AN INTERVIEW WITH
CLAYTON E. POSEY
(June 1994)

by

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Table of Contents

Introduction

Daniel Ludwig's mammoth forestry project in Brazil captured many headlines in the 1970s and 1980s, and an occasional headline even today. Readers of financial, forestry, and environmentalist outlets were given a series of accounts, and the large majority of this writing has criticized the effort. In fact, everything about the story is large, with acres in the millions and dollars in the billions.

Even a casual reading of this material today shows that often the later authors used earlier authors as their main source. Anger is a common tone, as authors find fault with the science upon which the project depends, its financial structure and viability, and even Ludwig the man. Also, nearly all agree that the project was a failure. To the newcomer it all seems a bit strange; how could something be so universally bad?

In the pages that follow, Clayton Posey gives an account that is at variance with every report examined in preparation for the interview. He could offer no rationale for the hostile treatment at the hands of a wide range of writers. To him, the project was a success, both scientifically and financially. As you will read, he speaks with pride and good humor about his years in association with Daniel Ludwig.

Clayton earned a Ph.D. in forest genetics from North Carolina State University and subsequently taught at Auburn University and Oklahoma State University. His very successful professorial research caught the eye of a Ludwig advisor, who saw the need for a geneticist to be on site in Brazil. Thus, in 1969 the Posey family left Stillwater for a rather primitive situation on the Jari River, a major tributary to the lower Amazon.

He quickly moved up to the manager of the Forestry Division, then to acting executive director, and from 1972 to 1975 he was the chief executive officer. Then Ludwig called him to New York to be vice president of the Forest Products Division, Universe Tankerships, Inc. It is from these various vantage points that Clayton reports what happened and why.

Successful plantation forestry was the key, for a reliable (and large) supply of wood fiber was necessary to feed the pulpmill. The pulpmill, by the way, was manufactured in Japan and in Ludwigian fashion towed halfway around the world and up the Amazon to its Jari destination. But Clayton insists these approaches were rational and cost effective. Then there was the need to create a community to house indigenous and imported labor, plus the requirement for training. Too, there was a steady stream of visitors, government officials, and consultants to learn from and to contend with.

Once such consultant who made dozens of visits was L. N. "Tommy" Thompson. He shares Clayton's pride in the Jari project, and it was through Tommy that financial support of the interview from T & S Hardwoods, Inc. was made possible.

Harold K. Steen
Durham, N.C.

AN INTERVIEW WITH CLAYTON E. POSEY

(June 1994)

Harold K. Steen: Talk about your original life expectations, and your ultimate expectations. I don't think you ever planned to manage forests when you were in school.

Clayton E. Posey: No. And, in fact, I never planned to go to the Amazon. It was the furthest thing from my mind. I was like many young fellows in research and teaching. I had everything that anybody could ever want. I had good position, good income, good title, graduate students, research funds, facilities. So there was no intent and no plan of ever going to the Amazon. So when the opportunity presented itself, I resisted for a long period of time. Finally, in frustration, to get them to leave me alone, I agreed to go to New York to meet them, to tell them no personally.

HKS: How did it come about that they knew who you were, or had some idea who you were?

The Initial Situation at Jari

CEP: The Jari project started in '67, and unfortunately Ludwig was a builder. He was not a biologist, and his concept of building something was to bring in construction people. And he wanted to build a forest. The way you build a forest is with "x" number of million of dollars' worth of construction equipment and "x" thousands of construction people who build dams and bridges and hotels and cities and whatever.

Of course, it didn't work. So in total and complete frustration after two seasons of complete failure, he went to an old friend or acquaintance, Dr. Bassett McGuire at the New York Botanical Gardens, and explained to him what he was trying to do. "I'm ready to throw in the towel unless you have a suggestion of what can be done."

McGuire--if my memory serves me right--was in his seventies, and he was head of the tropical studies at New York Botanical Garden. He told Ludwig what he thought he needed to do, and Ludwig said, "Okay, I don't know how to do that. You go do it."

What McGuire essentially told him was that he needed to do a 180 and hire biologists to be responsible for the program, rather than construction people. Having not been there at the time but being familiar with the tropics and being familiar with the Ford effort in Fordlandia, McGuire told him that he needed to hire a pathologist, a geneticist--

HKS: A geneticist. It was you, right?

CEP: That was me. And someone in silviculture and forest management. I think they jointly decided what the person should be and what his background should be.

HKS: Just for the record. You have a Ph.D. in genetics under Bruce Zobel.

CEP: Right.

HKS: Okay. If you're one of Bruce Zobel's geneticists, you would have entree.

CEP: Right. There were three criteria. One was that a person had to be a self-starter and someone that had gone somewhere and started a program on his own.

HKS: You had done these things?

CEP: Yes.

HKS: Give an example of your background. I want to know how you were picked out of the crowd.

CEP: Okay. Well, that's one of the criteria. I went from N.C. State to Auburn, and from Auburn to Oklahoma State. At Oklahoma State I started the genetics program and a graduate program. I set up a tree improvement research station in southeast Oklahoma so that today the trees that Weyerhaeuser is planting, basically all the pine being planted in the region today you see come from that program.

So the first criteria was that someone is a self-starter, because you're going to be in the Amazon, and there's no one to tell you what to do.

HKS: Sure.

CEP: Second, you had to be young, and young because there at the time were no schools. At the time that they started calling me, I had one young son, just about two years old. It would be at least a few years before there would be an educational problem with the family in the Amazon.

HKS: So the idea was you'd go down with family, a permanent situation.

CEP: Right. It's permanent.

The third thing, which I never agreed with and generally don't, is that the person had to have a Ph.D. to be qualified.

HKS: It's interesting that Ludwig would require that.

CEP: That was McGuire.

HKS: McGuire. Okay.

CEP: Essentially what that did was rule out a lot of qualified people because they didn't have a piece of paper.

HKS: Yes.

CEP: Once I went to New York and they explained the program, explained the objective and what they were trying to do, then I knew that I couldn't walk away.

HKS: It was really attractive to you in a scientific career sense.

CEP: Right. Right. It was a terrible thing to do because I had sold a fairly significant genetics program at Oklahoma State and had many McIntire-Stennis research projects and had gotten a Ph.D. program going with all the students I could handle. And just to have succeeded in doing that and having built new greenhouse facilities and new research station and everything, to walk in and tell the experiment station director "good-bye" was a terrible thing to do.

HKS: Did he think so?

CEP: He thought it was a terrible thing to do, and I was chastised. [chuckling]

HKS: So you really were burning a bridge in that sense.

CEP: Right. I burned a bridge. I have, and always have had, a burning desire and a concern for man and what happens to man in this world and for the masses of starving people that unfortunately we in this country never see and really don't want to see.

The Jari project is in a totally isolated region of the world, and still, there's no road connection with the outside world. A river trip from a city of any size to the project is two days.

HKS: What kind of a boat? Is it comfortable? Or primitive?

CEP: I would say it is comfortable because you can find a place to hang a hammock.

HKS: All right.

CEP: To most anyone here, it would be horrible. The only other option was air, and of course we had to provide that ourselves. Once they had explained to me what the objectives were, I went to Brazil to look, and once I looked I was really hooked.

HKS: From your resume--I don't know if this is out of sequence--but it looks like first you were vice president for the Forest Products Division, with much broader responsibility than Jari.

CEP: No. I went as a forester responsible for a genetics program. Period. But once there, I discovered that there was no demand for a geneticist. They had cleared probably thirty thousand acres by the time I arrived.

HKS: So there was a superintendent or a manager on the scene, on site.

CEP: Construction.

HKS: Construction. So construction was running the show.

CEP: Construction running the show. When I arrived, construction was still running the show, and I was reporting to a construction superintendent.

HKS: That's Morrison-Knutson.

CEP: Morrison-Knutson was in early, and they were in on the first failure, and they were gone. Morrison-Knutson left, but many of their employees stayed.

HKS: I see.

CEP: And so I was reporting to a construction superintendent. Do you want names?

HKS: Sure. That's the hardest thing to get at sometimes.

CEP: The superintendent at the time was Boyd MacMillan.

HKS: Okay.

CEP: As a equipment and construction superintendent, he was an excellent guy. When I arrived there in September of '69, they probably had cleared thirty thousand acres and did not have a nursery. They had a small nursery, in camp, but they did not have a nursery to produce the trees to plant on this thirty thousand acres.

Contrary to popular opinion, when you clear and burn the jungle, it doesn't turn to desert. You clear and burn. You do not kill. I mean, heat rises in a fire, and so you don't kill the roots. And the jungle comes roaring back. Within that region there's a dry season and a wet season. Land is cleared in the dry season and burned at the end of the dry season, so immediately after it's burned, it starts to rain. Because of the fire, you have a release of a tremendous volume of nutrients and plenty of water, and so all this vegetation comes roaring back. Within a few months, you have an absolute green cover that is almost difficult to get through.

HKS: So the plan was to use native cover, native species, commercially? Or was it just clear the land and plant whatever you're going to plant? I mean, obviously you had to clear something to have plantations.

CEP: Well, it's both. Let me back up a minute. When I arrived, they had land cleared, but no trees to plant. And so of what value is a geneticist if there's no plantation? Of what value is a geneticist if you don't have trees in a nursery?

HKS: What's the flaw? McGuire had a plan, right? And Ludwig says, "Make it work." But the plan had some flaws in it, apparently.

CEP: Well, they simply didn't understand what was going on and what the position was. Now, to back up, the next stage after the engineering and construction firms left, he hired a consulting firm. There's an outfit in Vancouver, Florestal, which is an international forestry consulting firm.

HKS: This is B.C.?

CEP: Yes. And they sent a fellow named William Oudshoorn. He, in all likelihood, was an excellent forester. He may have known what to do and how to do it, but with a strong-willed construction superintendent kind of boss and being a consultant rather than employee, what could he do?

So it's easy to criticize Florestal and the people they sent, I saw there were all kinds of things wrong. But in reality they probably did not have a framework under which they had a possibility to succeed. So it failed another year, but in no way should it be laid at their feet, because there was no framework for them to succeed.

I rapidly came to the conclusion that I had left an ideal situation in teaching and research, and here I was in the jungle with thousands of unknowns. The only way it was going to function was for me to be able to do what a forester knows should be done. I jokingly say that I became a hero because I knew that you plant trees with roots down instead of up. And I knew that you planted when it rained instead of when it was dry.

So that's the stage it was in. It was so basic. Yet, from the construction side, those basics not understood.

HKS: Almost like being in the Peace Corps.

CEP: Correct. One of my early bosses, after the construction guy, was an engineer named Robert McPhail, who had been president of Kaiser Brazil. This was before Kaiser sold to--I believe Kaiser sold to Dodge. He was an excellent guy, and I'll count him as a friend forever, even though he probably wouldn't speak to me today.

But on an engineering approach, he had a plan. There was no plan before, and so he had a plan. As engineers do, he scheduled, and he forced the following of that schedule, whether the environment matched that schedule or not. This led to another disaster.

It became clear to me that the only option I had to survive was to proceed and do what I thought needed to be done biologically, in spite of what anything any of my superiors said.

HKS: Your superiors were there, not in New York someplace?

CEP: I had a superior there who was either a construction superintendent or an engineer.

HKS: What do you think they thought of you coming down there in the first place? It was a good idea?

CEP: It was a good idea, and it was fine. Personally, they liked me. But they couldn't stomach insubordination, which is not a surprise. I guess this is the point to recount some of the things that happened.

Once I saw the situation, I struck out into the jungle and found the best place for a nursery, and that is not easy. One thinks that the Amazon is flat, and it's not. You need a flat place for a nursery. And with the flattest place I could find, we still had to spend a tremendous amount of time and effort in putting in wooden drainage ditches so that the nursery wouldn't wash away.

We had a central drainage system, and we had drainage ditch, a wood-lined drainage ditch between every three or four rows of the seedlings. We spent the first few months building that nursery, so we could produce thirty-five to forty million seedlings almost immediately.

HKS: You were able to convince the construction people to give you some equipment.

CEP: Not really. They were all for a nursery and understood that a nursery was required. But they wanted to build it in a construction manner, which I would not agree with. We used the equipment weekends, nights, when I could steal it from road construction or bridge construction or wherever. Let's put it this way; they permitted us to steal the equipment when they weren't using it.

HKS: [laughter]

CEP: [chuckling] But there was no program change as far as land clearing with equipment or road building or anything else in order to allow the construction of a nursery.

So we got the nursery built. I believe we sowed the first seed the tenth of October. We had to be planting the first week in January.

HKS: So that's the summer, because you're on the other side of the equator.

CEP: Right. Building this nursery included the clearing, the drainage system, irrigation system, because this is the dry season. We had a complete irrigation system. The planting season, the first planting season I was there came along, and our seedlings were maybe average eighteen inches tall. And the species was *Gmelina arborea.*

I concluded that the seedlings were too small to plant and too succulent to go into the field in that particular year. The rainy season didn't start on schedule. The executive director of Jari at the time was an engineer, and he had scheduled planting on a given day. We had to start.

We started, above all my protests. And we can cover the planting procedure later, but I followed behind. I was not responsible for planting.

HKS: The construction people were planting?

CEP: No, we had a forester who went down the same time I did.

HKS: Who was that?

CEP: Don Cole. He had spent most of his professional years with Continental Can in Georgia.

HKS: So you were the scientist. Then they brought in a practical person to make it work, in that sense.

CEP: Right. But, if I remember correctly, Don had spent probably twenty years with Continental Can. Then he went back to N.C. State to get his doctorate. I think he had everything but his thesis completed when he left and went to Jari the same time I did.

A strange thing to say, but unfortunately Don, with all of his corporate experience, had the mentality and the personality to do what his superiors said. And his superiors said, "Plant." And so Don and I could have a conversation, "Don't do it." But his boss said, "Plant," and so he planted.

I'd go a week behind the planting crews. The seedlings were so young and succulent, and it hadn't rained, that they were all dying. It was going to be another disastrous year, and we were already faced with planting small succulent seedlings in areas that had been cleared on the wrong schedule. Rather than planting these small succulent seedlings on bare ground, they were being planted in vegetation that was roaring back from the original forest.

I knew that it wouldn't work. So I begged and pleaded and fought, and absolutely no one would listen. Of course, all this time, Ludwig in New York is checking every day to see how planting is going, and he's being told, "We planted a thousand acres today and a thousand acres tomorrow, and everything's going fine."

