RE: April - June 1997 Technical Progress Report
Instrument No. DE-FG01-95-EE15637, ERIP Invention 637

Dear Fred, 

Here is yet another TPR instead of a Final Report. I was preoccupied with selling Acura Trak guidance systems, which put just enough cash in the coffers to get us through the summer. I even filled in with some hourly work for Wayne Coates at the UofA to help manage a farmer demonstration project. Now we can focus on getting our ducks in a row for the next season and plan for growth in future years.

This TPR also serves as a vehicle for keeping the Pegasus stockholders informed. We will hold a board meeting next week and an annual stockholders meeting on August 9th.

Here is the progress over the last quarter, according to the statement of work in our contract:

Task 1: Complete.

Task 2:

4. Test a prototype with USDA-ARS Agricultural Engineer Lyle Carter at the Shafter Research Station in California.

I have just returned from a week-long trip to the San Joaquin Valley (SJV) and spent a day with Lyle. We reviewed the plots and all of the current data and statistical analyses for the 1997 crop.

Precision Tillage Treatments:

One change to the study is the addition of a "precision tillage" treatment to each of the plots. Precision tillage is the use of a ripper shank to break compaction layers in the root volumes of the soil. Essentially it means that the soil under the beds is loosened.
by deep ripping, while the furrows are left undisturbed. Each plot in the study is eight 40-inch rows wide by fifty feet long. Now the plots are split with four rows getting precision tillage and the other four rows are left without the treatment.

Lyle Carter has been publishing research results on precision tillage since the early 1960's. It is a much more cost and energy efficient than "broadcast" tillage, where all of the soil volume is ripped, usually on a diagonal to the row direction (most farmers now do this). Broadcast tillage creates large clods, which mandates more tillage to pulverize the clods. This is a vicious cycle of ripping to remedy compaction, followed by more compaction to pulverize the surface layer of soil. Carter points out that this madness is a waste of time, energy and money.

The beauty of precision tillage is that you rip the root volumes of the soil and do not recompact the soil by driving on it (wheel traffic is restricted to the furrows). Even though the benefits have been proven time and again over forty years of research, the practice never gained wide acceptance in the West because we have not had a reasonably efficient means of getting rid of the cotton stalks. The Pegasus is the answer to the stalk disposal problem, hence it is also the key to the acceptance of precision tillage. We believe that the issue of soil compaction is becoming more important than ever with the increasing size of farm equipment. In the early 1960's a large row crop tractor weighed about 9,000 pounds. Now they weigh up to 25,000 pounds. Cotton pickers now have axle weights over 20,000 pounds; that is more than you can legally run on a highway.

Carter has taken penetrometer data from all of the plots and the results are clear. Precision tillage dramatically reduced the soil strength in the root volumes for both the Pegasus and conventional treatments. Similarly, another study on the station evaluates precision tillage behind the Pegasus and Interstate Shredder-Bedder and both show a positive response to precision tillage. This is not a knock against the Pegasus because all tillage systems can benefit from precision tillage.

The penetrometer data do show one area of concern with the Pegasus. We noted a slight compaction layer below were the stalks are buried (but only in plots without precision tillage). We believe this was caused by running too much weight on the stuffer disk. The recent modifications for whole stalk burial reduce the volume of soil we stuff with the stalks, this should help avoid compaction. We will watch for this problem in the future.

In walking through the plots, the only visible treatment differences are with the precision tillage in each eight row plot (the cotton plants are bigger with precision tillage). There are no discernible differences between the Pegasus and conventional treatments.

The point of all of this is to be able to make grower recommendations relating to the use of the Pegasus. We will definitely recommend the use of precision tillage in coarse-textured soils such as at the Shafter Research Station. On fine-textured soils, Carter's work over the last forty years does not show any benefit. Last year Wayne Coates and I ran four field tests with precision tillage in Arizona, and similarly we measured a yield response only in one field with coarse-textured soil. Coates and I will publish a research paper and possibly an Extension bulletin on the results.

Disease Data:
Carter and his co-workers counted the numbers of seedling cotton plants which died of disease. There were no differences between any of the treatments.

**Organic Matter:**

The whole stalk burial treatments have significantly higher levels of organic matter than the other treatments. This is consistent with Carter’s hypothesis that burying whole stalks will slow decomposition rates and improve the organic content of the soil.

**Nitrogen Levels:**

The whole stalk treatments have significantly higher levels of nitrate nitrogen than the other treatments. Ammonia N and total N trended higher with whole stalk burial, but were not significantly higher. This is important because some farmers fear that whole stalk burial may screw up the nitrogen cycle. These data show that whole stalk burial improves the nitrogen cycle.

