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Historical Sketch of Tractor Testing

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SUBJECT: A historical sketch of Tractor Testing at the University of Nebraska-Lincoln. Lester F. Larsen, Engineer in charge since 1947, visits with George S. Round, Professor of Agricultural Communications at the University, about individuals who made contributions to the successful program. He also reports on 1,155 tests conducted up to January 1, 1974, and contrasts tractors of 1974 with those of 20, 30 or more years ago. Testing fee schedules are reviewed in a self supporting project favorably known round the world.

DATE: March 7, 1974.

ROUND: Well, Les where do we start in identifying people who had a part in the successful tractor testing program? Who is the first gentleman you wish to identify?

LARSEN: I think we should give credit to L. W. Chase first of all, you know he was the first chairman of the department of Agricultural Engineering.

ROUND: That would be back when?

LARSEN: In 1905 he was chairman of Farm Mechanics Department. J. B. Davidson was the original chairman of Farm Mechanics in 1904. In 1908, was when the department was founded and Chase was the chairman of the Department of Agricultural Engineering.

ROUND: What about this notation that you have on Mr. Chase, concerning Winnipeg plowing matches?

LARSEN: There was quite a little contest between the old steam engines and the new tractors. Manufacturers were coming out with gasoline and kerosene burning tractors about 1908. The Winnipeg plowing matches were started in Canada about 1908 and were held for quite a number of years before interest dropped off. Chase and J. B. Davidson used to be classmates, graduating from Mech. Engineering Department at University of Nebraska. Davidson was at Iowa State and he went to Winnipeg with Chase to help referee the plowing matches. I presume that Chase learned quite a little about testing tractors from that experience and helped him formulate the procedure used during the beginning of the Nebraska Tests.

ROUND: What about the tractor and thresher division of the National Vehicle Association?

LARSEN: That's right, that used to be quite an important association. Now you know, we have the American Society of Agricultural Engineers and the Society of Automotive Engineers and so on. In those days it was the Tractor and Thresher division of the National Vehicle Association. They had requested the U.S. Department of Agriculture to do the testing of tractors. And one time I talked with L. W. Chase, he indicated that he thought maybe he had sparked the idea of the Nebraska Tractor Testing by giving a talk at the Thresherman's Association.

ROUND: Well, we're going to talk in another section a little more about the background on how it did start. But, the tractor testing itself, I guess it was a result of the efforts of among other people, a gentleman by the name of W. L. Crozier. What did he have to do with it?

LARSEN: Mr. Crozier was in the Nebraska legislature. A lot of people thought that he probably was elected to the legislature because of his idea of tractor testing,

but that isn't necessarily true. He was in the legislature and he had been reading several magazines, like the Farm Implement News, Automotive Industries, and some local papers. He decided something should be done about tractors. Because they were making rather unusual claims far beyond what they could do and they were not performing very well. In addition, farmers couldn't get parts or service for them. Crozier was one of these farmers. He bought a tractor called the Ford Tractor, not made by Henry Ford, but made by another company who sort of preempted the Ford name, before Henry Ford came out with his tractor. This tractor gave him no end of trouble. I don't suppose he ever got much good out of it. Then he bought another tractor which was much better. He thought something should be done to insure the farmer that all tractors be in good working order and give good service. That prompted him to introduce a bill in the legislature requiring tractors to be tested and the results be made available to the public. The bill also required that repair parts should be available within the state. Similar legislation was also being considered in North Dakota and Missouri. However, the Nebraska bill was passed first and Missouri and North Dakota dropped the issue.

ROUND: That was the part of W. L. Crozier?

LARSEN: Yes.

ROUND: What about Charlie Warner, did he have a hand in it too?

LARSEN: In those days we had the two houses and Crozier was in the legislature and Charlie Warner was in the Senate. While visiting with Crozier, a long time ago, he gave Warner quite a little credit for helping get this bill through the Senate. Later I remember talking to Charlie Warner and he said, "You know, there was only one dissenting vote for this bill." Only one!

ROUND: Who was that do you know?

LARSEN: No, I don't know who that was.

ROUND: What was Chase responsible for, setting up the test procedure then?

LARSEN: Yes. When the bill was passed, the Board of Regents were given the responsibility to conduct the testing and they in turn gave it to the Department of Agricultural Engineering - University of Nebraska. It could have been given to some other department for that matter. However, they happened to put it in Agricultural Engineering Department. And then checking up to see that manufacturers conformed, (the law enforcement in other words), was given to the State Railway Commission. However, in June, 1967, this was changed and the Department of Agriculture acquired that responsibility.

ROUND: The tests actually started in what year, Les?

LARSEN: Well, the law was passed in 1919 and a new building was erected. It was more or less a temporary building as you know. They didn't think this was going to last very long. A test was started in the fall of 1919, but it wasn't completed, as they got caught in a snow storm and the test was finally cancelled out. However, the test program really got under way in 1920 completing 65 tractor tests that year.