I calculated the nursery was much more successful than I had dreamed, and we had twice as many seedlings as required to cover the land that was prepared to plant. I knew everything they were planting was dying. When the nursery inventory got down to where we still had enough left to go back and replant everything, I went up to the nursery one morning and, rather than lifting and shipping on schedule, I sent all employees home and hid all nursery equipment in the jungle. This forced an end to field planting.

You can imagine the height of insubordination, the wailing and gnashing of teeth. The organizational structure at the time was that Ludwig was in New York. He had a fellow named Francis Thomas who lived in Caracas and was a mining superintendent. Ludwig had mining operations of various kinds scattered over the world, and Francis Thomas was responsible for the mining group. And he also was responsible for Jari. Then, technically speaking, McPhail reported to Thomas.

HKS: McPhail. I haven't heard his name yet.

CEP: Yes, Robert McPhail was the Kaiser, the guy that was responsible for Kaiser Brazil.

HKS: Okay.

CEP: Even though McPhail liked me personally, there was no possibility that he could allow that kind of insubordination and maintain any semblance of organization or authority over the program that he was responsible for.

HKS: It wasn't just you, you might be a bad example for the rest.

CEP: Right. I was told to pack my bags, and took my family and went to Caracas to explain my actions to Francis Thomas before he sent me on back to Oklahoma.

HKS: You didn't have much going for you in Oklahoma.

CEP: Right. [laughing]

HKS: [laughing]

CEP: So I went to Caracas. Fortunately, he wasn't a violent man, but he was verbally violent. I sat there and listened. Francis Thomas at the time was nearing retirement, and here this young whipper snapper, who probably at the time I was thirty-four, thirty-five, and he just, he couldn't contain himself. He fired me I don't know how many times during that session. I guess what stirred him up more was that I didn't get excited. I didn't argue with him. I just listened. When he wound down and was exhausted and had nothing else to say, then I started.

I essentially explained what was happening, and he said it couldn't be. I dared him to wait a month, and I'd go back to Brazil, continue to do what I could do, and if I was wrong, then if there were any seedlings surviving on everything they had planted, then he didn't pay my salary that month.

HKS: So you were again predicting that there would be a total wipe-out.

CEP: I knew it was a wipe-out.

HKS: Okay.

CEP: They were dead when I left, but nobody would face it. I could take people to the field and show them, but the boss said, "Plant." And so I knew they were dead.

I said, "If I'm wrong, you don't owe me for this month. But if I'm right, then we still have enough seedlings to go back and replant and have a successful year." Well, he wasn't there and he couldn't see, and, with his background, like others, he wouldn't be able to tell whether a seedling was alive or dead.

HKS: Was he reluctant to go on site, or would that be a violation of some protocol?

CEP: No, and he did. I went back, and then, within a week, he came. By then, the first planting was like a month old. You could pull a seedling up, and the bark stayed in the ground, and a bare stick of wood came up because it was rotten. Then it was obvious.

So that was the first time of many that I just simply ignored an order, did organizationally absolutely the wrong thing, made people unhappy. Unfortunately, in those situations, people get hurt because then the forester responsible, it became his fault, even though in writing daily, there was a directive that told him what to do and when to do it.

In the end, he was asked, "Didn't you know it was too dry to plant?" Ludwig asked that question. "Yes, I knew that." "Well, why did you do it?" "Well, my boss told me to." But in a Ludwig organization that is no excuse. One of the quickest and most fatal mistakes that one can make is doing what Ludwig tells you to do if you know it's wrong.

HKS: So that's no excuse for Ludwig.

CEP: It's no excuse. The fact that he told you--

HKS: Do you think McGuire knew that when he wanted a self-starter? He knew that you had to be able to--

CEP: Probably not. He only had a casual acquaintance with Ludwig. Ludwig and his wife were supporters of the garden and supporters of various philanthropic things in New York, and that's the reason he knew him. But with Ludwig, in an organization like that, you can't worry about being fired. If you're worried about losing your job, you will. Because you'll do something that you're supposed to do that you know is wrong in order to keep your job. As a result, you lose it.

HKS: What happened? The forester got in trouble. How about the engineer who made the plan to begin with?

CEP: He disappeared, too. But not immediately. The forester took the rap. Unfortunately, shortly thereafter was another situation, and I was determined, the following year, and clearing was being done erroneously too, but--

HKS: What do you mean by "erroneously?" The wrong place, or the wrong--?

CEP: I have to quit making statements like that. I'll come back.

HKS: Okay.

CEP: [chuckling] The next most critical thing was to get good seedlings, good, vigorous seedlings to cover the ground, because once that jungle was cleared and burned, if you don't get it covered immediately, you spend an absolute fortune in plantation maintenance. The root system that's already there is well-established, and any seedling you plant is at a disadvantage. So my immediate objective was to get as strong a seedling as we could get. We planted on schedule. The nursery functioned extremely well.

HKS: You got an adequate-sized seedling in six months?

CEP: Less than six months. My boss was Robert McPhail, on site, who was the engineer. I had learned that anything that appeared drastic that I needed to do, I couldn't talk him into it. We had seedlings up about ten feet tall, absolutely beautiful.

I didn't know he was bringing them. It wasn't my position to know. But he brought a group of visitors, and unfortunately, the experience was so traumatic I don't remember who the visitors were. But I had taken a heavy-duty sickle-bar mower and mowed down all the seedlings in the nursery to where they were just stumps, about six inches tall.

Now, if you can imagine, in our country we plant seedlings when it's cold, and the seedling is dormant. Well, there is no dormant season there. In the planting season, when it begins to rain, yes, it rains, but you still have most of the hours of the day with sun, and the transpirational loss is tremendous.

So if you have a seedling ten feet tall, it's cumbersome to handle, but in addition you have a horrendous transpirational loss. Unless it rains continually, the chance of survival is not good because you just don't have enough root system to support that much leaf surface area.

And so, without permission from anybody, because I knew I wouldn't get it, I mowed down the nursery, and we had just finished carrying off the tops and throwing them in the woods when this caravan of vehicles shows up. And he's explaining to them all along how successful the nursery is, and how beautiful it is [chuckling]--

HKS: [chuckling]

CEP: The seedlings are ten foot tall! [laughing] Comes around the corner, and they're all gone. Again, I was called on the carpet, and the only thing I said was, "Remember last year." We succeeded in replanting and getting better than 90 percent survival on all the land that was prepared to plant.

HKS: Tell me again how tall these seedlings were before you mowed them.

CEP: About ten feet tall.

HKS: Ten feet. So it was kind of spectacular.

CEP: Absolutely spectacular, and beautiful. You have such a good feeling. We went through a few weeks of horrible times, because here I had maliciously destroyed the nursery. But by that time, they were afraid that I was right. They were all ferociously mad at me, but afraid that I was right, and so they didn't put me on an airplane.

Well, planting season came. We lifted the seedlings, and a seedling in that condition is just a stump. You can throw it right on the ground, and leave it in the sun for several days without killing it. So the care required to plant didn't exist. I mean, you could lift all these roots, put them in big boxes, haul them to the field, and put them in gunny sacks, and the guy carries a gunny sack and plants all that.

HKS: Hand-planted.

CEP: Hand-planted. There were two times in our experience there that we had a hundred percent survival. Out of about twenty-two thousand acres planted, we didn't lose a seedling.

HKS: Wow. Not even loblolly pine does that well.

CEP: Right. [chuckling] And because they were never under stress, because the transpirational loss was not a problem, they started growing immediately. We set a limit--we had plenty of seedlings--we had to have at least a half-inch diameter root collar for it to qualify to go to the field. They had plenty of stored food, and so they set root and set sail.

HKS: How did you know these things? Was it just scientific speculation on your part about picking the tops off to reduce transpiration loss, and so forth, or was there literature from a tropical forest that you could use?

CEP: I had no literature.

HKS: You just figured it out.

CEP: I just figured it out. Knowing to plant trees with the roots up instead of down. In hot weather, hot sunny weather, any plant with tremendous leaf surface area is not going to survive in a field of planting. Yes, you could put one in your yard, and it would wilt some, and you could put some shade with it and water it three times a day and get it to live. Which they had done. But millions? Planted by people that never planted trees before? In circumstances where they're fighting roots and everything else? No way.

HKS: How big was the root? How big a hole to put the seedling in?

CEP: We took a standard tool, and planting mattock the locals used for planting manioc, and just made one lick, pulled it back, and put the root in and shoved dirt back in and stomped it, packed it, and that was it.

Unfortunately, I had to make those kinds of dramatic decisions in order that I, and the project, survive, because Ludwig said that if there was another failure, he was gone. It wasn't going to work, and it wasn't worth it.

HKS: So the investment he had made up to that point, the mill--that was way off in the future.

CEP: Yes.

HKS: You were clearing land, building more facilities, getting ready.

CEP: Right. The objective was to prove the biological viability of the program, and then think about facilities. That may be enough examples. I could go for a day on those kinds of examples.

HKS: Okay.

Ludwig's Outlook

CEP: Maybe this is the time to go back and give a little background of why this project and where Ludwig was coming from.

HKS: That's good. The literature features him as kind of a bizarre individual.

CEP: Right.

HKS: Maybe because he was reclusive. Anyway, it's your story.

CEP: He wasn't reclusive. That's a term applied by basically the media that he didn't give any time to. In circles of friends and associates, he was not reclusive at all.

HKS: So when you read "reclusive" in *Harper's* magazine, it means he wouldn't talk to the author.

CEP: That's correct. That's all it means. (Later we can spend some time on the relationship between him and the media.) Ludwig was not reared on a farm, but he had a yearning desire to grow things. A lot of people think Jari was the first thing he did in agriculture-related areas, but it is not. At the time of Jari, he already had a world-scale cattle program in Venezuela, called Hato La Vargarena.

And one of his many endeavors was that he figured a way to dredge the Orinoco River, in order that the tremendous deposits of iron ore could be moved to the Lake States, to processing facilities. The Orinoco was too shallow for large vessels, so there was no economic means of getting iron ore to the Lake States. So, being a dreamer, he dreamed a way to economically dredge the Orinoco, which he did. And, having dredged it, then his ships carried the ore to the Lake States.

So having been involved in Venezuela, he started this large cattle program. He also had a program in the Chiriquí Province of Panama. The company there was called Citricos do Chiriquí, and it was a large-scale orange plantation, with processing facilities. He also had a fresh melon program in British Honduras. And the objective in that program was to airfreight fresh melons to metropolitan New York, Philadelphia, Boston, on a daily basis. So he was not new to things biological.

HKS: On this fresh melon, I'm just trying to think of the kind of man he was. He could see a market, a huge market. The melons had to be ripe enough. You had to have good air transport infrastructure. What kind of analysis would he make? Was it sort of the seat of the pants? Developed like Jari?

CEP: He absolutely loved fruit. But he couldn't stand a pineapple that had been picked green. He couldn't stand a tomato picked green. He couldn't stand a cantaloupe picked green. A lot of things that modern technology brought to man, such as green-picked edibles, he avoided. And he assumed that there were enough other people that would like a properly tasting melon that he was going to bring it to them.

Fiber Shortage

CEP: So he really didn't analyze. He had an uncanny ability to see and project what was going to happen in the future. His basic tenet concerning Jari was that there was going to a major world shortage in fiber, and that he could help prepare for that. He predicted the year, and in terms of start-up of our pulp mill, he only missed that projection by a year.

HKS: In an ordinary corporation, by my perception, you have a fleet of accountants saying, "Well, if you're going to dredge your river, then get your boats up, that's going to be "x" million dollars capital investment, carried at a certain percentage, and you have to have so much income stream you know--

CEP: None of that existed. Most of the economic criticism of Ludwig and Jari is not valid. From a normal corporate world standpoint, from a banker's standpoint, yes, you could criticize. But one has to remember that, at the time when Jari was being established, Ludwig probably had more liquidity than any individual in the world. And it was his money. He didn't owe interest on it. He didn't have a board of directors. His idea of fun is proving an idea.

The bottom line proof of that idea is that it is economically sound. And so time after time, if you looked at the history of the development of his empire, if that's what we want to call it, he would put his money into the program until it became economically sound, until he proved that it would work. Then he would turn it over to accountants and finance officers and so on, and they'd go the normal banking route and whatever. It would become a normal business, with banking relationships and everything else.

But those ideas and concepts that he had that were non-bankable, I mean, no banker in his right mind would do what he did. No corporation. No corporation, CEO, Weyerhaeuser, anybody else, it doesn't matter how large they are, can take shareholders' funds and make that kind of an effort. He was a dreamer. He was an idea person, and he was a rare one that had the economic capability to proceed on his ideas.

HKS: Might he have agreed that he would have made more money in the long run if he'd bought IBM stock? He obviously made a lot money. Or would he say, "No, I'm really making more money this way."? And he could prove it with his bank account?

CEP: His objective in life was not making money.

HKS: Proving ideas.

CEP: Even though he did. Proving ideas. There will be some things that I will not disclose, but there were many occasions when there were easier ways to have done

what we were trying to do. It included buying controlling interests of a major forest products company, which under the given circumstances of the day, the stock values of the day, and so on, he could have done, and never missed the money. In so doing, we would have had the in-house engineering, mill operation capability, everything else.

So from a pure economic standpoint, that would have been the thing to do. He would have made a tremendous amount of money, as it turns out, having done that. That is an example of where just simply making money was not his objective. The bottom line reason that he did not do that was that he was afraid that in so doing it would dilute the focus of his objectives.

HKS: Interesting.

CEP: He felt that there was going to be worldwide shortage of fiber, and so he set out to find a place where he could establish a very large plantation to contribute to these fiber requirements. Being the kind of person he was and the stature he had, he had a lot of friends in the forest products industry. He had friends in many industries.

Probably his closest friend in the forest products industry was Reed Hunt, who was CEO and president of Crown Zellerbach. I won't go ahead and name the others. He had friends to talk to. He wasn't just out scatter-shooting at the world, trying to find a place.

Selecting Gmelina

CEP: He had an employee, an aide; his name was Everett Wynkoop. He had a young Panamanian agronomist named Juan Ferrer. Juan had helped establish the citrus program in Panama, and had helped establish the melon program in British Honduras, and was a, I'll say, a consultant to the cattle program in Venezuela. Mr. Ludwig sent Wynkoop and Ferrer, essentially turned them loose, to help find a place.

They looked at Nigeria, but if you remember the time frame of the Biafra War, there had just recently been millions of Ebo people killed. The land was there. Everything was there. But he was concerned, and justifiably so, about the political stability. So he backed out of Nigeria.

