Farming Systems and Farmer Decision Making in Columbia and Suwannee Counties

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ABSTRACT

In order to provide a mechanism for managing risks to agriculture associated with climate variability, there has been an ongoing effort in recent years to provide and apply seasonal, probabilistic climate forecasts (SCFs) for upcoming months up to one year. Conclusions of a 2005 *sondeo*, which is a multi-disciplinary, conversational interview approach, were generated from comments and practices of north Florida small farmers and from the researchers' conceptualization of the farmer decision-making process. In April 2007 we conducted a *sondeo* to study more deeply the fundamental processes of farmer decision-making, which was part of a University of Florida class project for AEE 5232, Farming Systems Research and Extension Methods. We conducted a *sondeo* in Suwannee and Columbia counties. We found that farmers must weigh a number of other factors when making management decisions before they might use SCFs. Several of these dominating factors that affect farm production decisions among the participating farmers were: weather, labor, input costs, and product prices. Many of the livestock farmers were linked into larger regional and national markets. Market factors, such as specific windows for the sale of certain products and contracts with wholesale buyers, often dominate the decision-making process, leaving little room for adjustment on the basis of climate or other information. Until SCFs are more accurate and definitive, and perceived by farmers as such, farmers will not find them very relevant to their overall decision making.

INTRODUCTION

Weather and climate are principal agents influencing society and farming systems around the world. Both have a role to play in the decision-making processes of farmers concerning their activities and enterprises. Weather and climate are conceptually different things, however, and it is important to understand the differences between the two before considering their differential roles in farmer decision-making.

Weather refers to current and recent meteorological conditions and conditions forecast for the near future. The major meteorological variables are: temperature, precipitation, humidity, wind conditions, and solar radiation. Weather is place and time specific. Weather affects farmer decision-making by acting as a trigger for, or an impediment to, direct action. Examples include waiting for rain to plant certain crops, irrigating to protect valuable crops from forecast frost damage, delaying harvest due to rain, or adjusting livestock feed and water in response to temperature fluctuations.

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In contrast, climate involves a longer outlook; encompassing weather averages in generalized regions over extended periods of time. Climate affects farmer decision-making in the present, but the implications of climate may also extend years into the future. Similarly, climate may affect production for one or multiple years. Climate-related data inform farmers about regional growing seasons, suitability of crops and crop varieties for an area, and the general need for irrigation.

In order to provide a mechanism for managing risks to agriculture associated with climate variability, there has been an ongoing effort in recent years to provide and apply probabilistic seasonal climate forecasts (SCFs) for upcoming months up to one year (O'Brien et al. 1999). One of the most important factors influencing global seasonal climatic variations is the El Niño Southern Oscillation (ENSO) phenomenon, with its phase changes between El Niño, La Niña, and Neutral. These terms relate to changing sea surface temperatures in the eastern, equatorial Pacific Ocean (Neelin and Latif 1998).

Seasonal climate responses to ENSO phases have been shown to be more prominent in the southern United States than in the north, with more pronounced linkages during fall and winter than during spring and summer (Jagtap et al. 2002). Such groups as the National Oceanic and Atmospheric Administration (NOAA) and the Center for Ocean Atmospheric-Prediction Studies (COAPS) produce SCFs for the Southeastern US. However, these forecasts need further interpretation as to their relevance and impact upon agricultural activities; for no matter how much a SCF improves it must be paralleled by advances in accurate interpretation and application of its predictions (Letson et al. 2005). The Southeast Climate Consortium (SECC) provides such a link between SCFs and agriculture for the states of Florida, Georgia, and Alabama through its decision support tools on the *AgClimate* website [http://AgClimate.org]. Fraisse et al. (2006) indirectly highlighted the importance of *AgClimate* in providing this link, as they concluded that the majority of crop failures in the USA are a result of too much or inadequate rainfall. The SECC currently provides risk assessment tools for three important crops in the region (tomato, potato, and peanut), and provides information on the likely responses of seven crops to changing ENSO phase.