- ROUND: Well, following up with the people who were really responsible and had a part to play in it. Then there's the name Oscar Sjogren. What was Mr. Sjogren's part?
- LARSEN: He was an assistant to Professor Chase. Professor Chase asked him to call on all of the tractor companies, (there was a lot of them at that time) and to tell them that, there was a law passed here in this state making it necessary to have a tractor tested if they were going to sell any in Nebraska. He just wanted to inform them and build up good relations right from the start. I thought that this was a nice gesture on the part of the department to promote good will. We have tried to keep up the good will and good relations with the manufacturers ever since.
- ROUND: Did he later become the chairman of the department of Ag Engineering?
- LARSEN: Yes, in 1920. You remember Chase severed his relations with the University and started the Chase Plow Company out in west Lincoln and then, Oscar Sjogren became the new chairman. I remember him quite well because when I came to the University, he was the first man I talked to about Ag Engineering.
- ROUND: What year would that have been, Les?
- LARSEN: I started here in 1927 as a student at the University.
- ROUND: Okay, after Mr. Sjogren, did the folks in the other parts of the Engineering College were they of any help to tractor testing?
- LARSEN: Yes, this required quite a little help to get the test work under way. Prof. Jiles Haney, who was the chairman of the Mechanical Engineering Department, and one of his colleagues, A. A. Leubs, assisted quite a little in the tractor testing. In fact, Mr. Haney signed 6 or 7 of the early test reports with Sjogren and Brackett.
- ROUND: What about one of the real pioneers that falls right along this line and one of the fellows that contributed so much to tractor testing, I would think, would be Chauncey W. Smith.
- LARSEN: Yes, I certainly remember Chauncey very well. He was, in fact, my favorite instructor in the University, and I had a great deal of respect for him. Unfortunately he is not with us anymore, but he was certainly very active in his earlier days, he was on the tractor test board almost from the beginning. And he certainly contributed a lot towards establishing the method of testing. He had a wonderful reputation with all the tractor companies and engineers. And they had a lot of respect for him.
- ROUND: He was pretty well respected on the international scene in tractor testing?
- LARSEN: Yes, he went to Italy, you know, and spent some time over there to help get a tractor testing program underway. And I recall Chauncey was awarded the Cyrus Hall-McCormick Award, which is quite outstanding, it's the highest award given through the American Society of Agricultural Engineers. I also remember the time we had a party for Chauncey Smith and his wife when he was retiring. I happened to be on the committee to arrange the party. We thought we would just have a small room down at the Student Union but as time went on, we received so many reservations that we had to use the big Ball room for the banquet in order to take care of everyone.

ROUND: He was a great individual wasn't he?

LARSEN: You bet he was.

ROUND: Who was the engineer in charge of testing anyway?

LARSEN: He was a man by the name of Claude Shedd. He was one of the early graduates from the Farm Mechanics Department back in 1908-09, when they were just changing over to Ag Engineering. And he was the first engineer in charge of testing. He had also served as a scorer in Canada when they had the plowing matches there.

ROUND: He was a scorer? What do you mean by that?

LARSEN: He helped make all the calculations necessary to select the winners.

ROUND: This was a manual job?

LARSEN: They didn't have computers like we have nowadays, of course. This work was done with a slide rule and a lot of pencil work besides.

ROUND: Wasn't the name of E. E. Brackett connected with tractor testing?

LARSEN: Yes, he was also in the Department of Agricultural Engineering associated with L. W. Chase. In fact, I think Brackett and Chase both came from Pawnee County. He was a little younger than Chase. He served in helping get the tractor testing underway also; in fact, he was engineer in charge from 1921 to 1925. I think he had about 39 tractors to his credit. He also served as the Chairman of the Agricultural Engineering Department after Sjogren left (Sabbatical Leave) to work for the John Deere Company in California. Then Brackett served as chairman of the Agricultural Engineering Department from 1929 to 1947.

ROUND: Who else comes in this line of people or personalities in the history of tractor testing?

LARSEN: There was a man by the name of Fred Nohavec, I don't know much about him. He followed Shedd.

ROUND: Was he the engineer in-charge?

LARSEN: Yes. He served after Claude Shedd and before Professor Brackett. Shedd worked with about 44 tractors that first year. That first year they had a total of 69 tractors all together and completed 65 tests. The other four were withdrawn from test for one reason or another. Then Fred Nohavec, tested about 35 tractors before Professor Brackett took over and he tested 35 tractors. Following him, a man by the name of Lew Wallace, I can't tell you too much about his beginning, except that he graduated from Ames. Lew Wallace started work at the lab in the spring of 1926 and tested about 54 tractors but unfortunately, he had stomach ulcers. Now that doesn't mean the work is that difficult or hard on one, but that happened to be the situation. However, the hours are very irregular and sometimes very long. Meals are often missed and these conditions apparently do cause some anxiety. In any event, Lew Wallace did not survive surgery for ulcers at the hospital.

ROUND: What years did he serve anyway?

LARSEN: Lew Wallace was there from 1926 to 1930. That was about the time when I was starting the University as an Agricultural Engineering student.

ROUND: The fellow more recently, recently as dates go, and known widely of course, I think maybe your predecessor was Carlton Zink. What about Carlton?

LARSEN: Yes, Carlton was my first instructor when I started in Agricultural Engineering. I remember I was taking a course in Farm Machinery and during the middle of the course he got tied up with the tractor testing because Lew Wallace had passed away in December 1929. Carlton Zink was appointed engineer in charge of the tractor testing activities. He started there in 1930 and continued on until about 1941. He tested 206 tractors before the war stopped the production of new models of farm tractors. Tractor testing was closed temporarily.

ROUND: Who succeeded him?

LARSEN: I followed him.

ROUND: When did you come on the job as tractor testor?

LARSEN: Officially in 1946, after tractors were being produced again but we tested only one tractor that year, it was late in the year when we started. We really got started in full swing in 1947. It was difficult to follow the fine work built up by Carlton. He was highly respected by all the tractor engineers.

ROUND: How about some other individuals?

LARSEN: There was one other fellow that I think we ought to keep in mind and that's the fellow by the name of Charlie Adams.

ROUND: Who was he?

LARSEN: He was the man who was helping Carlton Zink. And I think he had been working some there before. He used to help in the short course and a number of other things. Charlie did a great deal over in the lab by helping get the equipment ready to go; in fact, the test car that we use was built by him under Carlton's direction. I think that's quite a tribute to Charlie Adams and Carlton Zink. When he left here he went to work for The Oliver Corporation in Charles City. During the war years Zink worked as Extension Engineer at the University of Nebraska, then several years with Firestone and finally with Deere and Company. After retiring he has been active in ASAE and doing consulting work. In 1970 he was awarded the Cyrus Hall-McCormick medal for exceptional and meritorious achievement in agriculture. He was always a great booster for the University of Nebraska.