One of the reasons he was first looking at Africa was that, over the years, Gmelina, the tree that he had chosen, had been planted in many countries in Africa. A government would come in, and they're going to do everything right, and they need to replant and have wood for charcoal for people to cook with, and so on. They would plant, but there was no money for plantation maintenance, and the thing would fail.

HKS: So the basic properties of Gmelina were fairly well-known.

CEP: Somewhat. It was originally from Burma, and the slopes of the Himalayas, and it's an extremely fast-growing tree.

HKS: Fast-growing there, too.

CEP: Yes. And has an excellent fiber for fine printing papers. And so he chose Gmelina, and the search was on to find the place to grow it. When he learned more of what was happening in Africa, and it was getting increasingly difficult to get into Burma, he sent Wynkoop on a seed-collection tour.

To see this guy in the office in New York, with his suit and tie and all proper, you could never imagine that this same guy would roam all over Africa in any circumstance and set up seed-collection stations in whatever tribe, at whatever village, anywhere on the face on the earth. It was rather startling.

HKS: Did he keep track of provenance?

CEP: Yes.

HKS: So you knew where he got the seed from, elevation and all the rest.

CEP: Right. Now, of course the problem was that all the seeds from Africa came from the base of the Himalayas somewhere. So you didn't know. You knew it was in Africa, but you didn't know where it really came from originally.

Being fearful that it might be long-term in finding a place for his large-scale planting, with Burma closing and Africa in turmoil, he sent Wynkoop on a seed-collection binge. They collected. Ludwig bought a small area in Costa Rica, adjoining United Fruit properties, and put in a planting, using seed from all the different countries in Africa, in fact seeds from anywhere they could get it, so that he would be guaranteed of a seed source when he did find the proper place.

HKS: Do you think this was Ludwig's idea or McGuire's advice? I mean, that he would have thought all this through.

CEP: This is probably Ludwig. The details were probably Juan Ferrer's. Ludwig had the capability of thinking up all of the "what if's" and planning for contingencies. Once he had an idea, failure was not in his vocabulary. Once he embarked on this, he then could think of all contingencies and what needed to be done. In all likelihood he's the one that said, "Hey, with everything happening in the world politically, we have to secure a source of seed, and so go gather it."

HKS: He had the resources to do it.

CEP: Right. And he had the economic and political connections to be able to call the president of Nigeria and say, "Hey, I've got this problem, and I'm going to send this guy. Let him go wherever he wants to go." And he could go wherever he wanted to go.

HKS: He had that because he was shipping a lot of oil around the world.

CEP: It wasn't only oil. It was oil, mineral.

A Site in Brazil

CEP: At the same time that they had given up on Africa, they were collecting seed, but he had started looking in Brazil. Now, politically, the last revolution in Brazil was in '64, and the new president after that revolution was Castello Branco. And, of course, in our terminology it was a military dictatorship and not a democracy, and so it's bad.

Brazil has a very similar form of government. They have a president. They have a cabinet. They have a House of Representatives. They have a Senate. They have a Supreme Court. It's essentially modeled after us. At the time, because of the revolution, the dictator, the military dictator, is superimposed over the normal democratic system, so that when the democratic system gets out of the framework of what the dictatorship is willing to allow, then the dictator says, "No, you can't do that."

Even though it was a military dictatorship, House, Senate, Judicial, all these things functioned. Castello Branco was president, and he had a what we would call a secretary of planning and development. There it's called a minister level. His name was Roberto Campos.

They needed economic development, and Ludwig started talking to them about a location in Brazil. He needed a place in the tropics--they were interested in developing the Amazon.

HKS: Gmelina is up in the Himalayas but it's still tropical.

CEP: It's tropical.

HKS: Humid tropic.

CEP: Right. And there was really no limit of size in the Amazon, so they essentially gave him a green light that anything that he could find, property that he could find, he had tacit approval of the government to proceed.

HKS: Was the property owned in the Amazon, was it owned by the state or privately owned?

CEP: It's private. To put it in perspective, there were four governments in succession that we had tacit understanding with all of them that Ludwig would put in the seedlings and prove the economic viability, building schools, hospitals, roads, airports, all of the infrastructure.

Ludwig realized from day one that no company, whether it's oil, gold, whatever, no company long-term, forever, can be the mother, the father, the doctor, the lawyer, the

priest to everybody all the time. Economically it does not work. And so the understanding was that he would put in the front money to make it work, build the infrastructure. Once it was functioning and it was economically sound and we knew for sure that the jobs were there forever, then the government would come in, and we would give them the school system, the hospital, the airport, and at that stage, rather than us paying a hundred percent of the cost of the hospital, the hospital comes under the normal Social Security program, the schools come under the normal program, the company would pay property taxes and taxes on inventory, and everything, all taxes that a company normally pays, which would pay for the school system and medical services and everything else.

That was the basic key and the basic understanding of he being in Brazil. Very few people know it, but that is the reason that he left.

HKS: Various articles mentioned tax relief. This would make a lot of sense. I mean, he's putting infrastructure in, so why have him pay taxes?

CEP: Right.

HKS: It looks different the way you're saying than the way the articles portrayed it.

CEP: Right.

HKS: Like they were trying to lure him in with tax write-offs. But it was--

CEP: If you have no profit, there's no taxes.

HKS: Yes.

CEP: Now, we had a tremendous amount of incentives, which we can also get into if we have time. There were incentive programs for forestry, incentive programs for industrial development, all kinds of incentive programs that we utilized.

HKS: They were available to any investor in Brazil.

CEP: To any, and we used those. But to go back to our beginning story, so once Ludwig had had these meetings with Castello Branco and Roberto Campos, and because he had been shut out politically in other areas that he had picked, he decided that he liked the Amazon.

The land ownership in the Amazon--a lot of the titles go back to crown lands. The language in Brazil is Portuguese. Brazil was controlled by Portuguese. The original land grants in Brazil are crown land grants from the king or queen of Portugal. So Portuguese families who came to Brazil, and in this case came to the Amazon, received crown land grants from the king, from the throne in Portugal.

HKS: From that time on, it's been private ownership.

CEP: I've studied and worked through all of the land titles, and like would happen in this country when there was a family that got crown lands, the neighbor couldn't hack

it, and he had crown lands, and he went back to wherever, and he sold what he had to his neighbor. There was one family stayed and put together this massive piece of property from other owners over a period of more than a hundred years.

HKS: Did they develop any of the land?

CEP: In terms of the economy of the day, yes. They built, the literal translation would be trading stations, up all of the tributaries. The main two rivers that they controlled the Jari River and the Paru River to the west. They built trading stations up these two rivers and the tributaries, and so it was a collecting economy.

HKS: What did they collect? Medicines?

CEP: Their number one economy was Brazil nuts. The region has a tremendous Brazil nut tree population. Probably number one was Brazil nuts. Number two is balatta. Balatta is the latex--there's two forms. The main one is the rubber tree, rubber tapping. The next one is a latex from a tree called massaranduba. They collected seed that some French firm would buy for perfume. They'd collect hides, jaguar teeth, anything that the outside world would buy.

This family in boats--they had a fleet of boats--would bring in cloth, hand tools, ammunition, pots and pans, salt, sugar, basic needs of the people that lived in the region. They traded things that people needed for the items that the people extracted from the forest.

HKS: There was obviously enough volume of business to make it worth their while to buy all that land.

CEP: Right. "Buying" the land is probably a misnomer. They took the land, in most cases, when it was abandoned. It's like today. I can buy for you any number of acres you want in the Amazon for almost nothing. We at times in my company have owned large acreages in the Amazon because it was expedient from the standpoint of the banking system in Brazil. But never show it on a financial statement.

HKS: But there's an owner that you buy it from.

CEP: You agree to accept title so that guy isn't hung with taxes that he's not paying anyway. But as a non-Brazilian entity, you have to pay taxes.

HKS: Brazilian sovereignty over the Amazon is rather flimsy.

CEP: Correct.

HKS: Even today.

CEP: Even today.

HKS: There is the state of Para, and there's the territory north.

CEP: Amapá.

HKS: That would be even less developed.

CEP: Even less.

HKS: Same as our territories in the States.

CEP: That's correct. It would be like going to back to Oklahoma and not seeing a white man. Yes, there are people there. Yes, there are activities there. But there's not enough activity to justify a form of government other than a federal government saying, "Jose, go to the territory up there and try and have some form of law and order." That's about it.

So when we owned land, we didn't control it. I mean, anybody could come in, collect nuts, cut down a tree and haul it somewhere to get money for some medicine for his kids or whatever. There's no reason to control it. The cost of control is much more than the benefit that one would reap from the land.

HKS: When the articles I read referred to "squatters," that's really not an accurate description.

CEP: It isn't until, like Jari, you start developing the asset on a world-class economic base, and then "squatter" is a real term and a real problem.

Purchase of Jari

CEP: There's an old friend of mine, who died last year at the age of eighty-six, named Robin McGlohn. Robin McGlohn was one of the original Pan-American, international pilots. When Pan Am would open a new flight somewhere, Robin was one of the guys that would open it. So the first time Pan Am flew from U.S. to Rio, Robin opened it. He opened many of the new routes in the Pacific. He was the first in the old flying boat.

After the war, he picked up everything he had and moved to the Amazon. He was a well-known folklore legend in the Amazon. Georgia Pacific bought some property and a mill in the Amazon, probably in early '60s, late '50s. They bought it from Robin McGlohn.

HKS: They bought it from him.

CEP: Right. He put the property together, he built the mill, and he sold it to GP. He was continually doing that kind of thing. Robin McGlohn did the intermediary work of putting Ludwig together with the Andrade family that owned the Jari property. In one way you could say Ludwig bought the property from McGlohn. He bought it from and through McGlohn.

The old patriarch in the family that owned the property, like happens in so many families, they had fought and struggled for a century, and they had Brazil nut

processing facilities, where they exported Brazil nuts all over the world. They had heart of palm processing facilities; they shipped all over the world. They shipped other extracted items throughout the world. So it was, at that day and time, a fairly substantial family. But they had enough money that the younger generations were ruined. You know the old saying, "a shirt sleeve to shirt sleeve."

HKS: Right.

CEP: There was really nobody capable or wanted or cared to take over the helm. So the old man sold it. The first offices that Jari had in Belém were the offices of the parent company. When Jari was purchased--and Jari is not a new name--when Jari was purchased, he bought the boats, the land, the stores out in the jungle, the whole deal.

If you, in a discussion, told him that he did things because of his concern for other people, I mean he was a rough, tough, knock down drag out kind of a guy. If you told him that, he'd deny it. But throughout the years, time and time and time again, I saw him do things that said, "I'm doing this because of my concern for people."

When he bought the property, the logical thing for him to have done was stop all the trading, close down all those stores, and gone about his activity. But there were too many people involved. For probably eight to nine years, we did slowly slow down, stop all those extractive activities which over time were picked up by the competitors of the original Jari. But he did not just simply walk in and drop everything and leave those thousands of extractive type people destitute with no market and nothing to do, when in reality it was of no economic advantage to him whatsoever.

HKS: Was there a labor market there that some of those extractive people could have been hired to work?

CEP: We created the market.

HKS: For those who wanted to settle down and get a job, there was a job there.

CEP: Right. Over time, we hired many of them. But those who chose to remain in that form of life went to the competitors of the original Jari company.

HKS: The fact there were these relatively minor things going on there wasn't a part of Ludwig's plan. He inherited those.

CEP: That's right.

HKS: The write-ups. Some of them suggest diversification, that Ludwig never missed a bet to make a buck, because he had Brazil nuts and so on and so forth. But he wasn't really interested in that.

CEP: That's correct.

HKS: Okay.

CEP: A sidelight to that. We had, over the years, developmental programs in various things that would be additional agricultural and industrial activity for Jari. He had friends in New York, in IFF, which is the International Flavors and Fragrances, which is a very large company.

We worked on miracle berry and patchouli and all kinds of activities like that that were a possibility of development on an extremely large basis, supplying companies like IFF. Those extractive activities that were there that we continued for years were not continued from a profit motive because there was none. They were continued to allow the people time for us to develop and them to either go to work for us or continue in what they're doing and work for other people doing the same thing.

Ludwig's Age and Liquidity, His Manner and Management Style

HKS: How important was his age? He didn't know how long he was going to live, but clearly it was a time of life where he didn't have a lot of time left. Others have said he was in a hurry. Tommy Thompson said he was in a hurry.

CEP: It was extremely important. The first day I met him, he said, "I only have ten years to live, and we have to get this done." Every year throughout my experience with him, he only had ten years. So after the fifth year, he had ten years. After the tenth year, he had ten years.

HKS: [laughing]

CEP: Up until he became an invalid, he probably still had ten years. But he was in a hurry, and he made decisions based upon time. In many instances, he would want us to do something, and we would say, "Look, we can do it, and it will cost a million dollars, and it will take us six months to do it. Now, if you'll let us do that over a three-year span, where we can learn a little bit, step by step, as we go, it will be cheaper, and the end result will probably be better." He'd say, "Forget it. Do it in six months."

Many, many, many occasions, those kinds of discussions occurred and, without fail, that was the kind of decision he made. Yes, he was in a hurry. You also have to remember that he had tremendous liquidity that was growing by leaps and bounds every day, and he needed to do something with it. He was a penny-pincher in almost all respects. He didn't throw money away. But applying whatever money is required at an objective, saving time, to him was not throwing money away. He would do that, but if he caught you throwing--you know, half-using or not using the back of a sheet of paper, you were in trouble. I mean, it's waste. So you stop and you pick up a penny. You use the back of a sheet of paper. You don't put half a load in a washing machine. But you spend an extra three million dollars to save two-and-a-half years.

HKS: He obviously had confidence in his basic ability to grasp a problem. Was he vain? Was it ego.

CEP: No. No. Not at all.

HKS: Was he hard to convince if he was wrong? If you thought he was wrong, was he open to suggestions?

CEP: To many people, no. And unfortunately--I mean, he didn't ask. In many instances, he'd come in and he'd say, "Look, fellas, this is what we're going to do."

HKS: I see.

CEP: It could be off the wall and just as wrong as anything you can imagine.

HKS: Did he have a forceful personality?

CEP: Absolutely. Forceful, overriding, demanding. So forceful I have seen some of the world's greatest and strongest corporate executives melt in his presence and eat out of his hand, so to speak. Because of his power. They, yes, ran a large company and they were president and CEO and were revered and respected and everything else, but they didn't own it. Here's this guy, a larger organization than theirs, that has total power.