**Plans for the Future:**

The Pegasus is now the standard tillage system at the Shafter Research Station. Accordingly, Carter would like to upgrade from the old two-row prototype to a four-row machine. A four-row machine will be consistent with the other implements at the station and will be ideal for the controlled traffic farming system Lyle has been working on over the last forty years.

My plan is to sell USDA-ARS a new four-row machine at our cost (money is tight at USDA). I view this as an investment in marketing. This machine will be displayed and demonstrated at the station’s well-attended field days and with visitors from around the world. I want people to see the current product, not a funky old prototype.

We discussed the idea of having the station borrow a Pegasus from the local dealer as needed. We discarded the idea because of availability and scheduling problems. Also, Lyle may have some ideas about modifications and would be reluctant to modify a machine the USDA does not own.

Lyle also plans to use the four-row machine in off-station research with neighboring farmers. There is no person on the planet who gives the Pegasus more credibility than Lyle Carter. This gives us a big boost in marketing in the SJV.

USDA will send a truck to Tucson to return the two-row machine and pick up a four row in October. We can lend the two-row to one of the University of Arizona experiment stations.

**Task 2 Summary:** Complete, for the purpose of documenting energy savings for this contract. This work has been very beneficial and we will continue to cooperate with USDA-ARS after the completion of the current study.

**Task 3:**

1. Test market acceptance of the Pegasus...

   Overall, cotton crops growing after the Pegasus are doing very well.
Up through June, I inspected every field at least once a week and visited with the growers. We need to build a solid base of experience with the Pegasus to be able to steer growers around any pitfalls.

Growers keep asking "What's the catch?" and I keep telling them that there is none. All of the fields where we buried whole stalks are doing as well as their conventionally tilled counterparts.

We only had one fiasco and the problem related to mistakes in seedbed preparation after the Pegasus (he buried shredded stalks). The grower had no experience working preplant herbicide into beds (he normally applies the material on flat ground before listing). The problems were in controlling the depth of the herbicide-treated soil and in maintaining a consistent seeding depth. He had to replant virtually all of his cotton after the Pegasus.

Seedbed preparation is an area of concern, because we don't want growers to have trouble planting behind the Pegasus. Some growers eliminated the cost and hassle of applying preplant herbicide by planting 'Roundup Ready' cotton. These new transgenic cottons are relatively immune to Roundup. You simply wait for the cotton and weeds to germinate and then spray it with Roundup. The weeds turn crispy brown and the cotton is not affected. The result is a healthy, weed-free stand of cotton. Growers who did this behind the Pegasus are pleased with the results.

Roundup Ready cotton is new and has been in limited supply, but the seed will be available next year in most of the Cotton Belt in large quantities and in over 30 different varieties. Availability in the SJV is still three years away. This is due to the "one variety law" which dictates that only acala varieties of short staple cotton shall be grown in the SJV. A breeding program is underway to produce Roundup-Ready acala cottons.

New weed control recommendations from UofA Extension are encouraging the use of Roundup-Ready cotton. Extension is teaching growers how to best utilize herbicide-resistant transgenic cottons (there are some do's and don'ts). This technology offers the biggest cost savings if used to eliminate the need for the preplant herbicide, hence the high level of grower interest. The important thing is that growers are moving in this direction anyway, so the application of preplant herbicides should cease to be an issue with the Pegasus. Another important thing is that while we will not get into making herbicide recommendations, we can point growers toward the University recommendations.

Wheat yields behind the Pegasus were excellent.

A considerable acreage of wheat was grown behind Pima Gro's Pegasus. Most growers expect 4500 to 5000 pound per acre yields, and all yields were 5300 or better. One grower averaged 6700 pounds per acre of durum wheat (yields over 6000 pounds are highly unusual in Marana). Pima Gro now charges $10 per acre for sludge applications with the Pegasus (sludge applications are free if done without the Pegasus).

1. Establish relationships with dealers...

One result of last week's trip to the SJV is that we have two excellent alternatives for dealers in the area. Both the Caterpillar and John Deere dealers are willing to take the Pegasus on, however both want it as an exclusive for their market areas.
The backgrounder on this is that both brands used to be sold from under one roof (Cat/Deere stores were the norm) but now are completely separate and intensely competitive with one another. Cat has shifted its focus from construction to agriculture (Deere's turf) with the rubber-belted Challenger tractors. Deere recently introduced a rubber-belted tractor and Cat is suing for patent infringement.

Cat and Deere dealers are very selective about which "shortlines" they carry and are hard to get in with. Which one we go with in Kern County is a big decision, because it will set the pattern for the whole SJV, our single largest market area. Both dealers have excellent reputations. Both are willing to purchase one six-row Pegasus and begin a demonstration program with it. Both have ideas about renting the machine out to a "custom" operator who does tillage work on a per acre fee for farmers.