ROUND: How about some others.

LARSEN: Of course, we must not forget Lloyd Hurlbut. A very dynamic individual, he really did a lot for Tractor Testing.

ROUND: He was chairman, of course, of the Ag Engineering department.

- LARSEN: Yes, he followed Brackett when Brackett retired. He was President of ASAE in 1960. He promoted the idea of having the test report modified. Instead of having three or five page reports printed, like we used to have, we got it down to one page. I thought this was quite an improvement. I remember him arguing with Dean Lambert. Dean Lambert had called the Board over to his office and he said, "You know, this tractor testing is getting out of hand." We are spending more Experiment Station money printing the Nebraska Tractor Test Bulletins than we are printing all the rest of the Experiment Station bulletins put together. "Something's going to have to be done about it." He wondered if there wouldn't be some way to avoid that expense. Making these individual test sheets simplified the whole thing.
- ROUND: Well, Lloyd Hurlbet was a good force in many, many ways and he contributed to tractor testing then?
- LARSEN: Yes sir, he sure did. One thing we must not forget, Lloyd started the Tractor Power and Safety Day. You know that's been going for about 23 years now. I can remember when we were talking about that idea and Lloyd didn't get very much encouragement from anyone. He was a driver and he set his mind to the fact that we were going to have a Tractor Power and Safety Day and by golly we got it.
- ROUND: Well, he had a lot of imagination too. What about Steinbruegge, of course, he's still with you?
- LARSEN: Yes, he's still the chairman of the tractor test board, which he took over in 1965. He became the chairman after Hurlbut passed away and a few changes had to be made. And I think we should remember Steinbruegge especially for the fact that he got the testing of sound measurement underway. You know it wasn't easy to get that started.
- ROUND: What do you mean sound testing?
- LARSEN: Measuring the noise level of the tractors. And he felt that's something that should be done and he had been thinking about this for quite a little while in his classes and so forth. He promoted that idea to the rest of the board and also to the SAE tractor test sub-committee. You know, the tractor test board is scheduled to have a meeting at least once or generally twice a year with the Society of Automotive Engineers, who represent industry, of course. SAE has a tractor testing committee, "Tractor Test subcommittee," as they call it. Steinbruegge presented the sound measurement idea to this committee and they just threw their hands up and said that it would never work. He had to do a lot of convincing and put on a little pressure until he finally got it underway and this was really quite an undertaking, and probably one of the hardest parts of the testing in the last few years. This has done much good for our farmer friends. The noise level of tractors has been dramatically reduced since sound testing began three years ago.
- ROUND: And it's standard operating procedure now?
- LARSEN: Yes, we have been doing it now officially for three years. It started experimentally out about 7 years ago, a little bit at a time.
- ROUND: Well, with this in general, I guess with an exception for one or two other fellows, who else would you mention? Bill Splinter, do you have him down there?

- LARSEN: Yes, Bill Splinter came in 1968 to head up our department following some of the short terms of Jack Davis and then Bob Kleis. Bill Splinter, a former graduate from the University of Nebraska came back to head up the department. He instigated an agricultural advisory group for the tractor testing board. That's a nice thing because they come up with some new ideas that engineers don't always think about. This committee consists of farmers, county agents, implement dealers and people who are connected with agriculture. In this way we get some good advice from the grass roots areas.
- ROUND: Do they give you some ideas on how tractor testing might be improved?
- LARSEN: Yes.
- ROUND: By additional work or deletion of work?
- LARSEN: Well, we incorporated one test that worked out real well that we probably wouldn't have started. And they in turn urged us to do the sound testing. They were very anxious for us to do that. And then we've had some other suggestions too.
- ROUND: Well Les, in general, that's a brief thumbnail sketch of important personalities in the history of tractor testing, wouldn't you say?
- LARSEN: Yes, it covers some of the more important people. There are many other people who helped, of course, but we can't very well enumerate all of them, but these are some of the more important ones. I should mention John Carlile, a Technician, who has contributed much in keeping test equipment up to date. His handiwork is evident wherever we look in our lab.
- ROUND: Okay, on the second segment of our visit with Lester Larsen, we're going to talk about how many tests have been conducted and here we are in 1974 and what's going on and the like. So, Les how about it, in 1974 how many tests in tractor testing have been completed to date?
- LARSEN: We have completed about 1155 tests during the past 55 years of testing.
- ROUND: Would that be different models?
- LARSEN: We have had about 1115 models during the past 55 years of testing, but we have completed 1155 test to date.
- ROUND: How many different manufacturers have been represented during that period of time?
- LARSEN: About 112 different manufacturers have been represented during the time that testing has been going on. And, of course, some of them have had many different models tested.
- ROUND: Les, what about the financing of the tractor testing. Is this done entirely by fees?
- LARSEN: Yes, it's rather interesting how this developed. The first year, 1920, there was no charge. The University found this to be quite expensive, not only to build the test laboratory and get the equipment set up, but to carry on the

tests. So the University appealed to the legislature to make a change in the law. That change was made and a fee of \$250 was then figured as being enough to keep the place going.

ROUND: Was that a flat fee?

LARSEN: Yes, \$250 per test.

ROUND: 1921?