Canales et al. (2005) undertook a *sondeo* with small-scale farmers in and around Gainesville, FL. A *sondeo* is a multi-disciplinary methodology for rapid assessment, with research teams that should include a natural scientist and a social scientist for each interview (Hildebrand 1981). The objective of the Canales et al. (2005) was to better understand the perceptions of farmers regarding the potential utility of SCFs and other climate information produced by the SECC. Based on farmer comments and practices, Canales et al. (2005) concluded that there were at least two important factors that may affect the potential benefits of SCF information for farmers. One was the frequency of farmer-market interaction and the other was the frequency of planting or breeding (Figure 1). Given these factors, they concluded that cropping and livestock systems characterized by intermediate frequency of cycle initiation and low frequency of market interaction would most likely benefit from SCFs.

There may be significant potential for farmers to apply knowledge concerning SCFs to their management and production strategies. Lettre (1999) notes, however, that much research, communication, and understanding is needed to maximize SCF benefits for agriculture. In a step toward meeting this need, this *sondeo* focused on how farmers in two north Florida counties make decisions and the constraints they face in farming. Our belief is that better understanding of farming systems and decision-making processes will foster a more profound understanding of the potential for climate-related interventions and an improvement in the tools available to farmers.

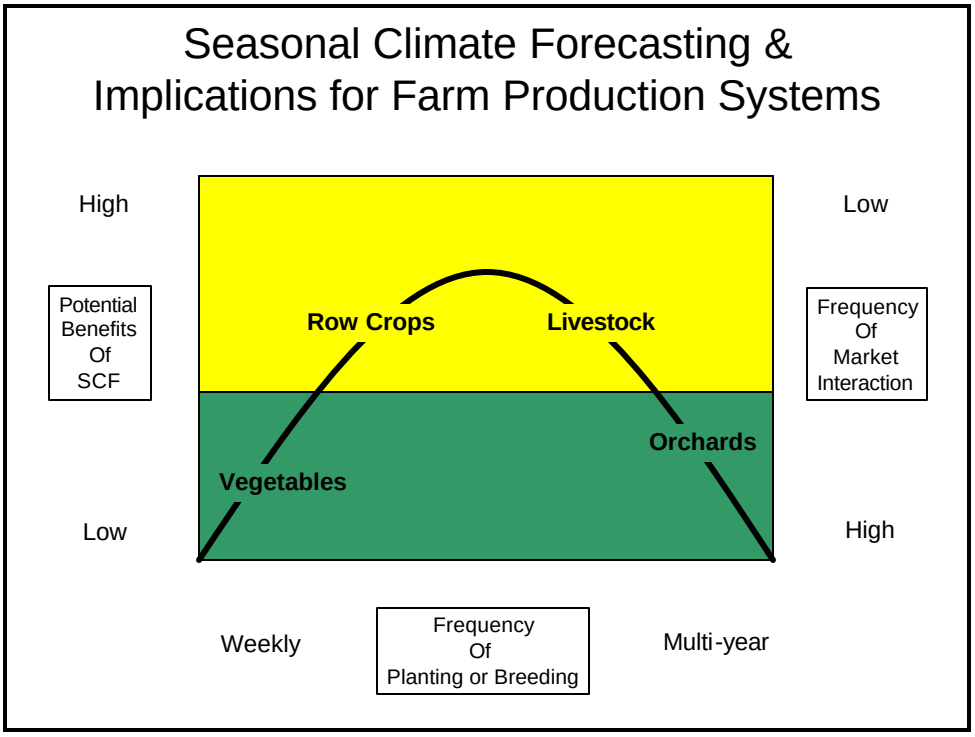

Figure 1. Graphic representation of conclusions from Canales et al. (2005).

The conclusions of Canales et al. (2005) were generated from comments and practices of north Florida small farmers, but also from the researchers' conceptualization of the farmer decision-making process. In April 2007 we conducted a *sondeo* to study more deeply the fundamental processes of farmer decision-making, which was part of a University of Florida class project for AEE 5232, Farming Systems Research and Extension Methods. Through this research we sought an improved understanding of the specific points in farm management where the provision of climate information might represent a meaningful and active intervention. The objectives of this *sondeo* were: 1) to understand the present reality of local farming systems; and 2) to access the farm management and decision-making process. In order to meet these objectives, researchers established two guiding questions: 1) What, when, and how do farmers decide what to do; and 2) How can the tools of SECC better assist farmers in their decision-making process?