There are strong arguments for both dealers:

**The argument for West Kern Machinery (Deere):**

- Almost completely focused on the ag business. Construction machinery is a sideline for them (Cat is still very big in construction).
- Were the first in the area to pick up on the Pegasus, have already gone through the USDA study with Lyle Carter and thoroughly understand what the Pegasus does and the market need it addresses.
- Especially strong connections to the cotton industry. The dealership is owned by the Camp family; the great grandfather came into the SJV during World War I. He was a USDA scientist with the assignment of finding out if cotton could be grown in the SJV. Indeed it could, and he founded the Shafter Research Station (then known as the USDA Cotton Research Station). The Camp family still farms 6,000 acres in the area.
- Cotton pickers are a large part of a Deere dealer's business (Cat does not make a picker). The cotton industry is in trouble, with acreage declining due to high production costs. This is the first year the Camp family has not grown cotton due to the cost/price squeeze. This dealer sees the need to reduce the cost of producing cotton, if for no other reason than to preserve the picker business.
- Have three stores in Kern County compared to one for Cat. Lawrence Tractor Co., the Deere dealer in Tulare and Kings Counties, has three stores in an area where Cat has one. These Deere dealers work closely together. We will have to deal with more entities in the SJV, and that is a two-edged sword. You have to handle more dealers, but a single one can't throw his weight around as much as a mega-dealer.
- Highly recommended by Lyle Carter (he hasn't steered me wrong yet).
- Seem to be most willing to take the product and run with it. They want me to spend some time training their personnel, and keep me out of the loop between the dealer and customer (my preference too).
- They would rather not deal through an independent manufacturer's representative (more on that later). They would rather deal direct with Pegasus. I am not sold on the idea of having a rep either.
- Willing to also carry the Acura Trak, the best guidance system to use with the Pegasus. Sunco Marketing assured me that we can rep the Acura Trak in California if we want to. Commissions to Pegasus would be 8% of net dealer invoice.
- Deere builds the world's best wheel tractors.

**The argument for the Quinn Company (Cat):**

- The Challenger is the first dedicated ag tractor in Caterpillar's history. It is not sold for construction or mining. Before the Challenger, Cat's ag tractors were
derivatives of construction crawlers. In 1995, Cat introduced the row crop Challengers (35, 45, and 55 models). Quinn sells more Challengers than any other dealer in the world, and they are very keen to have row crop implements to sell with Challengers. Row crop work is a new focus for Cat, and with their push into this area the Pegasus could gain excellent exposure.

- This dealer is only interested in unique and innovative implements and leaves the ordinary stuff to the competitors.
- One dealer covers the whole SJV. But this can also have a downside if they want the throw their weight around. Another issue is that narrow row cotton is predominately in the northern counties of the SJV, and we don't yet have a machine for that (so we don't yet have a product to sell in the northern SJV anyway).
- Quinn is very solid and has good liquidity. They put down 25% deposits on ordering some other implements; this should not be a problem with the Pegasus either.
- We are already in with Deere dealers in Arizona. Exposure with Caterpillar may be good for increasing our sell-out opportunities with the Pegasus. Cat just acquired Klaas, a combine and forage harvester maker. However, Deere, Case and AGCO have been on an acquisition binge as well.
- Highly interested in carrying the Acura Trak, since it is the guidance hitch Cat recommends for use on the row crop Challengers. But we may not be able to be the rep here.
- Cat builds the world's best tracked tractors. The Challenger is clearly superior to Deere's belted tractor and sells for more money.

I'm leaning toward Deere, mainly due to their cotton focus. Before making a decision, I will run this past the stockholders and board. You don't turn down either a Caterpillar or a Deere dealer without careful thought and analysis.

Another marketing issue:

Do we use an independent manufacturer's representative in California or go it alone?

Many shortline manufacturers use independent manufacturer's reps to handle their products in various regions. The reps usually work on commission-only basis, at anywhere from 5 to 10% of net dealer invoice with the average being 7%. Their duties are to get the orders, collect past due accounts, train dealer personnel on how to sell and service the equipment, handle warranty claims and other matters of dealer relations.

The main reason for using a rep is that it would be difficult to cover the territory yourself. Reps generally focus on one area and get to know people (knowing who pays their bills and who doesn’t is very useful).

If we were to use a rep in the SJV it would be Dave Farrand of Marwald West. I have known him for about four years, we have done business on some UoF projects. He is the person who got me in the door at Quinn and introduced me to the decision-makers there. He is working closely with Quinn to find unique implements to pull with the Challengers.