LARSEN: 1921, yes. Then in 1933, the \$250 fee wasn't quite enough to cover expenses so the law was changed again to double that, or \$500 per test. That went on for quite a long time. When we started up following World War II, it was still \$500 per test, well we just couldn't operate that way, so the law was changed again. It was raised to \$500 plus \$20 per horsepower. Horsepower is calculated by an old taxable formula used, as a taxable horsepower formula. D^2N over 2.5. Then this went on for about 3 years or so and we were still running behind so a little but more was added. The average test fee was about \$1200. Then in 1960, it was increased again and it jumped up to about an average of \$1700 per tractor, based on the size of the tractors. In 1969, the last time it was changed, it was raised to average about \$2600 per tractor.

ROUND: These fees are paid by the manufacturers?

LARSEN: Right. For instance, we have three tractors scheduled to come next month. We have already received the test fee, the application and completed negotiations so we're ready to start.

ROUND: So, from a beginning in 1919-20 no test fee, and 1921 a fee was established of \$250 and here we are in 1974 this season the average test fee is around \$2600.

LARSEN: That's about right.

ROUND: What does the manufacturer get out of it?

LARSEN: Well, of course, he gets the results which he can use. For example, this last year, we tested the Belarus tractor from the Soviet Union. They order the largest number of test reports I believe anybody has ever ordered. They ordered 10,000 reports. I was amazed! I know the folks here in your department sent 8,000 to begin with and then were asked to send 2,000 more. They charged for them too. I don't remember exactly what the fee is for each. It gets less when large amounts are ordered. \$25 per 1,000 copies.

ROUND: Well you know, Les, it's been said, and I guess it's true, that the University of Nebraska around the country internationally is better known for tractor testing because of the reports than for anything else.

LARSEN: Well, maybe so. I hope that's right. See Faulkner's book.

ROUND: What all do you test for anyway?

LARSEN: Now, of course, the hottest thing we're doing is sound measurement. And a few years ago the number one thing, (I'm citing these things as interests), was the difference in transmissions. You know we have gone through quite a session

in transmissions. We have had the old gear box, which was the most common, of course, and then we got into TA or Torque Amplifier that International introduced quite a few years ago. Then we got into the Torque Converter type of transmission. And the Torque Converter with Lockout and then the Multiple Shift or the Power Shift that goes clear through the whole gear range without using the clutch. And now we have the Hydrostatic Drive. It was quite interesting to see the development of the modern transmissions. Earlier, I think there was probably more interest in fuel economy than anything else.

ROUND: That was before the energy crunch?

LARSEN: Yes. You know, when I first started working there, we were testing tractors using tractor fuel, gasoline, propane and diesel. And the farmers were bewildered. They wondered which fuel they should use. We received a lot of letters, and so did others in the department, and we didn't know too much about it, but after we tested a number of them we finally came out with a little leaflet called "Which Fuel for Farm Power" and I remember Elton Lux, who was in the Extension Service, saying that this was the most popular circular at that time. Now, of course, nearly all tractors are going to Diesel.

ROUND: Practically all tractors are diesel?

LARSEN: Just about. In fact, some of the companies don't make anything else but diesel tractors.

ROUND: The size of tractors, of course, has greatly increased, haven't they?

LARSEN: Oh I should say.

ROUND: What's the biggest tractor you have tested?

LARSEN: Well, we have had 180 horsepower tractor recently. And we have had some larger than that some time ago. The largest wheel tractor we have ever tested was a little over 200 horsepower and largest crawler was 252 D.B. Horsepower.

ROUND: Do you have the facilities for testing that big of operation?

LARSEN: Yes. We've never been stopped yet by the size.

ROUND: What's happening with the tire situation during this period of time, Les, since you've been aboard?

LARSEN: Of course, they used to be rather small and one of the things that we observed over the years in the early stages following World War II, was the matter of tire wrinkling, and buckling. This was a bad situation. It was bad for the tires, it was bad for good traction and bad for horsepower. This has disappeared now because tractors have bigger and better tires more capable of handling the big loads.

ROUND: Are these radial tires now on tractors or not?

LARSEN: Not yet. We haven't had any radial tires so far, except one. That was way

back in 1959. Now this sounds ironic, but the first radial tractor tire came from Italy. A man by the name of Perelli designed this tire and it's called the Perelli tire. The Perelli tire was used on a Fiat tractor that was brought here in 1959. Now we're hearing about the American Radial tires coming and no doubt this will improve tractor performance.

ROUND: What do you think in the future, do you think there will be radial tires more and more used on tractors?

LARSEN: I wouldn't be surprised. Of course, if you read the ads about these new radial tires, you couldn't be without them, but then the differences aren't that great.

ROUND: We talked about the tractor test summary going all over the world and the like, and the manufacturers. How about the individual farmer, does he follow the tests?

LARSEN: Well, I'll tell you George, today we received a whole gob of letters just before I came over here. Our secretaries are mailing out the test reports. It seems like we have been getting a little extra publicity in some of the magazines around the country and we have just been swamped with letters. The Department of Ag Communications seems to keep the magazines alerted. We also have about 1200 subscribers who subscribe each year for the test reports and the summary booklet. They pay a fee of \$2.50 per year for this subscription service.

ROUND: Les, let's visit about some incidents that you recall that happened during the testing of tractors and may be of interest in the archives of the University and of any other people. How about the first one?

LARSEN: Well, the thing I recall most vividly is a situation that we had not too long ago. There has always been a desire to show more power all the time, and some company representatives come out here to test these tractors and they'll go to no end to get a little more power. Just during the last two years we have ruined three tractor engines because of this greed for more power.

ROUND: Why?

LARSEN: Because the fellows were a little bit too ambitious, they wanted to jack the horsepower up a little. You know with Diesel engines you can increase the fuel flow quite easily on the fuel pump and when they do that they pump a little more fuel to the engine and a little more horsepower comes out of it. It may smoke a little more and it gets a little hotter and the first thing you know, the engine seizes up. That's one reason, a lot of people think we're kind of "the old squares". We don't recommend the hot rodding of tractors. Other people may not agree with us, but we see these troubles happen right here at our test lab.