METHODS

Research teams used *sondeo* methodologies developed at, the Institute of Science and Agricultural Technology (ICTA, in Spanish) in Guatemala (Hildebrand, 1981). A sondeo is a multi-disciplinary, conversational methodology for rapid assessment. Teams should include a natural scientist and a social scientist for each interview.

A *sondeo* is performed without taking notes during the interview to provide an informal atmosphere and flexibility regarding the topics discussed. Further, the informality of the conversation provides freedom to explore specific concerns of the farmer. The team directs the conversation to elicit the desired information, but neither follows a dogmatic line of questioning nor imposes a formal agenda on the interaction beyond a broad area of interest, in this case, farm

systems and farmer decision-making. Through conversation and experience drawn from multiple perspectives the *sondeo* team is capable of obtaining important and diverse data from the informants.

A team of two or three students conversed with each participating farmer. Following each conversation, team members individually made notes. Team members then regrouped to discuss their notes to ascertain validity and inclusiveness, and to elicit additional information that may have been overlooked by individuals. After each round of conversations, teams are reconfigured to provide a variety of group dynamics throughout the study. Time limitations restricted the number of possible interviews; nevertheless, with 14 farmers and 4 extension agents included in the study these results are valid. The final report integrates the results of all conversations and the sharing and processing of information among team members. Owing to its conversational nature, a sondeo results are not easily quantifiable because not all informants are necessarily asked the same questions during the conversations.

Sample description

We elected to do this *sondeo* in Suwannee and Columbia counties for two main reasons. First, they are within reasonable proximity to the University of Florida in Gainesville, permitting day trips for student researchers. In addition, the extension agents for these counties responded favorably to our initial inquiries. Before meeting with farmers, each student team met with the county extension agents to gain a better understanding of the historical and present context for farming in the counties. At these meetings, county extension agents also provided lists of farmers who represented diverse production systems in the counties and who the agents believed to be most willing to participate in the *sondeo*. Although all of the farmers contacted were open to participation, scheduling limitations did not allow us to meet withal of them. Ultimately, we conversed with 14 farmers: 9 in Suwannee County and 5 in Columbia County. Conversations with extension agents and the selection of farmers through agent recommendations provided a broad information base regarding the major trends affecting agriculture in North Florida. This approach, however, might have biased our sample.

Most of the farmers with whom we conversed had ties to their land and farming operations that extended back for decades and generations. In contrast, we were told that in Columbia County, the majority or farmers could be better described as lifestyle farmers, that is, individuals or families who have recently moved into the area and who rely on off-farm work for the majority of their income. According to extension agents, maintaining agricultural property tax exemptions may be more economically important than making a profit for many lifestyle farmers. Some may also be working towards developing profitable operations, but many have not yet succeeded in doing so. Although we have limited information for these lifestyle farmers, we must consider the possibility that they represent different farming and livelihood systems.

RESULTS AND DISCUSSION

Production Systems

Farmers we visited managed from 70 to 4,000 acres, including land that is owned, rented, or both. Farm size did not, however, necessarily reflect the intensity of operations. Larger land holders seemed to engage in extensive cattle grazing, while smaller operations were involved in more intensive operations such as dairy production, chicken houses, greenhouse production, and seed production and cleaning. Many of the participating farmers had also grown tobacco in the

past, some as recently as 2004, but had ceased tobacco production as the structure of the market changed with the elimination of the allotment system.

One of the main production systems encountered was that of beef cattle, referred to as a 'cow-calf' operation, where cattle are pastured and the calves are sold to western feed lots at intervals, typically each spring and fall. We encountered farmers with both irrigated and rain-fed pastures. Many of the farmers with cow-calf operations also produced hay. Few farmers limited their farm activities to the cow-calf system. In most cases cow-calf operations represented one component of a more diversified system.