Anyway, the only way for anyone to survive with him was to discuss and if necessary argue. Whereas many people were fearful of confronting and arguing, I never was.

HKS: Did you--

CEP: Because I saw too many people commit suicide by simply doing what he said to do. Many times, he'd tell me what to do and in later years, as I learned more, he still would tell me what to do. I wouldn't do it. I would go find someone that could do it, or find the proper person in the organization that it was really his responsibility anyway, and tell him what I had been told to do, and then he would do his job.

HKS: There's been a lot of writing about his managing style, with thirty directors in fourteen years. He was so overpowering, it took a very strong manager. Somewhere along the line you have to explain why you survived.

CEP: I'd have to go back to the calendar--but I survived more years than all the other thirty-three combined.

HKS: I see that.

CEP: It was because I'm not smart enough to have fear. I and many others dearly love the man.

HKS: Why was that?

CEP: Respected him. Didn't agree. I didn't agree with his personality at all. One thing that literally slayed many people is that in the proper circumstance, not in a bank meeting, not with the Queen of England, but in a proper circumstance to him, he had

the language of a sailor. And when things were bad, his language was absolutely terrible, and he could walk up and just paint the air blue.

Now, to me, he was not railing at me as an individual. He was not calling me all those names. It was the circumstance. If you ever let the thought enter your mind that he was attacking you personally--I mean, there stands my boss and he's calling me all those names and he's blaming me for all these things happening. You'd be gone in a week. You'd collapse. Just couldn't handle it.

So number one in survival, you had to have absolutely no fear. Number two, you had to realize that he was railing at circumstances, not you as an individual. Number three, he was an idea man, and from an outward perspective it appeared that most of his ideas worked. But he didn't have one out of a hundred ideas that were worth a plug nickel. He was smart enough that the ones that didn't work he could stop. If he spent a million dollars on it and it was a bad idea, there was no board of directors to tell. There was no stockholders to say, "Well, I had this idea and I didn't get your permission, and the company lost a million bucks. I'm sorry." The million dollars just disappeared.

HKS: When you owned your own company the way he did, it was easy to start an idea, but it was also easy to stop.

CEP: It was easy to stop.

HKS: You didn't have a momentum in there yet you had to worry about.

CEP: That's right. I have seen, been in on, and I know there were others larger, but the largest that I was involved in was twenty million dollars. He started down this path, and it was in a country that the country required that 51 percent of a venture be owned by nationals.

It wasn't their money. He brought them in. He thought they were good guys. He brought them in because there had to be 51 percent, and he thought even though they would own 51 percent it was still a good deal. They kept trying to run the show and buck what he wanted to do. He walked in and said, "Look, it's my money. This is the way it's going to be. This is the way we're going to proceed. This is the way it's going to be built, and this is your responsibility, and that's what you're going to do." They bucked. And he said, "Then this program is over. 'Bye." And he headed out the door. They said, "Hey, you can't do this." He went to the airport.

One of the reasons he was so successful is that he didn't brood over that loss. Yesterday didn't exist. The word "what if" was not in his vocabulary. As long as I made a mistake, and I made plenty, as long as I learned from it and didn't repeat that mistake, there was nothing so to speak written down in his book, in his black book, against Posey. Now, if I didn't learn, then disaster. But you could make about any mistake first time and no consequences.

Whether it was personal or financial, there was no such thing as "what if." I talked to him about it one time, and he said, "'What if' is one of the greatest sins of man and one of the things that prevents man to recover when he falls and pick up and run

again." Say a guy goes bankrupt or he gets fired. He spends all his time brooding over what if I hadn't done this? What if I had done this? What if I hadn't told so-and-so such-and-such? So your productivity and your capability is drained off in "what if" in the past, when the only significance is past is, "Did I learn from it?" He had that ability so complete that he was always looking at tomorrow, nothing of yesterday.

HKS: Without having a corporate infrastructure with lots of vice presidents and so forth, and all the different holdings he had around the world, did he have a personal life? A family life? Or did he just work from dawn till dark every day? How did he keep track of all this without all the reports coming in and all the bureaucracy everyone else has to have?

CEP: We need to hit that on another subject.

HKS: Okay.

CEP: The only family he had was a wife. A very strong-willed, red-headed wife who understood him, and he could get beat up and wounded and run over every day and drag home at midnight, just barely get to the door, and by the next morning she'd have him put right back together again. That is one of the explanations and reasons for his survival.

So back to land.

HKS: Two more questions on Ludwig, the man. Did you call him "Mr. Ludwig" or did you call him "D. K.?" I mean, how personal was your relationship?

CEP: Many people called him "D. K."

HKS: I've seen that.

CEP: And thought that meant that they were close to him. I never did. I respected and revered him. It's like one of my old profs in college that taught me many things beyond the technical, and he helped me over the years. I used him as a consultant at Jari many times. He and his wife lived with us for a while. I never felt comfortable calling him "Nat." It was the same way with Ludwig. If I were calling him to get his attention, I called him "Mr. Ludwig." But other than that, in day-to-day conversations, I really didn't use his name.

HKS: Was he fairly generous with compensation? Did he give you bonuses or raise your salary? How did he view this?

CEP: He was a shipping man, and everything he did--and it doesn't mean it was good in all respects--but he had a ship captain's mentality. You hire a captain for a ship. You put him on the ship. The ship leaves. Either the guy can navigate, can do maintenance on the ship, can take care of the crew. He can run it, or he can't. You're not there to make any suggestions. You can't tell the guy to turn left, right, slow down. You're not there. You have to have complete trust in the captain you hire. The minute that you determine that the captain can't do what you wanted him to do, you have to get rid of

him. It's too big a risk--as Exxon has learned--it's too big a risk to have a captain that you do not have complete trust in.

So he applied that throughout everything he did. In many circumstances, it didn't apply. But that's the way he functioned. So, yes, when you became a ship's captain you had complete authority and you were well-compensated.

HKS: Except you wouldn't have stock options and the other things other companies would have.

CEP: But you didn't need it because the compensation was sufficient. I say you had complete authority. But in reality you had him second-guessing. You had a steady flow of consultants in every subject you can imagine on your back and second-guessing and sending reports. And you had the normal corporate individuals, in a corporate structure, not knowing what you're doing other than they're sending money down a rathole and don't like it, and they're clamoring to determine what's happening accounting-wise, fiscal controls, everything else. In that respect, Jari was a ship with a captain, and it was difficult for other people to get their hands on it because he kept them at bay.

HKS: And you had some pressures from the Brazilian government scientists.

CEP: Constantly. We had a steady flow of scientific, educational, military, political. In Brazil you have military colleges. You have the joint chiefs of staff. You have the military war college. Well, just like here. You have a group head of the air force, a group head of the navy, a group head of the marines. You have a school for each of those.

At the height of our development we had a group of people that essentially did nothing but receive and tour and explain our program to those kinds of groups. It was a significant portion of our budget.

Back to land. After the meeting with Castello Branco and Roberto Campos, he sent Wynkoop and Ferrer into the region to determine its qualifications for what he wanted to do. Ferrer was scientifically well-grounded and knew what Ludwig wanted to do, knew Ludwig's long-term objective. Ferrer's immediate concern was whether there were enough soils in the region suitable for Ludwig's objective.

He and Wynkoop went in and spent I don't remember how much time but probably two-and-a-half to three months in the field, running lines, soil survey lines, taking soil samples and lugging all these samples out to send them to a lab to try and get a feel. Of course they were doing it on a broad scale. I mean, if they were in a flat, they'd get a soil sample. They'd walk a mile and they'd be on a ridge top and they'd get a sample. They spent all this time and got out.

Juan got back to Belém. He called Ludwig in New York and said, "Okay, we completed the soil sampling. As an individual and what I know about soils, it looks great. But it will be another month before we get results of all the soils tests." And Ludwig said, "Well, they better turn out right because I already bought it."

HKS/CEP: [mutual laughter]

CEP: So here these two guys just spent all this time in the jungle, and it didn't mean anything because he had already bought it.

HKS: The information was ultimately useful, wasn't it?

CEP: Yes, because it allowed other people to look at the results and [still chuckling] determine the areas to begin the clearing program. But those were the kinds of decisions and kinds of things that Ludwig's time frame forced upon you, simply because he wouldn't wait for normal, scientific, bottom-line results.

Brazilian Concerns

HKS: The land purchase itself wasn't a major investment, as I remember the numbers.

CEP: No. No. In terms of the total money applied, it was insignificant.

HKS: Was it significant--when the property was sold in '82 or '83, a million acres or so was in land title search. Was this a real issue? You explained that the land grant titles were kind of obscure, but did anybody ever worry about that?

CEP: Well, yes. There are, and there always have been, a lot of nationalists in Brazil, the fear of somebody taking over the Amazon. If you can imagine something of the magnitude of Jari, if we went over in the middle of Georgia and struck off a few million acres and put a fence around it. We didn't build a fence around it, but it had a psychological fence in that there are no roads. You can't drive around it. There's no way to get there except through our gates, so to speak. You could fly over it, but what could you see? You're employing tens of thousands of people, and clearing land and planting little trees when you already had trees. So if you have a big tree, why would you cut it and not use it and plant a little one?

So there had to be some other motive. Maybe we had found tremendous reserves of gold. Occasionally they were out there with troops trying to find something. Somebody started the rumor that we were taking big Brazil nut logs, and we had this big auger that we hollowed out the log, filled it with gold, and then put a cap on it and were shipping gold out in logs.

HKS: Why would you have hid it? I mean, why were the rumors that ludicrous? Was there a royalty on gold or something?

CEP: Well, no, but just gold is something interesting. I mean, everybody likes to talk about gold.

HKS: Okay. I wondered why you would have bothered to hide it.

CEP: Because it was such a tremendous find, we were trying to get it out and, being foreigners, were trying to get out as much of Brazil as we could.

HKS: Okay.

CEP: There were rumors like that all the time. But if the Japanese came to Georgia and struck off a few million acres and essentially had a fence around it and were doing things that nobody understood, and doing stupid things like cutting down a big tree and planting a little one, there would be an uproar. I mean, the local population and politicians and everybody would want to know what was going on.

So it was the same thing there. It wasn't unexpected. It surprised some people, but it shouldn't have. If you put it in the perspective of where you came from, and somebody did the same thing next door to you, it's strange.

Of course, they couldn't understand how one individual could conceivably have that much money. And if he had it, why would he spend it that way? Why wouldn't he leave it bundled up in a room where he could see it?

HKS: Was there I'll call it a public relations program to cope with this initially? You've said you had a group that did nothing but conduct tours.

CEP: We didn't go out and advertise. The only way we coped with it, we just simply had an open door. Any scientific group, any military group.

HKS: But you didn't invite journalists in and see it and write articles and that sort of thing.

CEP: No. No. We didn't invite them in. We kept them out.

HKS: Was the original land purchase the basic purchase, or did he keep acquiring more in bits and pieces?

CEP: No. One purchase. But see, very few of the land titles were really any good. I remember one title in particular that said, "Start at the confluence of 'x' creek and 'x' river, and go so many leagues, so many degrees northwest." Well, if you did, it put you out in the Pacific Ocean off of Colombia.

HKS: It goes back to the original land grant. They didn't know where it was.

CEP: They didn't know where anything was. Let's take Alligator Creek. On this drainage system, the people that lived there named this little creek, Alligator Creek. There's a drainage system over here, and there's alligators over there, too. And the natives named that Alligator Creek.

HKS: Was this an impediment to investment, or Ludwig doesn't worry about that? He had his couple of million acres, whatever it was, and he was satisfied with that. How many acres were there?

CEP: Well, it depends. There's all forms of titles in Brazil. If you say that he owned the land for all forms of ownership that existed, it was about seven million acres. But

some of the land we ourselves never considered we had clear title to. What we, in our mind, had clear title to was less than three million.

HKS: So you tended to work with that three million acres.

Land Clearing and Saving the Soil

CEP: We functioned within that three million. Brazilian law is such that if, let's say, there's a piece of land within our ownership. We have papers saying we own it, but we really didn't believe it because of the form of ownership. But we needed to develop it. We'd go ahead and develop it. Build a road through it, plant it, whatever. Brazilian law states that if land is developed erroneously or when titles are in dispute, if the title dispute is settled by the court, whoever owns that land, if it wasn't the one that develops it, has to pay the one that developed it, its value, including developmental cost. Which means that there would be no one that would have the capability of paying us back what we spent on it, on roads, clearing, plantation establishment, and everything else.

To my knowledge, there's never been a question on any land that we developed that we had any inkling that it wasn't under proper title, because there was just no one with the capability to pay. So that wasn't a significant risk.

He purchased Jari and immediately went out and bought from Caterpillar U.S. seven million dollars' worth of land-clearing equipment and road-building equipment in '67. Sent it down and hired construction people and said, "Build this forest."

HKS: So he bought the equipment rather than having the contractor bring his own equipment.

CEP: Yes, because it was permanent.

HKS: Okay. He needed the equipment when they were through.

CEP: Right. And the land-clearing equipment was a mistake. At least the way they did it. That was one of the other things that I did the second year I was there. I parked all of the land-clearing equipment, and this was a tremendous blow to him because he had spent the money on all this equipment.

HKS: More on equipment than on the land itself.

CEP: That's correct. So that was a traumatic experience. We then started clearing by hand to where we didn't damage the soil, and used the equipment for road construction.

HKS: How about stumps?

CEP: Didn't touch them. What we knew at the time was that they had taken this massive equipment and cleared, and in order to have something that looked nice, they

windrowed. The key to growth of any plant in these tropical soils is organic matter. The biological activity in these soils is much more important than nutrient levels. People key in on nutrient levels after a burn, but it's really biological activity, and it doesn't matter what nutrients you have. If you don't have a high level of biological activity, then those nutrients are not in a form that's available to the plants. So when they piled and burned, made windrows, they scraped the soil, and they planted trees in the nice clean area that they scraped. All the organic material was in the windrows. Terrible results.

HKS: Could there have been some modification in that process, a different kind of blade on the tractors?

CEP: Right. That's what they were doing when I got there. And the next season, they cleared with equipment, but just knocked down and let it lay. But still a stump sticking up is a lot less impediment to planting and plantation activity than a stump on its side. If you have a tree knocked over, the roots and everything are sticking up, and you have a lot more volume than if you cut a tree off and you have a stump.