ROUND: Les, do you think there might be a tendency among tractor manufacturers with the energy crunch and the like with automobiles now to go the other way on power?

LARSEN: Oh, I think so. I think perhaps it will slow down the big tractors. A farmer friend I know is now looking for economy in his next tractor.

A farmer south of Lincoln bought a big four-wheel drive tractor, and he's still using the same implements he had with the former small tractor. They're just like guys who buy cars and like to get a high powered car, but now they may be thinking about something else more economical.

ROUND: You spoke about the sound business, do you have any comment on this?

LARSEN: We had a tractor that came here and we were going to measure the sound. And, of course, when we measure the sound in the cab, we like to close the doors and turn the fan on, because you can't be in there long unless you have the fan circulating the air. Company representatives were startled to find out how much noise their fan made. And they had just carefully explained to us the day before that they had done so much research work on this cab and worked thoroughly with it. They had all the information and if anyone wanted information they could get it. But, they had overlooked this fan. It raised their sound level at least a decibel or 1 1/2 decibels.

ROUND: What did they do about it later?

LARSEN: Well, they were real concerned about this, and didn't do anything about it, at once but I'm sure they have by this time.

ROUND: Speaking about cabs on tractors, they have changed tremendously haven't they?

LARSEN: They sure have! You know the early cabs were really worse than not having a cab as far as noise was concerned. Maybe you'd get out of the weather, but they were regular noise makers, because the noise would get inside and it would really be worse than if you didn't have a cab. But now it's changed, very much.

ROUND: How about this matter of tractors, you've got a list that jumped out of gear, does that happen?

LARSEN: Oh, yes. In fact, I know a man who just bought a new tractor this spring and he has that very same problem. I know of another case and it was just in the last year or so. We had a tractor that jumped out of gear during tests and I know they had to take a lot of similar models back and have them worked over again. It isn't much good when they jump out of gear.

ROUND: They do that on the test runs, Les?

LARSEN: Yes, we have had that happen several times.

ROUND: How about the horsepower claims, have they stood up?

LARSEN: Well, I don't think that a year goes by George, but someone has to modify their horsepower claims.

ROUND: They're too high?

LARSEN: Yes. For example, we had a tractor advertised at 225 horsepower. We didn't test it on the PTO.

ROUND: What is a PTO?

- LARSEN: That's the Power Take-off. Then when we tested on the drawbar we found it had a 162 horsepower. What they're doing, is that they're advertising engine horsepower, of course. Did it have a fan on? Maybe the fan took 30 horsepower right there. Those are things that are a little misleading. I know of one manufacturer that is avoiding sales of tractors in Nebraska just for that reason.
- ROUND: Is it still true, Les, that all tractors sold in the state of Nebraska have to be tested at your testing lab?
- LARSEN: Yes, a corresponding model must be tested. If they want to get a permit to sell in the state of Nebraska.
- ROUND: Is there any bootlegging of tractors?
- LARSEN: Oh yes, we know of cases where there has been bootlegging.
- ROUND: Who enforces the law?
- LARSEN: The Department of Agriculture is the organization that is responsible for the enforcement of the law, but you know some of these things just can't be helped. And usually anyone who buys a bootlegged job is probably sorry about it afterwards. I don't think it's getting out of hand, though.
- ROUND: There's a lot of talk about consumerism now, is this tied in with it?
- LARSEN: That's one reason I think probably the tractor testing plays a more important part each year. Because we're more "consumerism protection" conscious all the time. So people are concerned. I mentioned that sound is such a hot issue right now, we have people who call in, from out in the state and want to know what the sound level was on a certain tractor. They didn't care about anything else, just wanted to find out how noisy it was.
- ROUND: Maybe he was hard of hearing?
- LARSEN: You know a lot of farmers have been injured with the noise from tractors and I think this testing for sound is a wonderful thing. I think probably if we were to analyze it, our efforts in tractor testing have probably been appreciated more from the sound testing than from most anything else for quite awhile.
- ROUND: Well, it's very, very important. What about fuel consumption, is it still the important factor?
- LARSEN: In recent years it hasn't been. When I first started working at the tractor testing, the engineers would come out and they would go to no end in trying to improve the fuel economy. We would start in the afternoon and run all night trying to get the best carburetor setting. That hasn't happened in the last 10 years or so, in fact, I'm sorry to say, some of the engineers who come out with tractors tell us, "Just put it on the dynamometer and we'll set the fuel pump to get the right horsepower, we don't give a darn about the fuel consumption."
- ROUND: Is that true now?

- LARSEN: That has been the attitude, but I'm sure that's changing. We're going to watch that. Back in 1949 John Deere brought a tractor here, the old Model R, it was kind of a big old clunker for modern day methods anyway, but that tractor set a world record for fuel economy at that time. When we got ready to run the belt test at that time, the engineer who was along with the tractor, called up his boss and also called up the sales department manager. A whole carload of fellows came out, they just couldn't believe it! I remember that particular test because I couldn't believe it either. I had never seen fuel figures like that before. And after we had run the test, I told the engineer, who represented that tractor, that I would like to recheck that one run because I was afraid there was something wrong with our equipment. Maybe it wasn't weighing properly. However, we obtained the same results.
- ROUND: When you get into everything the tractor set, the way the manufacturer wants it, how long does a test run?
- LARSEN: It generally takes us about a week, we figure between 40 and 50 hours of engine running time. That doesn't include, of course, the preparation of our own equipment.
- ROUND: Do you run around the clock on it?
- LARSEN: Sometimes; however, we are doing less and less of that for safety reasons. Working outside at night is rather dangerous and the neighbors around the tractor testing lab help us keep away from there at night.
- ROUND: Probably doesn't make much difference in the results does it?
- LARSEN: No it really doesn't make any difference. Another problem that causes us to run more in the day time and not so much at night is the help situation. We used to be able to get fellows to work 10-14 hours without any trouble, but that isn't true anymore. After eight hours they want to stop.
- ROUND: Yes and you have a lot of other regulations that you didn't have before. What about this matter of repair parts on tractors, is this a factor at all?
- LARSEN: That was a very important part of the tractor law. Anyone selling a tractor in this state must have sufficient repair parts for these tractors.
- ROUND: They do have to have them?
- LARSEN: Yes they are supposed to have them. That was a real important thing in the early days because, like Mr. Crozier, he couldn't get any parts for the tractor that he had, he couldn't get any service on it. Well now I think we are getting into another situation, we are getting so many models, the dealers can't stock repairs. Of course transportation is a lot better and they can ship parts out. They fly them you know, and really doesn't work too bad.
- ROUND: Les, could you recall approximately how many different manufacturers of tractors that there might have been, in the height of tractor production?
- LARSEN: I think that there were as many as 125 at one time.
- ROUND: In 1974 how many would you guess?