Participating farmers with diversified production systems frequently grew peanut, corn (sweet, seed, or silage), potato, and watermelon. Many farms had pine plantations situated on marginal land and in some cases contracted the harvest of pine needles for pine straw. Other farms had large tracts of land devoted to pine and pine straw production. We also encountered dairy cattle, greenhouse production of fresh herbs, intensive broiler chicken production, and grass seed production and cleaning.

Most of the farmers suggested that their operations are dynamic and evolve constantly. Changes in the tobacco allotment program two years ago precipitated major change as some farmers strove to get big and others dropped out of production. For most, peanut has replaced tobacco as a crop that can generate decent returns, with economies of scale requiring 800 to 1000 acres for profitability according to these farmers. Moreover, speculation about consistently increasing prices for biofuel crops (e.g. corn and soy) remains at the forefront of most farmers' considerations. Many farmers also expressed tentative plans to grow new crops that they were considering or were currently testing on small farm parcels. New ideas with regard to crop timing and marketing were also mentioned.

Many farms were linked with regional and national markets with calves being sold in auctions to western operations, peanut being produced for corporations such as Bird's Eye and Peter Pan, herbs being distributed through large retail grocery chains, and watermelons going to eastern fruit brokers. In contrast, few farmers were involved exclusively in local markets or were moving in that direction as a niche marketing strategy.

Factors influencing production

Farmers reported several factors to have greatest impact farm production: weather, labor, input costs, and product prices. These four factors are interrelated and play important roles in farm decision-making. While these factors may change depending on the overall farm production system, farm size, and diversity of land-use, this report focuses on the general experiences the 14 farmers and how these factors affect farm planning.

In general, weather, labor, input costs, and prices are closely related to the following questions farmers are constantly grappling with: "What crops to plant? How much? When to plant and why?" In order to provide a clearer picture as to which SECC tools and data will be most beneficial to farmers, we need to consider the above-mentioned factors as they relate to farmer planning and decision-making.

Weather

Farmers typically spoke about weather more than climate as an issue of frequent concern. While they acknowledged the importance of knowing about likely climate conditions, such as, the likelihood that the coming winter would be harsh or mild, the probability of a drought, or an active and severe hurricane season, most farmers seemed more concerned with daily weather than climate. Most farmers stated that they check the weather forecasts every morning, but that they did not trust longer-term SCFs, as they are generally perceived to be inaccurate. One farmer

noted that he believed the Farmer's Almanac to be a reliable longer-term source, but was skeptical of most other sources. Another farmer stated that he was "still waiting for [this year's] El Niño to occur!"

In the livestock systems observed, there was less variability in the effect of weather on production than with row cropping systems. For irrigated pasture there was much less dependence on rain events, however, irrigation was mainly used to keep grasses alive rather than promoting pasture growth. For the crops observed, weather appeared to be the major factor for the timing of activities such as fertilization and herbicide treatments as well as when and what to plant. Weather directly affects when crops are harvested and processed. Peanut, for example, must be harvested and dried, making knowledge of humidity and general weather patterns important in their planning.

Labor

Labor was noted as a factor of production ranking high on farmers' lists. All farmers expressed a preference for hiring any available immediate and extended family members to meet the needs of their production systems and related businesses. Family labor, however, only goes so far. Scarce is perhaps the best overall description of the rural labor supply. This scarcity is most acute with respect to formal, documented employees, but it characterizes all components of the labor supply. One farmer commented that "[migrant workers] are willing to do the work local Americans are not interested in doing anymore, and for wages that farmers can actually afford."

Finding legal, hard-working laborers (immigrant and otherwise) that are willing to be paid "on the books" was a major concern for some farmers who needed to be able to account for labor expenses in their farm bookkeeping. One farmer noted that many migrant workers (documented or not) left Florida for Louisiana in the wake of Katrina in order to get better-paying construction jobs. For those farmers who manage to find immigrant labor and develop working relationships, labor availability is still unstable because guest workers have to deal with extensive and time consuming paperwork for themselves and for family members that may remain in their home countries. Another labor problem is the language barrier that can prevent farmers from properly communicating with these workers.