When I looked at the economics of land-clearing by equipment in an isolated region, looking at equipment maintenance and fuel costs and everything else, we started clearing by hand. We rapidly developed to a point that we could clear thirty to forty thousand acres in five months by hand, and not disturb the soil in any way.

We had knock-down and drag-outs until I showed how much cheaper hand-clearing was, and it was about 40 percent of the cost of machine-clearing.

HKS: Plus you save the soil.

CEP: Plus you save the soil.

HKS: Interesting.

CEP: To finish the initial subject I started on, Ludwig was not new in agricultural activity. This was by far the largest of any agricultural or forestry activity he started. He didn't know what to do and procedures to use, but he was willing to listen to people that knew or at least knew enough and was willing enough to stand up and fight for what they thought would work.

The initial burning was all a disaster. They'd clear, but they couldn't succeed in getting it burned. Once we showed how to clear, burn, and that we could plant and get good survival, then management-wise we really had no competition. From that point on, we essentially had a free hand on forestry development.

We had no limit on applied research, so we had a sizable research staff in genetics, soils, silviculture, management, administration. In fact, we had as many people in applied research to direct us where to go tomorrow than we had operational management. If you imagine, planting Gmelina is like planting tomatoes. If you let the weeds grow in your tomatoes--and I can show you where I live--there are bad results, and it doesn't take five years to find out. It's then.

Gmelina grows so fast that an incorrect step, which nobody knew, but an incorrect step in silviculture, you find out. If you looked. And so we looked constantly. A year never went by that we used the same procedures at the end of a year that we were using at the beginning of a year. There was no policy. There was nothing hidebound. We learned as fast as we could learn, and we applied it.

Tropical Forest Science

HKS: The tropics is, of course, a huge place. There's tropics in Africa, in Indonesia. Could you make use of other people's research that professors and scientists were studying worldwide on soils and so forth. Did you read the literature and find it useful? Or are issues actually so site-specific that you have to do it yourself?

CEP: I hate to say this, and the scientific community would have me shot if they could find me, but unfortunately many people in the scientific community do not look at the bottom line of the question. And the scientific community is influenced by fear of the media, and particularly now, fear of the environmental people and the media associated with it. So they get blinded, and number one, they don't ask the right question, and number two, if they ask the right question, they don't pursue that question to the baseline.

HKS: What I was thinking about when I asked that question, the Forest Service has a facility in Puerto Rico, has been there since '39. They have one of the largest tropical forestry libraries in the world. Could you go there and look at that literature and find things that would be useful to you at Jari?

CEP: No. It's a terrible thing to say. It's hard for people to grasp, because in this country we don't live in that kind of world. But we had no limit. Once our nursery had operated a year, and I picked a young Brazilian technical guy to run the nursery, he and I got on an airplane, we made a nursery tour of the U.S. We visited Weyerhaeuser nurseries, we visited state nurseries, we visited tree improvement programs. I gave him a whirlwind tour you can't imagine, so that he would see the objective that he was shooting for.

I didn't tell anybody I was going to do that. I didn't get permission for his ticket. With Ludwig, let's say he was coming in two weeks. The way to get shot, so to speak, is be needing to do something but well, he's coming in two weeks. I'll wait and ask him. If you ever told him that you waited two weeks to make that decision till he got there, you've got a notch in your black book or on the handle of the pistol or whatever. Because not making a decision when you're supposed to know is wrong. Losing time is wrong, and costs money. So normal operating things like that that needed to be done, you just go do it.

We looked at plantation development in Venezuela. I went to Africa. I looked at everything I could find in the literature that might provide something that we could look at. So yes, we looked. We tried to learn, and we applied it. But the question you ask, I still unfortunately have to say no.

HKS: I see on your resume you published twenty papers, twenty articles. Was that before Jari?

CEP: It was all before.

HKS: So you didn't publish--

CEP: Not one since. Unfortunately it's because if you tell the truth about Jari, no one will believe you. If you say what they want you to say, I could publish something every month. I refuse to write what people want to hear, rather than the reality.

HKS: I want to get back to this major commitment in the local research. Did you have a lab on site so you could analyze your own soils on site. Or did you have to send things out?

CEP: One of the first things we did when I got there was set up soils lab. We were running with all kinds of fears. I mean, the world says and the literature says that monoculture is bad. It says that if you clear tropical soils, they deteriorate and the growth goes down. All kinds of wives' tales.

In the scientific community you could go to--well, I won't name places. You can go and talk to tropical experts in forestry, and common knowledge is that the reason people, in shifting agriculture, clear a spot and grow a crop for two or three years and then move is because the soil deteriorates and is no good. And in some people's mind, it is destroyed forever.

HKS: You read those sort of things.

CEP: Yes, and the scientific community believes it. This is one of those areas where they haven't asked the base question. That is as erroneous as any concept that you can imagine. In reality, what happens is that a guy clears his three acres, and he doesn't have a local store where he can go buy some silvicides. If the store was there, he wouldn't have the money for them. So this jungle, this three acres that he cut and burned, comes roaring back. It comes roaring up from the bottom, and it comes in from the sides. Purely and simply, within three years, in his time and effort, it takes less time to chop down another three acres and abandon the brush that he can no longer beat down with his machete and start a new patch. Because the fire does get hot enough to give him some relief from using his machete for a period.

It has absolutely nothing to do with soil fertility. Now, if clearing ruined it, why do you not see, when you fly over, all these tremendous areas that have been cleared in the past? They're not there. They disappeared. One of our activities today is to go back to areas that were cleared in the past and recover products from those areas.

But you can take a guy who is sitting on this spot, where he's growing something to eat, and you say, "Where were you born?" "Well, back down here?" "When were you born?" "Thirty years ago." And so you can tag the age classes of each of these parcels

that he cleared. "Where was your father born?" "Well, he was born down here." "Where was your grandfather born?" "Well, he was born down there."

So we have gathered products resulting from the fire where his grandfather cleared a place fifty, sixty, seventy years ago, in products that wood doesn't rot. And you know what? We collect those products in a forest that the normal scientists going by could not detect that it had ever been cleared.

HKS: This might be the time to bring up this June '93 article in *Science*, which I don't know if you've seen or not, but it's on tropical deforestation using Landsat imagery. So what does that mean? They're showing clearings and loss of habitat. They're saying that Landsat was too imprecise. There's less clearings than they used to think, but the wildlife habitat loss is worse than we used to think. But they're assuming that the land cleared is done for.

CEP: Oh, yes.

HKS: This has been peer reviewed, *Science*, a very reputable, not a radical magazine, I would say.

CEP: What happens is that any acre that was ever cleared or ever touched by man is destroyed. And it's almost to the extent like when you, in the summertime, go home and watch the ten o'clock news and there's a fire in Idaho. The way the media presents it, the land is lost, like ten thousand acres slipped off into the sea and it will never be forest again, and it's destroyed and gone.

I'm not saying that land has not been cleared. Some of the biggest mistakes in the Amazon were projects financed by the World Bank and projects essentially financed by the tax incentive program. Swift-Brazil, Volkswagen-Brazil. Several very large programs. But those areas--I mean, it's real. It was cleared. It was burned. It was put to pasture. And it failed.

To me, some of the greatest forestry opportunities existing in the world today are those areas. Because clearing and burning and planting grass didn't kill the original forest. It's back. Not in the same species distribution, but it's back. Those areas have airports, housing, all the infrastructure.

If I were a Ludwig today, I would go into one of those areas and, having the infrastructure in place, start managing. I would choose probably the best twenty species that at least have some chance of use in our world today, based on our wood technology today, and favor those twenty species and accompany the development of this new forest as an economic base, rather than wail and moan and decry the reality.

I mean, it's real. It was cleared. It should not have been cleared in the way it was. It should not have been managed the way it was. But it is forest today. It will be forest tomorrow. Why not, instead of wailing, channel all of our activities to turning that into an economic base that provides jobs? Bottom line is that jobs prevent clearing of native forest.

At Jari, yes we cleared and burned and created jobs, and the number of acres that Jari has saved from being cleared is already several multiples more than we cleared. And it should last forever.

HKS: So the cost of sustainable development is viable, very viable.

CEP: Absolutely. Absolutely. I haven't read this [referring to the magazine], and I don't know what percent of the total Amazon that they're saying is cleared, but--let's see.

HKS: It's in the southern part. The brown was never forest land. Some kind of savanna, as I understand it.

CEP: Right.

HKS: But Jari is where? Here? I can't quite figure out where we are in this.

CEP: I don't understand their subdivisions, because the mouth of the Amazon should be right in here, and there is no river this shape. See, this is another tremendous misnomer. There are literally millions of acres in the Amazon that are natural savannas.

HKS: This is sort of "before and after." This is ten years apart.

CEP: Yes. But these lands were never forest. Well, they were. But in terms of--

HKS: It says, "clouds." I guess it was cloudy those days.

CEP: But in terms of history of Brazil, if we take Brazil since it was just Indians, all the stretch through here is open savanna, grasslands savanna. There are tremendous areas that are savanna. There are tremendous areas along the river systems that are várzeas and not forest. Yet all these acres get counted as cleared.

HKS: In ten years this is more cleared land than before. That's the way I read the map, without knowing the terrain.

CEP: Right. But here again, that is not the Amazon. This is not the Amazon.

HKS: I guess this area drains into the Amazon River.

CEP: No. You'd think it is, but it's not. I won't name the institution, but an institution sent me a bulletin to review. The title of it was I don't remember exactly but something like "Useful Species of the Tropics." They were listed in there, and their characteristics and uses and so on, in alphabetical order by their scientific name. First one on the list: *Aracaria angustifolia*. It's not even a tropic species!

HKS: It grows in Chile, doesn't it?

CEP: If it occurs south of the U.S., it must be in the tropics.

HKS: I see.

CEP: None of this land that you see here is in the Amazon. You take this out, take this out. You take the Amazon drainage. What percent is cleared? And then you take the savannas and várzeas out, and what percent is cleared?

See, the river, where the city of Belém is, is on the Paru River. It's not the Amazon. People think Belém is on the Amazon. It's not the Amazon drainage. People have an agenda.

HKS: I don't want to get you off this subject, but this is a photograph on page 1905. It's a very straight line. It's almost like the public land survey of the United States. Has Brazil been surveyed? Why are these ownership lines like that? Very straight.

CEP: Land that is being developed, if you're not a squatter, is surveyed. The law applying to land that is granted to settlers, if it's forested land, depending on where it is and so on, a percentage has to remain in forest. That's the reason you see this kind of pattern. Let's say you get a grant for a hundred hectares. Half of it has to stay in forest.

HKS: That's a federal law.

CEP: It's a federal law. Now, you can choose which half stays in. But half of it has to stay in forest, and so that's the reason for this kind of pattern.

HKS: I see. Are there state laws as well?

CEP: Yes.

HKS: Is that a complication for managing?

CEP: Yes, and there are replanting laws. Brazil has excellent forestry laws. It doesn't have the economic and social and political means to enforce it. We probably need to get into a social discussion before we complete, but this one statement here is basically, land-clearing is a social problem that has no solution outside of jobs and education.

No government has the political ability or will to prevent starving people from walking onto a piece of property that is otherwise not being used, in order for that person to grow something for his kids to eat. I would go further in saying that no scientist, no environmentalist, no anyone in developed countries has the right to doom that guy and his family to starvation.

Things that we have the ability, economically and based upon our industrialized world experience, to help, there is no means of helping until we realize that the Amazon is not ours. The Amazon does not belong to the industrialized world. We cannot apply any law to it, social or otherwise. We cannot impose anything upon it. We have tried to apply economic pressure in terms of the Amazon, and all we have done is made it worse.

I can give specific, horrible examples of where rules that the IMF or banks or whoever applied have created more problems than they solved. So bottom line is it's not ours. That doesn't mean we can't be concerned. It doesn't mean we can't help. But we can't stop what's happening by being arrogant and assuming it's ours and trying to force the starvation of millions of people. And so far that's the approach we've used.

HKS: What Chico Mendes was trying to do to get the system going, extracting rubber and so forth, and the ranchers didn't like that because they wanted to clear the land and make it sort of an agribusiness. That's Brazilian against Brazilian.

CEP: That's correct. I think what we have to realize is that just like in this country, what people in industrialized regions want to do, seemingly, is preserve the Amazon. That's equivalent to saying, when there were pioneers here, preserve the USA and don't cut any trees.

That's not realistic. The only thing in my mind that's realistic is that as people become better off economically, as they have jobs and as they are educated, they have fewer children. Population pressure is what is forcing clearing. I mean, go to Africa. Population pressure is what is stripping Africa of vegetation.

It's hard for the industrialized world to realize that probably 70 percent of total wood consumption in the world each day is to cook a meal. When you look at the billions of people in India, billions of people in China, the people in Africa, we in our industrialized society are a very small percentage. Most of the wood that's harvested is simply to cook a meal.

To me, the approach has to be to work toward relieving the pressure of masses of humanity, and that's only done through providing jobs and education.

HKS: How about the other questions. The earth needs the Amazon rainforest in order to maintain some atmospheric balance. You have to be sort of a scientist to understand that.

CEP: In my Arkansas language, that's hogwash. Everybody out there is talking about it. I have never found anyone that will answer my question or can stand under my question.

A lot of money is raised by environmental groups by convincing a grandfather that his grandchildren aren't going to have any air to breathe because the Amazon is being destroyed. So what I dearly love to do is be in a group and find a biologist, a high school teacher, even, in the group, and rather than me saying how it is, just start asking questions, and let that person respond.

Because number one, a virgin forest is not a net producer of oxygen. So undisturbed, the total Amazon drainage is not a net producer of oxygen. So you ask the biologist, "Where does oxygen come from?" Well, it is one of the net effects of the photosynthetic process. Photosynthesis occurs most rapidly as a result of growth. Yes, there is photosynthesis in a maintenance mode, but the greatest level of photosynthesis occurs as a result of growth.

So a climax forest has zero net growth. If that were not true, the trees would be as tall as the moon, and you could no longer walk through the forest because it would have grown closed. So there has to be a point at which it stabilizes and there's no net growth. Of course that's what a climax forest is.

If there's no net growth, where does the oxygen come from? Yes, it produces some in the process of maintenance, but a climax forest is in constant process of dying. A tree dies, and young ones take its place. All of the leaves that are dropped every year, and the individuals who die. What happens? They decay. What does the decaying process do? It consumes oxygen. So what little net oxygen was produced in the process of maintaining the forest, then is consumed by decay of leaves and individuals that matured and died. So please someone answer where is this tremendous fountain of oxygen? It doesn't exist.