LARSEN: Now it is kind of simmered down so that we have only about 7 major companies. Of course, I am not mentioning any foreign tractors coming in, these are domestic tractors, you can name them on the fingers of both hands.

ROUND: You have tested quite a lot of foreign tractors haven't you?

LARSEN: Yes we have tested quite a few, about seventy five.

ROUND: Are they sold in this country?

LARSEN: Yes, there are quite a few sold in this country. They are coming from Rumania and Poland. There is a company in North Carolina by the name of Long Tractor Company that is importing Rumanian, Polish and Italian tractors and they're selling, the last time I talked to the engineer there, they had imported 400 and they were going to get a lot more. Then Duetz Tractor Company is setting up quite a distribution system and David Brown has merged with the J. T. Case Company, so we are getting quite a few. Then of course, there are some new Japanese tractors coming too.

ROUND: They are increasing numbers?

LARSEN: Yes, we have tested several Kubota tractors, and we tested one Satoh.

ROUND: How do the foreign made tractors measure up with those manufactured in this country?

LARSEN: Well I am sorry to say that the one foreign tractor set the record for fuel economy this past year, kind of beat the socks off of our own domestic tractors. They have some pretty good tractors and they have some pretty good ideas just like new tires. The radial tires that came from Italy. I think perhaps the Duetz are spreading out quite a little. They use all air cooled engines, and that is something unusual - we don't have many domestic tractors that way except the small garden tractors.

ROUND: What about wheel weights?

LARSEN: We are seeing less of these being put on tractors all the time because the speed of tractors is going up and therefore we don't need to drag so much weight around and of course the tractors are a little bit bigger and heavier than they used to be. Fact of the matter is we are testing quite a number that don't use any cast iron weights on them at all, but they do generally have liquid in the rear tires.

ROUND: What about transmissions, you had some of them fail?

LARSEN: Yes we had quite a number of transmissions fail for one reason or another, usually the reason for that is they have upped the power. Some people are greedy for power and in order to get a new model they have increased the power a little bit and then the transmission isn't made to take it. One time we had a tractor, just to give you a little example, and testing it for the maximum pull run. We completed the run by evening and that night the engineer who was representing the tractor called results back to his superiors. The next morning the phone rang and the boss talked to him and said that we must show more pull than that, see if you can't talk Les into backing up and starting

over again and add a little more weight. We started over, didn't like to but we did. Anyway we started out the next morning and added additional weight. We had to weigh it again and go through the whole ritual to get ready for the rerun. We made one lap around the test course and got things fairly good and then we started to make a second lap. On the second lap around the tractor locked up and something seriously went wrong. We couldn't even move it as the rear wheels were locked, we couldn't push it so we had to get a fork lift and lift up the back end and push it into the building. The company representatives, of course, knew fairly well what was wrong. We opened up the transmission and there laid a bunch of gears busted down inside. Well of course, he phoned in to his boss right away. That night the chief engineer was on his way to Lincoln to visit with the test board and convince them that he could withdraw this tractor and bring another tractor. Cost didn't mean anything, he would gladly pay another test fee. The test board wouldn't listen to this because he was operating on a temporary permit. That means that the manufacturer can go ahead and sell the tractor in Nebraska before the test was made. Once you do that, however, the test must be completed, so there wasn't any choice. The next day here comes a transmission man and he comes flying out here in an airplane and brings a whole new set of gears and other parts and worked a couple of days to get that all assembled. Then we went out and tested it just like we did the first time.

ROUND: Then what happened, did it work all right?

LARSEN: We went back to the original weights.

ROUND: There was a case where they were excessively increasing weight to show higher drawbar pull.

LARSEN: They put too much weight on to get more pull and the transmission couldn't take it.

ROUND: You have a note here Les that 12 tractors have been withdrawn from the tests since 1947, what do you mean withdrawn?

LARSEN: In the case of a tractor like the one I mentioned, if the company hadn't had a temporary permit this tractor could have been withdrawn and then they could have sent another tractor out in its place. Then there would have been no remarks made, otherwise we would have to put all the remarks in as to what happened. There are a few that come, for instance, this one tractor that the engine froze up solid and they withdrew the tractor from test.

ROUND: What does the report show then, if anything?

LARSEN: If they don't have a temporary permit then they can withdraw and no mention will be made of it. Otherwise, a complete explanation is made in the test report of the repair.

ROUND: If they don't have a permit and can't be sold with in the state of Nebraska? I wanted to ask you also on this visit are there other states that have tractor testing labs?

LARSEN: Not like this, the only other place where there would be any similar testing would be among the tractor manufacturers themselves. They of course do a lot of test work.