Labor availability and costs can affect decisions about what to produce. If a farmer doesn't have enough income to pay workers, then labor can be seen as a limiting input cost. Conversely, if there is insufficient labor available at peak times in crop production cycles, farmers will have to produce crops that are less labor intensive. In general, livestock owners seemed less affected by labor considerations than crop farmers, as cattle and pasture are less labor intensive.

Material input costs and product prices

Farmers often spoke of increasing costs for production inputs and how these costs affect their production decisions. Land (owned and rented), fuel, fertilizer (especially nitrogen-based), and feed costs have all increased drastically in recent years and affected overall farmer profit margins and particular production activities. Conversations were full of input costs as well as intermediate and end product price quotes and their effects on farm management. Consequently, production system decisions came across as being highly sensitive to current market prices and input costs. It was less clear, however, the extent to which these changes simply affected profit margins or had more profound impacts on decisions about what to produce.

Prices of fuels have increased dramatically in recent years. Fuel price increases not only affected the cost of running farm equipment, but also the price of inputs (fertilizers and feed) needed. Fuel prices can affect farmer decisions about which crops to produce. Higher fuel costs

associated with planting, harvesting, and drying tobacco, in the context of falling prices after the removal of the industry-funded allotment programs, led one farmer to convert the majority of his arable land from tobacco to pasture for livestock.

Encroaching development on farmland in northern Florida has led to increases in property values and taxes, and a decrease in arable land. Many farmers noted that land prices skyrocketed from 2002 through 2007, especially from 2005 through 2007. In Suwannee County land prices have increased from $2,500/acre to $10-15,000/acre. Farmers who cannot afford to buy more land have to lease fields from their neighbors, a resource that is rapidly diminishing. For commodities where razor thin margins may necessitate significant economies of scale, what a farmer decides to plant can depend heavily upon the amount and price of available land.

New demand for corn stemming from the surge in subsidies for ethanol production has altered the production landscape as well. Dairy farms in particular are adversely affected by higher prices for corn and corn silage. While some farmers see increasing corn prices as a potential profit opportunity, the market has yet to provide sufficient incentive for the farmers participating in this study to increase production levels.

Flexibility

Farm-specific information and the broader factors of production combine to give particular farmers varying degrees of flexibility. Being flexible means that farmers have the option to adapt to a changing production environment through modifications in the specific crops and varieties they produce, as well as the overall product mix. They can also adapt by changing the timing of their production-related activities.

A farmer that can determine the assortment and timing of activities and products can be considered flexible. Falling prices may lead a flexible farmer to produce less of a product. However, a less flexible farmer may need to produce more in the event of falling prices, thereby compensating for lower margins with increased production volume. Flexibility does not describe farmer attitudes; rather it refers to a condition that is defined in large part by the combined effects of numerous factors: farm size and farm household composition, labor availability, capital investments, outstanding contracts, regional climate, weather, input costs, and market conditions, to name several.

Farmers who are flexible may, over time, be viewed as resilient; whereas those with less flexibility may find themselves prone to 'feast or famine; conditions. One farmer described his situation as,, "One year you can break even, one year you can be on the top of the world, and the following year you can be bankrupt." Most farmers fall somewhere between flexible and inflexible, especially as the diversity of farm activities and production increases. Two examples provide insight into the flexibility observed.

One relatively flexible farm was a small dairy farm. This farmer found a niche in the market to meet the increasing demand and willingness of his customers to pay a premium for unpasteurized milk. The farmer adapted to this market opportunity by reducing the number of dairy cows in the operation, opening on-farm retail operations, and selling to local 'green' stores and farmers' markets. On-site processing and packaging and the ability to select consumers led to a more profitable business.

Another flexible farm produced herbs, vegetables, peanut, and cleaned and packaged grass seed. Flexibility was a result of regular experimentation with new crop types and growing methods. This farmer had constructed greenhouses, grown herbs hydroponically, created an irrigation system, and experimented with different planting and harvesting methods. In other words, the farm was an outdoor laboratory. The farmer has also noticed increased demand for

fresh, local produce related to residential development in the area and he is now planning to grow more vegetables on a small parcel of his land to sell in an on-farm storefront.

