory on the amount of winter feed that can be produced. In some instances, hay production has been increased through investment in leveling irrigated land and planting improved hay varieties. The leveled land allows for better irrigation practices and improved yield. Also, many operators are fertilizing their hay to improve yield and total hay forage production from a given land base.

Economists often ask why ranchers do not seek to improve their hay yield. The answer is, they have no need for additional winter feed for the livestock inventory that the range or pasture land available to the operation can properly carry. Also, there is a limited market for hay in the area and transportation costs are high to move the hay to other areas.

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Carl Olson is a Professor of Agricultural Economics, University of Wyoming, Laramie, WY.

One can argue that the feeding period can be extended by up to a month or so which would enable the range to carry a few more head, but for fewer days. In some instances this type of program will work. However, changes in the livestock inventory may result in labor shortages at critical times. And good part-time labor may not be available when needed.

The above description of the basic ranch organizations and their organizational problems are needed to better understand and interpret the responses to risk management given by the operators interviewed.

A total of 11 ranch operators were interviewed in the early fall of 1983. The following is a qualitative analysis and interpretation of their responses to use and usefulness of various risk management strategies in their ranching operations.

#### Enterprise Diversification

The operators indicated that the resource base of their unit dictated to a very large extent the amount and type of diversification that could be effectively implemented.

One large operation had both sheep and cattle. The combination was working very well in terms of utilization of forage, existing building facilities and labor for the ranch operation. If a ranch has the buildings and corrals to handle both sheep and cattle, such diversifications might be feasible. However, if facilities to handle one enterprise or the other had to be built, the costs would most likely be greater than the reduction in income instability of having a single enterprise operation.

Two of the operators interviewed had purebred cattle as well as their grade herds. The operators felt such a combination was working quite well for their particular situation.

A diversification system suggested by several of the operators was to have sufficient range or pasture capacity to run stockers during the grazing season in addition to the unit's basic livestock inventory. The stockers could be owned either by the operator or by others and pastured on a charge per head per month or season by the operator. Several operators in the area are presently engaged in leasing or renting their range and/or pasture in this manner with fairly good success. However, it works only if the range and pasture capacity is available and cattle are available to put on that range and pasture.

#### Geographic Diversification

Most of the operators interviewed did not use geographic diversification as a risk management strategy. The nature of the ranching operations in Southcentral Wyoming do involve a certain amount of geographic diversification. Often, the operated rangeland is often spread over wide areas and may be at different elevations which gives different climatic features to the rangeland. One operator indicated his ranch was in three climatic zones. He had irrigated hay and pasture in the valley, irrigated pasture and dry land range in the foothills and forest grazing in the mountains. The total distance between the three grazing areas is approximately five miles, which is not far for western livestock ranches.

One of the operators had irrigated hay and pasture land in two drainage basins. He felt that such geographic diversification minimized weather risk for his hay production. He indicated that he could produce enough hay to feed his livestock inventory through the winter even though there were adverse weather conditions in one drainage. This operator is also able to move his cattle from one drainage area to another for grazing as weather conditions permit. He did indicate such moving is expensive, but he could maintain his range and not get into overgrazing situations.

The manager of the large corporate operation with ranches in three states indicated that the corporation did move livestock between the ranches when weather conditions were adverse in one area. Such movements enabled the corporation to maintain a stable breeding herd and take advantage of favorable grazing conditions as well as avoid range deterioration when drought hit at one of their locations.

#### Production Practice Diversification

The ranch operators interviewed did not think production practice diversification as described in the questionnaire to be very important. Several operators have improved part of their irrigated hay land and vary the fertilizer application according to fertility test recommendations. The conclusion reached is that there is really very little room to diversify production practices once the ranch is organized.

#### Maintaining Feed Reserves

All operators interviewed keep some hay in reserve in case of a poor crop the following year and/or a long, hard winter. The amount of hay that the individual producers keep in reserve varied. However, the carryover of hay (Maintaining Feed Reserves) is very important. The main reason given for carrying hay over was that hay becomes very expensive in a local area when it is in short supply. The feed costs are much less when the operators produce all the hay they need to carry their livestock inventory for the feeding period. Maintaining hay reserves reduces the risk of the current hay crop not being sufficient to feed the livestock inventory properly through the winter feeding period. The length of the feeding period depends on the length and severity of the winter. Carrying over hay reduces this risk.