There are pros and cons to consider:
Pros:

- The tillage season in the SJV runs somewhat concurrent with Arizona, making it problematic for me to split my time between the two regions.
- On a commission only basis, the rep cost is directly related to sales volume. Doing it myself will involve travel time and costs before sales pick up. The rep will be making this investment before the sales start.
- The rep knows the people in the area and can steer us away from trouble (though I don't worry much about that with Deere and Cat dealers).

Cons:

- The first year, I will have to spend a significant amount of time in the SJV either way. I will either have to train the rep or the one dealer we will start out with. The plowdown deadline in Kern County is December 15th, as compared to February 15th in Central Arizona. I could get one dealer off to a good start in the SJV before Arizona really gets going.
- Most reps are essentially salesmen. They can get orders, but usually are not good with messy issues such as past due accounts and warranty claims. We may end up handling much of that anyway. Having a rep does not completely eliminate the need for me to be there.
- I have been thinking about hiring someone to handle day-to-day issues in Tucson (receive freight, manage the parts inventory, ship parts to dealers, handle warranty claims, etc.). This would allow me to spend more time out of state (the season in Southern Texas is over before Arizona starts). The person could earn their keep during the rest of the year selling Acura Traks in Arizona. This might even allow me to take a vacation once in a while. I would want to hire the person in July '98.
- When sales ramp up, the costs of a rep go up accordingly. That can be significant later on.
- When we farm the Pegasus out with a rep, so goes the Acura Trak. That represents some income potential.
- I question whether it is realistic to expect a rep to do a good job of market pioneering. First, it demands a great investment of time and effort before the sales take off. Second, selling something as innovative and different as the Pegasus takes a great depth of knowledge of both the product and cotton agronomy. No independent rep is going to have that depth of knowledge.

I'm leaning towards going it alone, at least for the first year.

2. Incorporate and last-minute commercial design modifications of the Pegasus.

   Last summer before launching the production run, I set prices based on the cost data available at the time. I added a 15% extra cost to cover inbound freight on parts and unforeseen expenses. As it turns out, the freight and whole stalk update are right at the 15% extra cost in the original price calculation. We will keep prices the same until we sell our current inventory.

   Specific changes are detailed in the last TPR. Most of the components are now in captivity. There is some welding and painting to do and I plan to do most of that myself during August. The alternative is to pay Bonita Steel $37.50 per hour to do it.

Task 4:
3. Expand marketing activities...

We made a demonstration video of the Pegasus (you received a copy a few months ago). It is not very polished, but farmers get excited when they see it. Doing something more professional is out of our price range at the moment.

The enclosed article appeared in the June/July issue of Progressive Farmer. This ran in the regional issue which covers the Cotton Belt from Texas to the Carolinas (it will run in the NM, AZ and CA issue next month). Several farmers and dealers have called for more information and we responded with product literature and videos for people in Texas. As a result, we are planning some demonstrations in the Houston area in September. My only expectation is that we will lay the groundwork for doing business next year.

More articles will appear soon. The Cotton Grower magazine will feature it in the fall issue. It will be the cover story of the Arizona Farmer this fall. California-Arizona Cotton will feature it on their cover in January or February '98. This is a big boost, since we can't afford much paid advertising.

Another publicity angle is that the Pegasus reduces dust pollution, a big issue with the tightening of particulate matter standards (a big issue in the SJV). I will try to get some mileage out of that.

4. Expand accessibility of machine with loan and lease programs...

As reported in the last TPR, the rental program kept the company alive but is not something I want to continue with, at least not the way it was done last time. I can't spend all of my time moving plows around and baby-sitting drivers.

A better way to go is with a "custom work" program in which a custom operator goes around plowing farmers' cotton under with a Pegasus for a per acre fee. This way, you only set up and train one operator and turn him loose for the season. This can either be on a per acre rental or a purchase. The result is that a lot of farmers get to see what the Pegasus does, without me having to be there all of the time. This is the approach we are planning in the SJV and Arizona. At the going rate of $25 per acre, a custom operator can make good money at this. The fee is high enough that most farmers will buy their own Pegasus after gaining experience and confidence in it.

This summarizes the technical progress over the last quarter.

Now is the time to get our ducks in a row for the next season. This mostly involves getting all of the plows updated for whole stalk burial and building the Acura Trak armor kits. Also, our contract expires September 1, 1997. I definitely want to have the final report in by then.

Sincerely,

Gary W. Thacker
Enclosures:
Progressive Farmer Article
Caterpillar Challenger Information
SF-272

Copies:
DOE Office of Placement and Administration
DOE-OSTI
Pegasus Stockholders

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Challenger 55 Agricultural Tractor


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Customer Support/Serviceability
Your Cat dealer provides in-field service by ag tractor technicians from a “shop on wheels,” plus high parts availability and preventive maintenance programs. Combined with easy access to daily service points, it adds up to more uptime in the fields. pg. 6
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