The above examples stand out as they demonstrate large and visible changes to farm production systems. However, adaptations need not be large, nor outwardly noticeable, to have significant impacts. Subtle shifts can be important risk mitigating adaptations for those able to undertake them, such as the planting more pasture in dry years or digging peanut early in years when above average rain is predicted for the fall**.**

Production system decisions in context

The three main production activities observed in Suwannee and Columbia counties can be broadly defined as: 1) row crops, including corn, peanut, melons, and tobacco; 2) pasture, hay and grasses; and 3) livestock, including beef cattle and dairy cattle. Farmers' decisions regarding production activities are strongly influenced by market demands and the crops that other farmers are planning, and are less influenced by SCFs. Most farmers interviewed said that they did not find a SCF to be useful on a regular basis because of its inaccuracy. Several farmers mentioned that dry weather needed for hay production did not arrive until late in 2006; then conditions changed quickly into a wetter winter. This sequence reduced hay production and led farmers to conclude that weather forecasts are more useful than SCFs.

Market openings also affect cropping decisions. For example, farmers have responded to increasing corn prices, reflecting high demand driven by ethanol production, by:

- Dairy farms are shifting from feeding cows on corn silage to corn grain;
- Many farmers are increasing, or planning to increase, corn production, or shifting from growing corn for silage into growing corn for grain;
- Higher prices increase the need for irrigation and other capital investments, which make factors such as weather and climate less relevant. In contrast, accurate forecasting, within an acceptable margin of risk, might help farmers reduce irrigation and other costs.

Market trends can limit farmers' flexibility in terms of what they grow. Markets appear to be relatively stable for the major crops and larger farms tended to produce crops under contract with large commercial ventures. Tobacco appears to have consistent demand and price over time, but it has become less profitable since the end of the allotment systems and is only profitable for those who produce sufficient quantities to gain economy of scale. Smaller farmers may not able to diversify when crops are contracted only in quantities larger quantities that some farms can produce.

Increasing demand for ethanol has begun to affect farmers' decisions regarding production of corn for grain and silage. Many farmers were increasing the area they cultivate for corn, or at least they were considering this option. Corn production decisions may also affect peanut production; as some growers increase corn production, others may increase area cultivated with peanut to meet existing demand and to benefit from anticipated higher peanut prices.

Markets can affect the flexibility with regard to time of planting and harvest, at least in cases where these activities are not stipulated by contract. General climate trends influence the general season for farm activities, but short-term weather forecasts have more influence than do SCFs on such decisions as taking a risk to plant a bit earlier with the hopes of getting an edge on competitors. Farmers mentioned different ways that they were able to stay "on top" of the market. In some cases, farmers monitor seed sales before planting season. Other farmers have fixed contracts or solid market niches for their produce. Some farmers experiment from year to year with crops that seem economically promising in conjunction with other more reliable crops with a relatively stable market.

The following sections address specific production decisions to manage risks associated with weather, input prices, and market demand for crops that sustain most farms over the long-term. One of the farmers put succinctly why there is a focus on crops with a distinct market niche and why they tend to diversify regardless of farm size, "In order to keep the farm, you gotta be able to lose a crop." Farmers combine production of various commodities, cash crops, and niche market products to mitigate the risk that any one crop is lost.

Row crops

Most of the farmers interviewed talked about windows of time during which certain procedures, such as fertilizer application, planting, and irrigation, are performed in order to take advantage of short-term, seasonal weather, fuel prices, and markets. The dates that farmers have determined are generally flexible within those windows, but there are crop specific dates for crop planting and maintenance that the farmers have determined to be ideal.

Of those interviewed who farm peanut, several mentioned that they rotate corn and other cash crops with peanut to take advantage of peanut's ability to fix atmospheric nitrogen, which has a positive effect on crops that follow peanut. Farmers also talked a great deal about the influences in farm activities that are broadly based on climate but more specifically based on weather, market windows, and the perceived magnitude of risk in terms of carrying out certain farming activities. The most evident activities affected are rotation cycles in crop activities and livestock activities around which the farm revolves.