ROUND: Are there any manufacturers that refuse to put their tractors on test in Nebraska?

LARSEN: Yes, there are some that have circumvented the state. Even some of our major companies have done some of that.

ROUND: Do they sell in the state then?

LARSEN: No, we had one case where a tractor from one of the leading tractor companies here in the states that was importing a tractor and hadn't had it tested and wanted to sell it to some fellow out at Sidney, Nebraska, from a Colorado dealer. They happened to find out that the tractor hadn't been tested and they called us and we had quite a little go around until they finally cancelled the sale.

ROUND: The Tractor Testing Lab has of course, this long history of success and the like starting in 1920. Do you think the tractor testing has served its purpose? Is there a need for it in the future?

LARSEN: Well I think with this present day consumerism being so dominant now for buyer protection it is probably more important now than it ever was. I think that people are interested like the sound measurement--they are very concerned about that and fuel consumption is a big issue again. We are noticing that right away, farmers are beginning to ask about. This matter of having repairs available in the state gives a farmer a little leverage on the manufacturer in case they get a tractor and can't get parts for it.

ROUND: There was some comment from some people at one time, has been for some time as you know so well about the possibility of moving the tractor test laboratory from the campus of College of Agriculture to the Field Laboratory at Mead, is that in the picture at all?

LARSEN: Well we thought it was for awhile, but I don't see any immediate prospect of that under the present circumstances. One of the things that we have been working on, we do some of this in the winter time, is trying to conceive some method whereby we could do the drawbar testing inside, or do the equivalent type of thing. We built two treadmills, a small model and then a larger one and actually ran one test, not officially, but experimentally on this one treadmill. The cost of setting this type of thing up and getting it to work is almost prohibitive. Now if we could do that I know we wouldn't be moving up to Mead because this is really a better location as far as all contacts with test board, the Department of Agriculture and visitors who come here. Present location is useful for students and visitors. Many visitors come each year including many foreigners.

ROUND: So I take it you and your colleagues are not overly enthusiastic about the possibility of moving up to Mead?

LARSON: Not at the moment anyway.

ROUND: When was the Tractor Testing Lab put on hard surface?

- LARSEN: In 1956, we built the concrete test course, the reason for that was, as you can well suspect, when we were testing tractors on earth and it rained we had to stop because there was mud. We couldn't do any more until the roadway dried. I remember one tractor from Massly-Harris was out here and we spent a whole month to do one tractor. The only reason was because it rained every day and that caused us a lot of trouble and delay. Secondly it was very difficult to make an earthen surface uniform and consistently the same. We wanted to make our tests more consistent and more uniform. We finally decided that it would be best to build a concrete test course.
- ROUND: This worked very well?
- LARSEN: Yes it has worked very well, but it was tough to get.
- ROUND: Vince Lambert was the Dean at that time?
- LARSEN: Yes and we didn't have enough money. We take in only so much money for each tractor and we had to pay our own way. So we talked to Dean Lambert, the tractor test board did, and considered this possibility. Well the best estimates we could get would cost us around \$25,000 to get this done and we didn't have that money so we were wondering if there was some way we could have the experiment station finance this and then we would prorate a certain amount each year. Dean Lambert presented this to the Board of Regents and he came back with this message. How many tractors are you going to be testing next year, and the next year and next. Well that was impossible for us to say, but we made a guess at it and then he presented the situation to the next Board of Regents meeting and they said to go ahead. They gave us permission to go ahead and spend the money to build the test course, so we got a contractor lined up and that was built in the spring of 1956.
- ROUND: And paid for by the proceeds of the test?
- LARSEN: Yes and strangely enough that year we happened to have a large number of tractors to test and we received sufficient test fees to pay the money in advance. We received enough money and paid the whole thing off as soon as the test course was completed. Everybody was happy after that even though it cost over \$30,000.
- ROUND: What about some other reflections or recollections you have personally of the tractor testing program here at the University? Are there some others that we haven't covered? When was the first tractor test, is that the one with the picture of Chauncey Smith here with the old High Boy, or what do you call that?
- LARSEN: That was the Waterloo Boy. It was quite a contribution to power farming, mainly because it was the first tractor tested I guess, and a pretty good old tractor. You know it was the forerunner of the John Deere Tractor Company. Along about that same time, the Fordson Tractor came out. Now the Fordson had some rather dubious qualifications. It goes down in record as the most inefficient tractor ever tested. A very, very popular tractor and made quite a contribution to power farming. The old Fordson was all enclosed and ran in oil for the transmission, the rear end and the crank case. It was compact and was cheap, -\$395 and it was sold through all the Ford dealers and every dealer had plenty of spare parts. There were three years (1923-25), when there were more Fordson tractors sold than all of the rest of the tractors put together and there were a lot of other tractors.

ROUND: They went out of the picture then?

LARSEN: Yes. The old Fordson was intended mainly to pull a plow. I remember my Dad had an old Fordson but he didn't have much use for it because he said, "we must have the horses anyway because we need to cultivate our corn and we always cultivated corn three times, one year we cultivated it four times. He didn't see much point in having an old tractor around when you had to have the horses anyway. There was quite an interest in getting a row crop tractor.

ROUND: Fordson wouldn't operate in row crops?

LARSEN: No, they were real low and they were not intended for row cropping. You know they looked a lot like some of our present day small tractors. If they had had rubber they would have looked quite modern. Well anyway Moline Universal came out with their Model D tractor. It was tested in 1920. That was quite a contribution. That tractor was way ahead of its time, it had an electric starter, it had a battery, it had an electric light, (only one light) it had an electric governor, it had a differential lock, it had some semblance of power steering and it was made so you could cultivate with it, you could plow with it, you could do any farm job you wanted to do. The engine ran 1800 RPM which was about twice as fast as most of them in those days. Modern and way ahead of its time. But the company couldn't make a go of it very well. The next development that came out and I think the most important contribution to power farming was when International came out with their Farmall. That really proved to the farmer that he could do all of his farm work with a tractor. Probably the turning point in power farming -- it proved to the farmers that all the farm work could be done with tractor power.