Now, NASA has done surveys. They grid the world at various altitudes, measuring oxygen level. The Amazon is one of the most oxygen-deficit regions of the world. So if one is really concerned about oxygen supply, we should be doing things in the ocean, in the warm oceans of the world, to increase the productivity of the phytoplankton. Because one of the richest oxygen regions of the world is over the warm waters, and it's oxygen being produced by phytoplankton. When they die, where do they go? They go to the bottom, where they can't consume oxygen in the decay process. So there's a net oxygen surplus.

Now, this is a simplistic, short explanation. But I'm still, after years, looking for someone to explain that away from what I just said. And I've never found him.

HKS: I'd like to pursue two more avenues on this, two more lines of thought. One is on the carbon budget and global warming. If you convert this biomass, you burn this carbon, this causes global warming. I'm not saying it does, but we read that it does.

Another thing I read is that rainfall is affected, global precipitation is affected by changing the hydrologic cycle by converting the forest to another kind of forest or to another kind of vegetation. So if you have a comment on that, we can go on to other subjects.

CEP: I submit that the poor guy in the Amazon clearing three acres to grow something for his family is not the bad guy. Because he is creating a situation where growth is rapid. He is producing oxygen, and he is much less a predator upon the earth than you or I driving our car to work today.

But for clearcutting that has occurred, and take Jari as an example, because of the rapid growth of the plantations, short cycle, rapid growth, Jari is contributing much more oxygen to the planet than it ever dreamed of consuming in the burning process. So yes, it contributed carbon to the atmosphere for "x" limited amount of time, but it has been producing oxygen at a very rapid rate for a much longer period of time, and it will continue to do so, than that period where it contributed carbon.

The other part of your question was sustainability. So far, growth rates at Jari have been greater each successive rotation than the previous. All the literature, everything

we were told, all the naysayers that came through. It was just the opposite, and there are specific reasons. The naysayers are going based on what they have seen worldwide in other tropic regions. If you go to many plantations in Africa, it's exactly what happened. If Jari were not managed, it would happen.

HKS: So you think proper management in Africa would solve the problem?

CEP: Management is the key. Understanding the soil that you're dealing with. At Jari there's a range of soil from--we have rich--I'm still saying "we." There are rich, clay soils. There are red clay soils, origin basalt. As fertile a soil as you can find anywhere on the face of the earth, grow anything, good permeability, pH of about 6.7, 6.8, I mean literally an Eden. Literally across the creek from it--I mean, you could throw a rock--and the soil is a sandy soil with a pH of 4.3. Both of those soils can be managed for a forest, but management is totally different. The base key to management of soils in the tropics is maintaining organic. If you can maintain organic, you can maintain the biological community. If you can maintain a biological community, you can grow almost anything.

One other area that we might get into is that there has been--I don't have a tie on the numbers any more--but probably a hundred and fifty to a hundred and seventy-five thousand acres of pine planted in the savannas in the Territory of Amapá. The first of that we, meaning Jari, planted in 1973. What I learned in ecology is that there are natural savannas. I now know there are not. The reason they're savannas, and I mean you have a lush, tropical rainforest, and in many areas it goes to savanna just like a property line like you have in this photo.

Number one, that's suspect. But we started planting savannas. We found that growth, in this case pine, is very good and that in two rotations you can convert a savanna back to a tropical rainforest.

HKS: How about precipitation in the savanna?

CEP: The precipitation has been the same as it is in the rainforest.

HKS: I didn't realize that. I thought it was drier, somehow.

CEP: [chuckling] Oh, it's supposed to be. But what happens in the case of pine is that these have been savannas since Indian days way back when, and they're savannas because of Indians. Because of a hundred inches of rainfall, there has been leaching. You get a sandy, loam soil with nothing but a grass on it, and not a very good grass at that, and a hundred inches of rainfall for a few hundred years, and yes, it leaches.

But when you plant pine--and "leaching" is a terminology like "lost," like five thousands acres burning in Idaho and it disappeared. It leaches, but where did it go? Did it go to China? All the way through? Likely not. So when you plant pine, which has a taproot, guess what? It serves as a pump. So in savanna soils, the reason so far that each generation has been better than the first is that this natural pump is reclaiming those nutrients that leached, that in our mentality meant lost forever, and bringing them back to the surface. When they come to the surface, you get leaf drop and biological activity reestablished. You have a good site.

Now, with that site established with shade, the ground is cool, it's more moist, and animals carry in seed from the adjoining rainforest, and wind blows seed in. The third generation in a pine generation. Once you clearcut the pine and are ready to replant the pine for your next generation, the plantation maintenance cost to fight out the invading rainforest is the same as an acre of cleared and burned rainforest.

So after the third generation, if you clearcut the pine and walked away, you have converted the savannas to a rainforest. That's against everything I ever learned. It's against all the naysayers. So that if someone said, "Let's get rid of savannas," which are basically non-productive. The grass on them in the spring--the grass is beautiful, and the cows still starve to death. So if somebody says it makes economic sense to get rid of the savannas and go to rainforest, it's easy to do. Plant pine.

HKS: With the scientific facilities, research facilities you had there at Jari, you actually documented this nutrient uptake? It wasn't speculation? You observed it happening and you wondered why?

CEP: Right. We didn't know. I mean, we were a bunch of young what I called blood-and-guts scientific pioneers. If I wanted to hire a Ph.D., I hired him. If I found the best soils guy in the world in Timbuktu, I hired him. I had no limitation. So not knowing, and having fear of everything everybody is saying, in our soils group we measured every known variable to man. What the soils scientist community knew that day of things that influenced growth, whether it was physical or chemical, we measured it.

We had soils samples of the organic layer and each horizon, if there was a horizon. In each major clearing, we had soil pits so deep that to get in them we had to dig a stair step procedure where a guy could get to the bottom. So we had soil pits as deep as anyone could conceive that nutrients would leach. In some areas, you had a lateritic hardpan where elements accumulated, so that was fairly well-defined. Others, you didn't. We went deep. Some places in the red clay soils we'd go to bedrock.

We catalogued, tagged, measured everything we possibly could so that we could determine what was happening and, in knowing what was happening, know how to change procedures and management and species. See, people looking from the out in, I mean, everybody is a critic. And every little thing that happened at Jari that we started that, based on sound data, we changed, to anyone on the outside it was a mistake.

I don't view that as a mistake at all. We were dealing in an unknown world. We were dealing under a circumstance where "wait" didn't exist. "Wait until you know" didn't exist.

Gmelina vs. Pine

CEP: In the case of Gmelina, when we started, the first day I hit ground there, I knew that we should be planting pine. I just knew that Gmelina, which has a spreading, fibrous root system, would not function well in sand. That was probably my first argument.

HKS: Yes. I interrupted you mid-sentence. You were starting to talk specifically about shifting from Gmelina to pine. You were talking about plantations, and you were always kind of skeptical that Gmelina was the right tree after all.

One of the articles I read said that you were forceful in explaining to Ludwig--I don't know if you've been interviewed by journalists or not--but one of them quoted you that you always thought Gmelina was wrong.

CEP: Well, I didn't know that Gmelina was wrong. I knew that in all likelihood Gmelina was very site-specific, and I knew that the likelihood that one species would be the correct choice of a very wide range of soils, regardless of origin--whether it was sedimentary or formed in place, or whatever--the likelihood of that was slim. So, from the very beginning, and if we go back to the first discussion I had with him on the subject, he said, "We have to start with something. I have chosen Gmelina, and we will start with Gmelina until you prove there's something better. And the minute there is something better, then we'll add it to the program."

That reflects back upon the fact that he wanted to run and was not willing to wait. In a program such as that, you're constantly learning, and Jari would not exist if you waited until you thought you knew everything. Of course, even in forestry and agriculture, where we think we know everything and we look back at what we did ten years ago, we didn't know as much as we thought we did. So with that kind of concept, he said, "We have to start with what we have."

I said, "Well, almost for sure, in the sandy soils we should plant pine." He said, "Well, we are not going to dilute our effort front end. We're going to plant Gmelina, and when you're more sure of what you're saying about pine, then fine."

HKS: Gmelina wasn't a brand new species. It had been planted in Africa. What was known about it scientifically, in terms of the kinds of soils it preferred in Africa, or pests and whatever? Or was it still relatively new so we didn't really--

CEP: It was relatively new, but there was some literature and there were very few pests. It was known that did extremely well on fertile, well-drained soils. At the time in '69 when I started at Jari, the plantations that he had started in Costa Rica to guarantee seed source were probably five years old, and the growth there was fabulous. Of course, it was on banana-type lands. The conditions in Costa Rica were such that the soils were very fertile but not well-drained, and so they had gone in and ditched. They kind of gridded the plantation and ditched it to provide better drainage. And the growth was absolutely fabulous.

HKS: They knew enough to drain it.

CEP: Right.

HKS: So it wasn't guess work. There was some basic plan.

CEP: That's right.

HKS: If you want to grow Gmelina, you have to do these kinds of things.

CEP: The literature from stands in Burma--it doesn't occur in pure stands--but the literature from Burma simply said it prefers fertile, well-drained soils. So the soils in Costa Rica were fertile but not well-drained. And so they drained it.

At this same time, at the citrus plantation in Panama, probably in '63 or '64, when he first started thinking about it, they planted a block of maybe an acre or two of Gmelina. It was good soils, and the growth there was just absolutely fabulous. So he was making the assumption that he would get the kind of growth in the Amazon as he got in Panama and Costa Rica.

It wasn't just me. Every forester that we had with any kind of experience was convinced that it would not provide that kind of growth on our sandy, sedimentary soils. This will go back as far as probably when Bassett McGuire first visited. He had the same feeling. When I arrived, a road had been punched north a good ways to the better soils that I previously described, and several hundred acres cleared so that they could start planting on those better soils to show the difference in growth between sandy soils and clay soils.

Probably everyone with any training or background whatsoever had the same fears that we did. We were under pressure to plant the areas closest to the port first, simply from the standpoint of logging cost and everything else. So the bulk of the areas planted in the earlier years were on sedimentary soils, where all of us were uncomfortable with Gmelina large-scale.

The one comfort we had was that we were on a five- to eight-year rotation, depending on the soil. All of us were convinced that we would get at least one rotation on those sandy soils, and by that time we would know enough to replant the second rotation on those lands with some other species, whether that would be pine or eucalyptus or whatever.

If it had been a situation where we thought we would not even get a first rotation, then the fight would have been much more vigorous than what it was. But under the assumption that we'd get one rotation--which we did--and that he would let us change when we knew what to change to, we proceeded.

He essentially forbade us from doing anything with any other species for the first year or two. He knew of our concerns. He was afraid that if he said, "Okay, do what you need to do," that the initial effort on Gmelina would be watered down. He said, "After a couple of years, when we see how it's going, we'll do what we need to do."

I wasn't willing to wait. We obtained *Pinus caribaea* seed, and I went into backsides of plantation blocks that he would never see, except from the air after it was too late, and we put in several one-acre plantings of *caribaea*. There was one in particular that was just about a kilometer off the road between the town and the port. When it was probably eighteen months old, I took him to it. It was absolutely beautiful. The color was as dark a green as you could ever want, and the growth more spectacular than any

pine I had ever seen at that time in my life. We drove up, and he said, "What's this?" I said, "It's pine."

HKS: This is an acre.

CEP: About an acre.

HKS: Okay.

CEP: He said, "How much have you planted?" I said, "This, and a few more just like it." He said, "What's wrong with you? You ought to be planting ten thousand acres of this."

HKS/CEP: [mutual laughter]

CEP: That was about July. The following January, which was six months later, we planted ten thousand acres.

HKS: You could get a plantable pine seedling in six months?

CEP: Yes.

HKS: That's incredible. I don't know what it takes. I mean, Douglas-fir is like two years or something.

CEP: Right. You don't have a dormant season. I didn't dare plant bare-rooted and all my experience in planting was bare-rooted, in the winter.

I went to what was then St. Regis in Florida to a milk carton plant, and I designed a small, about a one-and-a-half by one-and-a-half inch square, six inches long, folding carton with holes punched in various positions along all four sides and the bottom. We used those as containers. So we built frames. We'd fold these cartons, build a frame, fill it, and then fill that flat with a premixed soil or growing medium, and put the seed in that, and then all of that in nurture beds. So if you drove by and looked at the nursery, it looked like a regular pine seedling nursery. But they were all in containers. So in planting season, you didn't disturb the seedlings at all. You'd just go out and dig a hole, drop this container in, and fill in the sides, and the roots came out through the prepunched holes.

From the decision in July until January--we planted in January, February and March--but by the end of March we had ten thousand acres of these.

HKS: Were you still planting Gmelina?

CEP: Yes. Ten thousand acres wasn't enough to cover all of the available sandy soils, so what we did, our soils group mapped the areas that had been cleared, and those that were more sandy than others, we put into pine. That was 1973. Each year after that, the percentage of sandy soils that went to Gmelina declined until about in '76 all of the Gmelina was being planted north on soils formed in place, and all of the sandy soils were going to pine.

HKS: Was there adequate literature that allowed you to pick *caribaea* over *radiata*, over some other species? And was *caribaea* the obvious choice?

CEP: *Caribaea* was the obvious choice because here we're dealing with pure low-land tropics. *Radiata* is not a tropical. It's grown in some regions in, say, the sub-tropics. *Caribaea* is not truly low-land tropics, but it's nearest in its native range in Central America. It comes closer to the pure tropics than any other species.

HKS: Is that the species used in southern Brazil? *Caribaea*?

CEP: No. In southern Brazil, it's mainly slash and loblolly.

HKS: Okay.

CEP: Here again, southern Brazil is temperate. In the northern portion of the range, where pines have been planted, you can consider some of it to be sub-tropics. But most of the pine is in a temperate location.

HKS: I'm impressed that you can get enough seed to grow seedlings for ten thousand acres, or almost ten thousand acres, within a short period. There's a seed source there?

CEP: The first seed for that first year was a purchase from Resource Management in Birmingham, Alabama, who I had had business dealing with before. There's a bulletin by A. Lamb. It's an Oxford publication on *caribaea*. And being a pine guy before I went to Brazil, and knowing Lamb personally, I knew that publication in and out. We knew the location of all *caribaea* plantations at that time.

At the same time as we bought the seed from Resource Management, I put together a team and went with them and got them started on seed collection in Central America, and we collected enough seed that season for several years' planting. Plus we did a standard collection for providence testing. We established, both at Jari and another location, providence tests to determine which source within the range of *caribaea* was best for the Jari situation.