Land preparation methods differed from farm to farm. Some farmers used no-till, some used aeration, and others used conventional till. Farms also managed irrigation differently. Some used drip and pipe irrigation, some used no irrigation at all. Cost was sometimes a limiting factor as the price of fuel has been high for the last few years, which had a direct impact on the use of irrigation. Most farmers interviewed used traditional tillage and irrigation on at least one of their cash crops. According to farmers, irrigation serves two purposes: it is a means to provide crops with water as well as a risk management strategy for mitigating frost damage during hard freezes.

According to the "South East Farm Press," fertilizer price often plays a major role in the profit or loss of a cash crop. Farmers mentioned fertilizing during planting and sometimes again at the midpoint of the growing season. Dry or liquid fertilizers are used depending on the farm.

Pasture, hay, and grasses

Pasture and hay production are primarily for either on-farm use or for the horse hay market, with only a small proportion of hay being sold as cattle feed. Every cattle producer (beef or dairy) had some form of pasture on which the cattle grazed. In many cases, producers also cut hay. In general, higher quality 'Tifton 85' bermudagrass and alfalfa hays were sold as horse hay and lesser quality bahiagrass hay was used on farm as cattle feed. The primary pasture crops were 'pensacola' bahiagrass and 'coastal' and 'Tifton 85' bermudagrass, though one producer also grew crabgrass as perennial forage. A small amount of alfalfa was grown specifically as horse hay. In addition, ryegrass, oat, and clover were planted as winter forages primarily for grazing. One farmer also produced ryegrass seed to sell to livestock and hay producers to plant as winter forage.

Larger producers appeared more concerned with having good weather for planting, cutting, and baling hay than about how much rain would come in a season. This attitude is due in part to the option of applying irrigation as needed and in part to the need for labor to be spaced out in order to manage the whole farm. General times for planting winter forage are primarily

driven by seasonal changes, but there was not much flexibility with these especially for large-scale producers. Medium- to large-scale producers tended to have irrigation equipment available for their pastures, especially for highly specialized farmers.

Fertilization and herbicide weed-control is done primarily by using a boom sprayer or incorporating fertilization with irrigation.

Beef cattle

Beef cattle production operations ranged from 48 to 500+ head of cattle. Breeds seen were Brangus, Angus, and some Florida Cracker cattle. There were several operations for beef cattle, some were calf grow out facilities in which the calves were raised to 5 months and then sold at stockyard to be raised for slaughter. The biggest concern for beef operations largely related to forage or hay for the cattle. Shortage of hay has resulted in elevated prices. While some farmers were able to grow their own hay, others had to buy what they did not cut. Depending upon the farm, pastures could be irrigated or rainfed, with cattle rotated among fields every 10 to 20 days.

Farmers decide when to move cattle by watching the feeding rate and availability of forage. How well their pastures were able to hold animals were largely related to the forage planted and the amount of precipitation received. Recent years have been dry and the cattle going to market have required extra input from the farmers in the form of feed or silage. A common feature among beef cattle ranchers, whether they had irrigated or rainfed pastures, was that they had difficulty in deciding when to cut for hay, which is largely a weather dependent event.

Farmers decide whether to buy or sell cattle largely based on the current market. Many farmers try to limit their cattle herd size to the number they can feed with the hay cut from their land. This decision was made to establish the most cost effective system due in large part to the high price of hay. The process of balancing herd size with forage production was a challenge for many of the smaller farms. Larger production systems simply depended on buying hay if their production fell short.

Cows were in a timed estrous cycle with cycles of young calves for each herd being ready for market. For example, calves born in January would be ready for market in May and the next herd would be calving at that time. Most farmers opted for natural insemination and had at least one bull to each herd. However, some farmers synchronized calving rates with artificial insemination. In this process when the calf is about 3 months old, it is penned and fattened. During this time the calves are fed hay, soy-pellets, and silage. The calves are raised to about 400 pounds before they are sold. There were two main market times for selling the calves, May and September.