#### Spreading Sales

Spreading sales as a method of reducing risk was not very important to the producers interviewed. They all said that they sell their feeder animals when the animals are "ready." They felt it was not possible to hold the animal very long beyond the time it is "ready." Also, they cannot speed things up very much without incurring considerable additional costs which they did not feel they could cover with higher price and/or sale weight.

A few of the operators did have sufficient resources to carry calves to yearlings when feeder calf prices were bad. The operators that indicated they would carry the feeder calves to yearlings when they had feed available and/or feed was relatively inexpensive in terms of cost of gain and the expected returns from the heavier feeder animal.

### Forward Contracting

Forward contracting is used by many of the ranchers interviewed in one of two ways. Several of the producers contract for feed supplements (protein cake) and/or fertilizer. They indicated they liked to contract for the inputs when they felt the prices were most favorable. Also, the contracting gave them a known production cost to use in their planning.

A few of the producers indicated they like to contract their feeder cattle sale four to six weeks before the cattle are ready. Apparently, such contracting gives them "peace of mind."

One operator has used the video sale system with mixed results. The terms of the sale in which he participated were sale in September for November delivery. One year, the operator was very pleased with the result. The next, the bid prices were quite low and he had a "no sale." The video sale system has good possibilities for the range livestock producer.

### Futures Market and Market Information

None of the producers interviewed use the futures market to hedge their cattle at the present time. A few have tried hedging but had bad experiences and are not likely to hedge again.

The ranchers indicated that they do utilize the futures prices as one source of market information. Market information is important to the feeder cattle producer. They indicated they use current information to time sales (which week in a four week sale period) to try to hit the best price during their usual sale time.

Market information is also used by the producer to formulate longer term price expectations. Such price expectations are important when planning capital (machinery, buildings, land, land improvements, breeding livestock) investments.

### Government Programs

The ranchers interviewed indicated that their participation in government programs was mainly cost sharing land and irrigation structure improvement programs of the ASC and the SCS. Those with sheep do participate in the wool incentive program. None of the ranchers in the survey are using government credit programs.

### Insurance

All operators in the survey have insurance that covers stored feed in case of lightning and other sources of fire. The buildings and equipment are also insured. None of the operators had all-risk crop insurance.

### Financial and Credit Reserves and Debt Management

The idea of keeping financial reserves, be it cash or credit, is very important to the ranch operators. The relative importance of cash versus

credit depended on the debt situation of the operator. Those without any debt (several had no debt at all) had financial reserves in the form of certificates of deposit and savings accounts available in case funds were needed.

The operators that use credit indicated they try to use less than their limit to keep a credit reserve for unforeseen emergencies. They were limiting their borrowing.

The ranchers using credit in their operations indicated they try to work with their lenders when having repayment problems. They try to pay their operating notes each year, which sometimes limits their borrowing when they look at expected repayment capacity. They make sure that they can pay the interest due each year.

Two operators interviewed have development land for financial security. They indicated that they can borrow against the land if they had an unforeseen financial emergency. They can also sell the land if the financial need was such that sale was necessary.

#### Pacing of Investments and Expansion

The ranchers interviewed indicated this to be very important in risk management. They all indicated a need to plan for building and facilities upkeep as well as machinery replacement. Several suggest that five-year planning horizon was best.

The actual outlays were based on need, available funds, and expectations of repayment ability in the future. It was strongly suggested that expenditures in this area need to be watched and should be based on ability to pay for the change through cash available or with debt without jeopardizing the survival of the unit.

#### Off-Ranch Work by Operator and Family

The importance of off-ranch income appears to be a function of ranch debt, age of family and distance to town. In the cases where the ranch has income from off-ranch sources (wife is working, operator has non-ranch sources of income) the income is very important.

#### Summary

The responses to the questionnaire by cattle ranchers in Southcentral Wyoming indicated that maintaining feed reserves and financial and/or credit reserves are very important in their management of risk. They also indicated that planning new and replacement investments in durable capital, and breeding livestock and expansion of land base are very important, and must be coordinated with debt and credit management. Off-farm income sources to the family is a very important risk management strategy for several of the operations.