Maybe this is the point to say also that Weyerhaeuser at that time had an interest in--they had a--I don't know how to describe it. Let's say they had a corporate feeling that at some stage, somewhere in the world, next year or thirty years in the future or sometime, they would need and establish large-scale pine plantations. So Weyerhaeuser was as interested in having a seed source of improved *caribaea* as we were.

From the base at Jari, we started all kinds of things. When you'd have an idea that we couldn't control, the Jari base was responsible for carrying out whatever activities. So we were involved in mining exploration and everything you could imagine. In fact, the present-day ALCAN bauxite program in Brazil was initially our program. We developed that mine, and then it was sold to ALCAN.

In the state of Minas Gerais Ludwig, along with Antunes. Antunes is the individual's name. The company name is a conglomerate called ICOMI. Anyway, Ludwig, with

Antunes started a project in the state of Minas Gerais. The objective of that project--and this was back in the early '70s. There was the oil embargo, the high interest rates, the economy was just absolutely slaughtered in Brazil. People here thought it was bad, but there, at that time, Brazil imported 92 percent of their carbon fuels requirements.

HKS: Wow.

CEP: They went out into this vast open place, like going to Oklahoma with nobody there, and started an alcohol project based on sugar cane and manioc. That gave us a location, a sub-tropical location, to establish provenance tests and a seed orchard in a situation where there would be no outside contamination from pollen.

That seed orchard was a joint Jari-Weyerhaeuser program. Weyerhaeuser had a geneticist--his last name was Dykstra--who I believe had been in their project in Indonesia. We had already started it and got it going, but they assigned Dykstra to that project. It was carried out as per plan. Exists today. Weyerhaeuser has pulled out, and I do not know the details, but as far as I know, they have pulled out but maintain an agreement whereby if they need seed, they have the right of first refusal to purchase seed at market price. Some combination. I don't know what the details are. So for anyone desiring to establish large-scale *caribaea* plantations in the tropics, the seed is there.

I mentioned that in about '74 we started planting in the savannas, in the Territory of Amapá, and that initial effort was--ICOMI had a manganese mining operation there. They exported manganese, and they could begin to see the end of the reserve. Antunes asked Ludwig, "What am I going to do when I run out of manganese, and we have this tremendous infrastructure? A town: hospitals, schools, everything. Just like we did at Jari. Railroads from the mine to the port, port facilities, the whole deal."

I don't have time to go into the details, but Ludwig had a great affinity for Antunes for some specific reasons, and so any time Ludwig could help him, he wanted to. For that reason, Jari started doing developmental work for large-scale pine plantations in savannas.

We did ripping to break up the lateritic layer. We plowed, disked, planted in the grass every combination you could think of. And on the Jari property we also had many savannas, in isolated places, and we would just put a crew on a helicopter and drop into a savanna with planting bars and containers of seedlings over your shoulder, and the helicopter would sit there and they'd lay off a plot and plant four hundred trees and get back on the helicopter and leave.

HKS: You could do that sort of stuff in part because in the early stages there was no cost accounting. There was no cost-effectiveness to worry about. He wanted you to work on other projects. It didn't affect your success at all.

CEP: That's right. He was interested in overall development of the property, regardless of what it was. It didn't have to be Gmelina. It could have been squash, so to speak. At another location on the property--which is a total different story--we had a major rice program, with the research and developmental work under contract to the International Rice Institute, which was an arm of the Rockefeller Foundation.

He was interested in total possibilities for that property. He had a vision, and he had a place to start. But past that, it was no holds barred. And so we began doing that developmental work for pine. I did it before he ever knew. I don't know the number, but this group now has planted probably a hundred and seventy-five thousand acres of pine. Some of it has been hauled to Jari, and barged to Jari and pulped. That is a resource available, and there are literally millions of acres of savanna now with this proven project and proven growth rates and proven better growth in successive rotations, for somebody to go into savannas large-scale. Now a Weyerhaeuser, a GP, a large corporate organization could now go in justifiably and not be slaughtered. The bulk of the unknowns had been answered.

HKS: What's happening to Gmelina all this time?

CEP: In the beginning, with Jari, no one--no corporate, no government, no anybody.... It took a Ludwig-type approach to do it the first time. Now that it has been done and it's working, then other programs can follow in the path. They don't have to reinvent the wheel.

In an endeavor like that, in retrospect, when you have twenty-twenty vision, we made mistakes. They weren't mistakes, I guess, because no one knew. Didn't know any better. So they were mistakes only in terms of twenty-twenty hindsight.

The first step was Gmelina. We added pine by brute force, not by any data or information or anything else. But from day one, our research group started species testing. So on every soil type we had plantings of native trees--I mean, we'd see Para-Para, which is a pioneer species, and it's lightweight, uniform type fiber, grows beautifully straight. We'd collect seed and we'd grow Para-Para.

Literally any species that appeared to have promise under plantation culture, we planted. Any species that had proven to be useful anywhere in the tropics anywhere in the world that we could identify, we found and planted. We didn't go out and advertise. But all of those plantings were done and data kept.

We also assumed that there was one or more eucalyptus species that would be suitable on the sandier soils. Unfortunately, there are many eucalyptus species, but very few that are truly tropical. There are only about four or five species that are truly tropical or low enough sub-tropics that you could say, "Well, I'm going to call it tropical."

HKS: This would be in Queensland where you looked.

CEP: Right. So we planted plots of every eucalypt we could find, including the ones being used in central Brazil in large-scale plantings. Eucalyptus had been planted for a long time in Brazil. Much of the smelting activity in Brazil is based upon heat from wood charcoal. The original forest was cut for charcoal, and they came behind that and started planting plantations of whatever species, and it has turned out that eucalyptus is one of the better. So there are large-scale eucalyptus plantations, short rotation, that are used for charcoal for the steel industry.

There's long-term experience on species in central Brazil. At the same time Jari was being developed, there were large-scale plantations coming onstream for pulp. There are many large-scale eucalyptus plantations in central Brazil that are managed like Iowa cornfields. I mean, it's plowed, fertilized, weeded, irrigated, and the growth is just absolutely phenomenal.

There is a fair amount of literature on eucalyptus also. Because of the freedom we had, anybody we found that had successfully done something with eucalyptus somewhere in the world, we tagged him and brought him to Jari and said, "What do we do?"

HKS: Was there an underlying assumption that you'd have trouble with pests because you were in the tropics? You wouldn't necessarily know what they were in advance, but the literature brings it out a lot about the ants and the mirex. Ant control could be major.

CEP: Right.

HKS: Henry Ford lost his shirt in Fordlandia in the '20s because of the rubber plantation and disease, so I didn't know what your expectations were.

CEP: My assumption is that a tropical tree that is not under stress does not have any more risk for pests than a temperate tree that is where it is supposed to be.

HKS: So a plantation managed with single species with all the risk of a single species, you weren't concerned about that, more than you would be anywhere else.

CEP: No, and that's proven to be the case. Now, what little I know about Fordlandia, Ford, as everybody knows, was a very strong personality. In digging back through the literature and listening to people, my analysis of what happened is that the scientific people he had were good people. They knew to maintain a broad genetic base, and they were doing that. They came up with a few clones that were absolutely fabulous, and with his personality he said, "You're going to grow those." I mean, rubber production is high, they're early producers, whatever the traits were, "and this is what you're going to do." Personality-wise, they didn't have people like maybe we had at Jari. They did what Henry Ford said. They had no genetic base. They had very few clones, and when something hit, it was over.

Our program at Jari, for pine, as an example. Every origin of pine, every environmental niche, every extreme of elevation--on top of a mountain, the poorest soils, growing in a swamp, the southern end of the range, the northern end of the range--every extreme that the species occurred in was planted at Jari. And maintained in blocks. The records are kept in such a way that if something shows up at Jari, say in pine.... Let's say that one region of the natural range is susceptible to something at Jari. On a large-scale planting, the seed is mixed and planted at random, and so yes, an occasional tree that's not adapted there and a bug gets those out. But it doesn't wipe out your plantation. Then you leave that particular source out of the next planting.

HKS: I think it was the articles by Fearnside and Rankin. Are you familiar with their work? They're trained in ecology and were observers. This was about the time you left,

or after you left. They went inside, just describing the ecosystem, and published a sequence of articles. Gmelina, if I read it correctly and remember what they wrote--there was a canker that made Gmelina not work. Now, is that Gmelina growing under stress, as opposed to Gmelina growing in the soils where it was adapted?

CEP: Well, there's two things. Early on, we were cutting Gmelina, let's say at the end of the first rotation. Cut it, and it resprouts. Then, after a few months, you go back, and the dominant sprout has expressed itself, and you knock the others down. Under those conditions, and in sandy soils, where it's not adapted, you have the problem.

HKS: With canker.

CEP: Right. We had things show up. We had an insect, a caterpillar show up that none of us had ever seen before. On a given soil type it showed up one day and defoliated the place. We thought, "Oh, my goodness." Rather than panic and go out and spray and kill everything, I said, "We're just going to watch it." It disappeared.

I mean, you take southern pine in east Texas today. That species was born there, so to speak. It's in its native range. It's in its home, and it's being attacked vigorously by southern pine beetle. Now, who made that mistake?

You can use examples. Take fusiform rust in southern pine, across the range. Whose fault is that? So what tends to happen is that when anything shows up in a plantation, regardless of severity, it's because it's a monoculture, and someone should have planted something different or whatever. But any species out of where it is comfortable, so to speak, is more susceptible to both insect and pathological problems. Of course, that was one of the reasons for us pushing so hard to get the right species on the right site.

HKS: So you didn't have any particular concern about monoculture, about being wiped out by something. Because the literature makes a big deal about--

CEP: Oh, yes. Oh, everybody that came through just wailed and moaned.

HKS: Well, you learned that when you were a junior in college.

CEP: That's right. These guys that came through, they would say, "You can't do this. It's a monoculture." I'd say, "Well, get in the jeep. Let's go." We'd go out and stand in a pine plantation or a Gmelina plantation, and purposefully I would pick a plantation that was just scheduled for cleaning.

HKS: What do you mean by "cleaning?"

CEP: The jungle comes roaring back.

HKS: It's the jungle you're cleaning, not the pines.

CEP: Yes. The biggest single cost at Jari was not land-clearing, not building roads, nothing other than maintaining in good growing conditions the plants that we

established. When you go in and a crew goes through and they knock down the competing vegetation with machetes, it looks like a pure, quote, "monoculture." And it's pretty. But when--

HKS: Now, that's Gmelina, and here's your son there. [showing photo]

CEP: Right.

HKS: Is that a fairly close canopy stand? So even if the stands grew not to maturity but fairly full, there's still enough sunlight getting through that you have the maintenance problem.

CEP: Absolutely. Gmelina, as you see in this picture, is deciduous. In the dry season, it drops all its leaves. So you fly over it, and it's all dead. During this few months period, when it has no leaves, sunlight is on the ground, just like it would be on the forest floor in the U.S. in the wintertime. Except that the plants that are not deciduous then are getting full sunlight. Obviously, a picture such as this, a crew had just gone through, and it has been cleaned.

But I would take these people. I would ask them for a definition of monoculture, and then I would take them to a stand that needed cleaning and say, "Does this fit your definition of a monoculture?" They would look up and say, "Yes." I'd say, "Well, lower your eyes and tell me what these other hundreds of species are doing here if it's a monoculture." It would kind of set them back.

In the lowland tropics you have a species of preference. But it's certainly not a monoculture. I've never understood the phobia over monoculture, because if you fly to northern Finland, or to some places in northern Canada. In northern Europe you can go just miles and miles and miles and miles of pure *Pinus sylvestrus*. Is that not a monoculture?

HKS: It sure is.

CEP: So, "monoculture" in and of itself is not a nasty word. It all boils down to management. Now, to me, monoculture, in the absence of management, in the absence of genetic diversity, in the species you're dealing with, in all likelihood will lead to disaster. It's just like clearing tropical soils and doing everything wrong. Yes, it will lead to disaster. But it doesn't have to.

HKS: So good management is the issue, not monoculture or anything else.

CEP: Right. If monoculture is bad, how do these natural monoculture stands survive all the onslaughts that they talk about?

HKS: Okay. I've asked you the question. You've answered it.

CEP: [laughing]

HKS: I don't want you to challenge all of it, but it came up everywhere!

CEP: Everywhere.

HKS: One said Gmelina rotation has changed from six to five to four because of the canker. It's just generalized statements.

CEP: It depends on the site. Of course, when these people were there was when there was still extensive stands of Gmelina off-site.

HKS: Okay.

CEP: So, back to one of your questions. Today, at Jari, twenty-five years later, it's pine, *Pinus caribaea*, Gmelina on the very best soils, and eucalyptus on the in-between.

HKS: No native species.

CEP: No. No. And we never even got close with a native species.

HKS: All kinds of problems? Or what?

CEP: Many of them simply are not adapted to plantation conditions. There are many U.S. species like trying to grow walnut in plantation conditions. It's very difficult for it to work. We would find a species that looked good, we were interested in. We'd do pulping studies on it, and it wouldn't be any good. So for whatever combination of reasons, we just never came up with a native species that would compete with pine, eucalyptus, or Gmelina.

HKS: You had a rather admirable research program there. You started answering the questions you had on-site. Did your scientists publish in the technical literature, *Forest Science* or whatever?

CEP: Very little.

HKS: That was a personal choice? I dropped out of forestry twenty-five years ago--been in history since--so I don't know what's been going on. I don't read the technical literature except maybe the *Journal of Forestry*. I scan that. Using my technical knowledge of the late '50s, early '60s, this is new information.

CEP: I say this in retrospect, and it wasn't a conscious decision that I made. Some of us occasionally went to meetings and made a general presentation, but number one, we were in a struggle for survival. Everyone there worked thirty-six hours a day, ten days a week. And loved it. There was so much demand for information of what to do next and watching what we had already done that there was simply no time for publication.

Ludwig's Consultants

CEP: The other thing that was probably subconscious in most of us was that we were under constant harassment and bombardment for being pioneers that we had it up to the

gills with propeller-tie scientists and consultants. Ludwig had no personal limit on how much he spent on consultants to run around all over the world. I mean, you would have a truck transportation expert from somewhere show up to advise us on forestry. You would have someone from an accounting firm show up.

One of Ludwig's bad traits was that he was in such a hurry that he did not have time, and he didn't have the personality, to choose the right person for the right job. He simply put someone there, and if they worked, fine. If they didn't, they disappeared. That was the selection process.