One problem for all beef cattle farmers is the coyote. Many farmers shoot coyotes on sight to protect their calves. Some farmers used unconventional methods to control coyotes, such as placing a donkey in the pasture to sound an alarm or having dogs fight them off the property.

Dairy cattle

Dairy cattle operations had many of the same issues as beef cattle production systems. There was a large range in size of dairy operations, from less than 100 to 5500 head of cattle. Breeds consisted of Jersey cattle crosses and Holstein.

A farmer who managed a larger dairy was very fixed in his decision-making process. Production was maintained on an extremely tight schedule, with replanting of pasture or corn for silage almost immediately after harvest. He could not change acreage dedicated to each crop type. With such inflexibility in farming system management, he expressed that SCFs would not be helpful. In contrast, a farmer with a smaller operation had more flexibility in his decision-

making processes and could vary times and types of seed planted for forage in his pastures. Therefore, SCFs may have been useful in his decisions about pasture planting and herd size.

CONCLUSIONS

All farmers interviewed indicated that SCFs are currently less useful than weather forecasts for most of their management decisions. Typically, farmers speak more about weather as an issue of frequent concern and climate as an issue of rare concern. There are two primary reasons for this. First, flexibility in most of the systems we examined is greater in weather-based than climate-based decisions. Second, given the risk involved in making climate-based decisions, farmers tend not to trust SCFs at their current levels of accuracy. Several farmers mentioned the SCF based on El Niño conditions for the winter of 2006-2007 did not prove to be accurate. Cattle farmers noted that the region experienced dry conditions, rather than the wet conditions, which had been forecast. This situation led to poor production on pastures and a subsequent hay shortage. Thus, if they had followed the recommendations for that year, they would have increased their herd size by 10-12%, which, given the increase in hay prices, would have caused substantial losses or reduction in profit.

Farmers indicated that they would pay attention to SCFs if they were more accurate and definitive. Forecasting dates of last frost could be very useful, especially for corn, watermelon, and certain grasses, if it could be done within an acceptable margin of risk. Farmers are keenly interested in starting corn and watermelon crops as early as possible, but they also can't afford to lose them to a late frost. Several farmers also mentioned that accurate predictions of the onset of cold weather would help them decide on fall planting times for pasture grasses.

Larger-scale farmers mentioned minimizing risk via increases in capital investment, for example, by purchasing irrigation systems. These capital investments reduce their vulnerability to climatic fluctuation. However, any capital investment will tend to require higher or more stable production to compensate for a lower profit margin. Thus, farmers with high fixed costs, through large capital investment, had less flexibility in deciding what and how much to produce.

Local planting dates are based upon lifetimes of experience and generations of farming observations, and seem unlikely to be altered on the basis of a SCF whose accuracy is viewed with suspicion.

Market factors, such as specific windows for the sale of certain products and contracts with wholesale buyers, often dominate the decision-making process, leaving little room for adjustment on the basis of climate.

Availability and reliability of labor during peak times may dictate cropping decisions and limit flexibility. Labor shortages can also limit the potential for expansion of production and development of new enterprises.

Growing human populations and expanding housing developments in Suwannee and Columbia counties are drastically altering the economics of agriculture in these areas. Because of increases in land value and property taxes, development can pressure farmers into selling parts of their land. Many farmers are unable to afford increases in property taxes so they must downsize. Such, land sales represent an opportunity for short-term income that could not be matched by any agricultural activity. However, this same development activity also provides opportunities to sell to emergent local niche markets.

We found several other factors that weigh more heavily in farmers' decision-making processes than SCFs. Until climate forecasting is more accurate and definitive, and perceived by farmers as such, farmers will not find it relevant to their overall decision-making. Even if SCFs

are sufficiently improved for farmers to trust them, farmers' ability to use climate data and recommendations from the SECC will depend largely on the flexibility of farming operations, which in turn is related to farm size and availability of irrigation. Moreover, weather will continue to have more immediate impact than climate for most farm management decisions.

ACKNOWLEDGEMENT

We thank the extension agents and farmers in Suwannee and Columbia Counties who gave generously of their time and ideas, which are described in this report.

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