ROUND: Is the Farmall still made?

LARSEN: Yes, in modern models. There are some old models still running, we have a couple of them over in our Lab.

ROUND: You don't have a museum of tractors do you?

LARSEN: Yes we have a collection of some of these old timers that represent some of the highlights, we don't have the Waterloo Boy unfortunately. I wish we did have, but we have the old Fordson and we have an old John Deere which followed the Waterloo Boy.

ROUND: You were telling me before about an interesting story about your interest in getting more of the old models to show the evolution of the tractor and the like, about a gentleman up in northwestern Nebraska that has them, tell us about them.

LARSEN: A fellow by the name of Daughtery. Mr. Daughtery had made a hobby of collecting old tractors and I think he had something over 90 old time tractors. I went out to see him three different times and he told me that he wasn't interested in any money making proposition just wanted to provide these old time tractors for future people to see. I suggested to him that a nice place for a museum for these tractors would be right down here by our Tractor Testing Lab. But apparently as time went on somebody else made him too good an offer, and one day as I was driving out for breakfast on 33rd St., I saw the Burlington

go by with a whole train of flat cars loaded with old time tractors. There they went and my dream of the best tractor museum in the world vanished.

ROUND: Reportedly what did he get for those tractors?

LARSEN: I don't know, but maybe it was a million anyway they went to a museum in the East.

ROUND: Somplace besides the University?

LARSEN: Yes and I was certainly sorry about that.

ROUND: What about some other highlights?

LARSEN: I think probably the next big contribution to power farming was the coming of rubber tires. A fellow by the name of Schields worked for Firestone. Schields was a traveling man for the Firestone Tire and Rubber Company. He got the idea from visiting with some of the tractor people that they ought to try rubber on tractors. Some of the farmers had been taking old tire casings and bolting them on the rim and trying that idea. He talked to Harvey Firestone about this but Harvey Firestone didn't think that was such a good idea. He told Mr. Schields you better not spend his time with that. Mr. Schields did it anyway and helped Allis-Chalmers get a set of tires for their old Model U tractor. For the rear I think that they used a couple of airplane tires and then they got some truck tires for the front and let a man near Waukeshaw, Wisconsin, a fellow by the name of Schroeder. This man used the tractor that year and the more he used it the better he liked it. It was easier to ride and it didn't make as much dust and it seemed like it ran more efficiently, it didn't use as much fuel and you could get more work done, he could travel faster and you know that was the beginning of rubber tires on tractors. When this thing was happening, of course, newspapers got word of it and they came out and took pictures of it and the first thing you knew Harvey Firestone saw this in the paper and he wasn't too happy about it.

ROUND: Firestone makes tractor tires now don't they?

LARSEN: You bet they do, they make a lot of them.

ROUND: Of course tractor tires are standard on all of them?

LARSEN: Yes, and we have this old tractor over here in our museum, the first tractor equipped with rubber tires. It belongs to Allis-Chalmers, however, but they told us we could keep it indefinitely. The next thing that happened was Allis-Chalmers sent tractors out here to be tested and they knew about this tire situation but they didn't know how to test it with rubber tires so they brought the tractor out here on steel wheels and went ahead and ran the test. In the meantime they were talking to the test board about the possibility of doing some work on rubber tires. I was always rather proud of the decision the Test Board made, they said, "we will test it both ways, then we will all know something about it." That was the first information that got out showing the merits of rubber tires vs. steel wheels. Later C. W. Smith and L. W. Hurlbut reported the advantages of rubber from Experiment Station project.

ROUND: Do you have any others you want to go over?

LARSEN: I think probably the next thing we ought to think about as an important event is the coming of the three point hitch and draft control developed by Harry Ferguson. He tried to sell this idea to all the American tractors companies.

ROUND: Was he British?

LARSEN: Yes, he came from the David Brown Tractor Company and David Brown didn't like the draft control idea too well. You know this company used the three point hitch but not the draft control for the David Brown tractor.

ROUND: What is the three point hitch?

LARSEN: That is so you can mount the plow or other implement with a three-point in the back. Now all tractors are fixed that way. Doesn't make any difference if you go to Russia, Japan, or Europe, three point hitches are used the world over. Harry Ferguson is the one that started that.

ROUND: Do you have any others there briefly?

LARSEN: Those were probably the most important things. In 1956 we had established the fuel economy record that has never been beat. We had some boys come from the Soviet Union and they were telling us how efficient their tractors were. We compared notes a little bit and we converted our figures over to the metric system and after that they could't understand what we were talking about. We never did find out whether they had any tractors more efficient or not.

ROUND: Is that the reason why they invited you to Russia to look things over. They did send invitations didn't they? Did you ever hear anything on it?

LARSEN: No. I have had many invitations to go to other countries, and I have visited many countries. This has been one of the interesting extras in connection with this work.

ROUND: Les, all in all you have enjoyed your work in tractor testing haven't you?

LARSEN: Yes it has been real interesting, and the thing I have enjoyed the most about it has been the friends I have made in industries all over the world. It has been real interesting to see the development of the modern tractor. Today's tractors are certainly different than they were in 1947.

ROUND: I want to say to you Les in this short period of time it has been a pleasure visiting with you and I have enjoyed it very much.

LARSEN: It has been a pleasure and I am glad that you asked me to do this because it has been stimulating a little interest in going back over the historical things as far as our tractors testing is concerned.

ROUND: Fine. Thank you very much Lester Larsen.