To give you an example: We had been in the field one day. We came back to the office, and I was walking in front of him, and something that he saw in the field that he didn't like hit him, and he had forgotten that he hadn't said anything to anybody about it. He stopped the first guy that was nearest to him, told him what he saw, and told him to be sure that that never occurred again. The guy didn't speak English. He was a janitor. In his mind, he resolved the problem because he told someone to take care of it. Now, fortunately, I stepped back and heard what he said, and I took care of the problem. But if I had not heard it, when he came back next time and he saw it again, you'd be chewed out for not solving the problem.

HKS: Chain of command. That really wasn't one of the things he was concerned about.

CEP: No. No. And realizing many of these things about himself, one of his protective mechanisms was to have a steady flow of people in and out, whether they knew anything about the subject or not. Going through and going back to New York and telling him, "The trees are dying." "The trees are living." In one case, the guy went back, and his idea of a tree was that it's beautiful and green and it's big. And he came and he commandeered a vehicle, which all of them did. He didn't know where to go, so he kind of followed traffic, and he got out into some of the areas that had just been planted with Gmelina stumps. Well, there were no trees there. There was no green. He went back and told Ludwig that everything had died. [laughter] So we get a call. He says, "Surely this is not true." But this guy comes back and says all the trees are dying. I said, "Well, I hadn't noticed." [chuckling]

HKS: How would Ludwig find these people? They'd have some sort of credentials or track record or something for him to bother talking to them or hiring or retaining--

CEP: Not necessarily.

HKS: You mean if I had sent a proposal to him someplace, he might say, "You're a historian. Go down and study the history of this. We need this."

CEP: Yes. Absolutely. We had one guy who came down as a consultant on trucks. His name was Larson. He was from Portland. Ludwig met him on a boat somewhere. Ludwig talked to people. He said, "What are you doing?" The guy said, "Well, I'm old and I just sold out a fleet of trucks I had, so I'm spending my time redoing my boat." Ludwig said, "You know, I'm putting together a project in Brazil, and I've got to have hundreds of trucks. You need to go down there. Would you go down there for me?" "Well, I just retired. I guess I would."

HKS: [chuckling]

CEP: For three years we had this guy who is our truck, transportation, specialist. I don't mean one guy occasionally, I mean a continual flow of people like that that you have to learn to deal with, live with, contend with, whatever the word is, and get your job done at the same time.

The Jari Railroad

HKS: That anecdote reminds me of something I was reading that Ludwig had these preferences for certain things, and one is that he preferred--he wanted a railroad. Even when trucks would have been more economical to build the road as opposed to the railroad. I don't know if it's true. But first of all, he wanted the railroad. There was a railroad there, right?

CEP: Yes. We built a railroad.

HKS: It was, in your opinion, the proper thing in terms of the overall infrastructure needs of the project? Or would a good truck road have been just as good?

CEP: Under tropical conditions, it would be hard to conceive of a truck road that would withstand the traffic. You get into the rainy season, when it rains every day, and you have literally hundreds of trucks daily on the main road system. The only possible road that would withstand it would have been a concrete road. The rail system was a joint effort, economic study, between ourselves and Weyerhaeuser. It's proven to be correct.

HKS: So it wasn't because one of these consultants came through and sold Ludwig on the idea of this.

CEP: No.

HKS: This was a good idea.

CEP: With Weyerhaeuser we had such a relationship that if we needed two or three transportation specialists, all we had to do was call. We had Weyerhaeuser plantation people, economic people, transportation people, facilities planning people living with us for over a span of at least three years.

HKS: We had GP in Brazil, McMillan-Bloedel is there. I don't know who else was there. But Weyerhaeuser somehow could see the benefit to the company and collaborated on certain elements of it.

CEP: I don't know whether this belongs in this discussion or not, but the overall objective was that there were joint venture negotiations between ourselves and Weyerhaeuser. At that time the objective was that Weyerhaeuser would come in on a fifty-fifty basis. We were at the stage where we had proven the viability biologically,

and we were needing facilities planning people, engineering, mill start-up capability--all those kinds of things to move us from a developmental biological project to production.

HKS: Weyerhaeuser's Bill Johnson. Was he the primary figure in this?

CEP: He was there, and he was probably involved more with railroad than anything else. My feeling about Bill Johnson was that he was, at that stage, already an old-timer. He was a blood-and-guts, salty production kind of guy that George Weyerhaeuser liked. I don't know whether this happened across the board or not--but what I saw was that George Weyerhaeuser listened to the scientists and the management people, got all of the data necessary to make a decision, and then he would ask Bill Johnson, "Does this make any sense?" Bill Johnson had the ability to cut through all of the pages and the extra verbiage and say, "It sure ought to work," or "No, we need to forget it."

Bill Johnson did not have a specific direct responsibility. He was in and out occasionally. In fact, we used him in the same way. If we and the Weyerhaeuser technical guys were there and we came up with a conclusion, and he came down and would say, "This makes sense."

Anyway, the railroad was a planned deal. To this day, I'm still convinced that with the traffic involved there's no other logical way.

HKS: Roadbed maintenance I guess would be the issue there. I was also thinking about maintenance problems. It's one thing to repair a diesel engine on a truck, but to repair a locomotive is a whole layer of skills and harder to find.

CEP: Right. But see, Antunes had a railroad just east of us, in the Territory of Amapá, and it had been there probably twenty-five years when we built ours. So people to maintain locomotives were just across the river, so to speak.

But when you imagine an eight hundred and fifty ton a day pulp mill and all of the fuel that would be required to provide the power, the volume is tremendous, and I think I'd be safe in saying there's not a single highway anywhere in the U.S. that carries that kind of industrial traffic.

The port was really the only place it could be. Just above where we put in the port, the river became shallow. So we were at the upper limit of the port. The port, if you flew over it, you wouldn't call it a peninsula, but when you look at the Jari River and the small river that runs into the Jari at the port side, and turns and runs around to the west side, southwest, in swampland, in reality, from the town to the port is a peninsula of high ground. It's really the only place the port could be. So you have a stretch of road that 100 percent of the traffic. The town of Monte Dourado was in the only logical place.

The kaolin refinery was at the port. Pulp mill at the port. Because of the isolation, all of the chemical recovery was at the port, and some chemical processing. Power plant at the port. So if you can imagine supplying all the raw material down a road and having all of the work traffic of all the employees down that same road, you literally would

have had to have had a six-lane concrete highway. So yes, it's easy for somebody to fly in and say, "What are they doing with a railroad here?"

We didn't want a railroad. We tried in layout and every possible way to prevent it. Ludwig didn't want a railroad. Until we started looking at numbers on traffic. We ended up with a railroad when, to my knowledge, he never wanted a railroad.

HKS: At that time, you were planning for a second pulp mill. You needed that capacity.

CEP: That's right. That's right. At that time, we were planning a newsprint facility. We were planning a dam on the Jari, which is now, presumably, going to be built. I mean, the concentration of traffic is just horrendous. Also, the kaolin facility has been a good investment and essentially profitable since initiation. The kaolin comes from east, just across the river. It's on a high plateau. It's put into a suspension, centrifuged to get the larger particles out, and then gravity-flowed to the refinery. That reserve will not last forever. There's another reserve just to the west on the plateau. And there's a railroad spur to that location. So when you look at overall development, there's just no logical other alternative.

Almost regardless of what the subject is, you can see in the literature things that somebody flew over, spent thirty minutes, and became an expert.

Things happen so rapidly. I took a group of about forty people to Jari three years ago, and a lot of the people that we trained were still there, and we had a fabulous reunion. But management did not know me from Adam, and I didn't say anything. We went on the tour, and they took us into pine plantations and took us here and there. On that trip, among many other things, I discovered that present management is the one that started planting pine, and present management was doing a lot of things that they had developed and discovered, and anyone very astute could have looked at the plantation and seen that it was twelve years old, maybe, and said, "How long have you been here?" And known the difference. That is not atypical of what happens in any kind of a management change.

HKS: You said something earlier, and I'd like to follow up on a little bit. That eventually you had more people in research than you had in management or some managerial positions. I don't know what kind of financial statement that Ludwig received from time to time, but he must have noticed that.

CEP: Well, that statement was related to forestry only.

HKS: Forestry only.

CEP: Yes. We had a soils group, we had a tree improvement group, we had an inventory group, we had a native forest group, because the intent from the beginning was as much as possible to utilize the natural resource that was there. We just never were able to succeed at it. Of course, no one else has, either. We didn't do any better than anyone else.

HKS: Native woods were used for fuel, weren't they?

CEP: Used for fuel.

HKS: But that's it.

CEP: That's it. Of course, that statement has to be flavored by if you were in southern pine region and your name is Union Camp, you would have a group doing continuous inventory work so that at all times you know what your position is on inventory. With us, we had that group, but it was developmental, and they were in the applied research group, rather than in the forestry operating. Because we were learning what to do and how to do it.

If you took the normal guys that would be in an industrial forestry department and put the inventory guys on the operating side, and go through the organization in that manner, that statement may not have been true. But for us, because we were learning, if you were not directly involved in clearing, land prep, nursery planting, plantation maintenance, then you were doing developmental work. Now, we did not, for internal political reasons, we never had a group that we labeled "applied research." At the time, we did no research, as far as our organization was concerned, because it would have been seen as, and some accountant would have tagged it, as research. We were supposed to be busy establishing plantations. And so a geneticist there was doing applied research to help guide us to know which direction to go, but we certainly did not give him a research title.

In fact, the guy running the soils lab we sent back to graduate school. He got his doctorate in soils at the University of Maine. He was a scientist, probably in the truest sense. He was Brazilian. He was certainly doing scientific work, but we never called him a soils scientist. He was involved in site selection. He had to do all of this background scientific work in order to select the site.

Hiring Brazilians

HKS: Sure. Were many of your scientists Brazilians?

CEP: In the early stages, no. One of the unusual comments is that Brazilians are very proud of their country, and an educated, upward-moving individual, scientist, wants to be where the action is. Well, the action is in the south. And, in general, Brazilians have much more fear of the Amazon, and all of the snakes and mosquitoes and alligators and whatever, than any other people on earth. So to attract a Brazilian professional to go from where the action is to the isolated nothingness is extremely difficult.

It's the same mentality in our New York office, when I said, "I've had it with this place. I'm moving to Oklahoma." The New Yorkers there couldn't believe that anyone would voluntarily leave New York. I mean, yes, you could be banned to Oklahoma, like people are sent to Siberia. But surely no one would voluntarily go.

HKS: I understand that. Did you have difficulty attracting....

CEP: You could hire any nationality on the face of the earth easier than you could hire a Brazilian.

HKS: Were most of your scientists from the U.S.?

CEP: Yes.

HKS: Did you have trouble attracting them?

CEP: No.

HKS: They were hired for a two-year stint, bring their family.

CEP: No. I never hired anybody except for forever. They might not last but three weeks, but the intent was forever, because our program was forever. In an unknown situation, if a guy stays two years, it's a waste of his time and ours. It takes at least that long to adapt to a new language, new culture, and new biological world before one can become productive.

In an extreme case, we had a management guy who was not succeeding in carrying out his job responsibilities, and I couldn't understand why, because in talking to him, he knew what to do, he knew when to do it, he left at six o'clock every morning, he came in after dark. Nothing was happening. He was technically qualified to do the job. I showed up and went to work with him one day. He was hollering at some of his supervisors, in frustration. I said, "What's the deal?" He said, "I've been here six months, and not a single one of these supervisors speaks English yet." I didn't say a word. I went back. I sent a telegram to Belém, got a ticket for him and his family, and put them on the next airplane back.

Because one of the requirements that I placed on anybody I hired was that within three months they didn't have to be fluent in the language, but they had to be able to get their job done in the native language. If they didn't, they were automatically gone.

HKS: But you had language training there.

CEP: Yes. And you'd be amazed. This is somewhat unfair in that I don't have difficulty with languages--but you can learn the word for shovel. You can learn the word for tree. You can learn the word for snake. You can learn a hundred words, and by saying those hundred words and gesturing and showing, I mean, these people learn, the natives there learn very rapidly. They want to learn. They want to do better. They are determined to show their boss that they can do a good job. So getting a job done in the native language is not all that tough. You have to want to.

What we did was initially bring in people from the outside, and then Brazil has excellent technical schools. You go through high school, and then you have two years of technical training, in forestry or agriculture or engineering. You take a basic physics course, a basic biology course. Enough to at least get an introduction. Then you go to work.

We found that these technical people, young, aggressive, were readily trainable, and we had extremely good experience with young foresters. We never had good luck with getting a forester with five years experience with an industrial organization in southern Brazil. But taking guys fresh out of school, first job, they were hungry. Had to have a job. Willing to go anywhere. Had to go to the Amazon, because that was the only job there was. But once they were there and found out how terrible it was not, and got wrapped up with the challenge, turned into just absolutely fabulous guys. I'd put them up against foresters from any school in the world.

It was that core, that type of core of technicians and young foresters that we trained. We had the freedom to send them to see and look and learn anywhere in the world that there was something for them to see. We built the foundation with those kinds of guys, and they're still there today. They disappeared in the change, when we sold, but management learned and had to go find them and bring them back. They're there today.

The guy that for the last eight or ten years has been responsible for all of the harvesting program was the guy that I trained to run the nursery. So all of those guys are in management positions. As we were able to train those people, then we had fewer and fewer and fewer expatriates, to the point that when we left, the only expatriates we had was top management and scientists in specific fields where they simply were not available in Brazil and the kinds of scientific work that you can't take a guy with a B.S. and train him.

Hiring Americans

HKS: A thought I had was that most Ph.D. scientists that I know of, in this country, are somehow tied to the academic system, and you have a tenured position. It's one thing to ask your dean for a leave of absence for a year or two, and something else to sign on indefinitely. For them to give it up, I thought it may be difficult for you to have attracted people because of that.

CEP: But these kind of people would not have been qualified for Jari. In their minds they're probably qualified to do most anything. But they would not have been qualified to work at Jari and would not have survived.

HKS: Someone like John Welker.

CEP: He's with Mead Corporation. He walked out of Yale with his masters in economics and came straight to us. So he had all the background, and we trained him on site. He's an avid reader, so he continued his education. We'd give him a job that he had never done before in his life, and he had to do it. So, by talking and reading and discussing, he'd succeed.

It takes a pioneer mentality to be involved in something like this. One of the most difficult things for most everyone involved in the developmental stages of Jari is that rarely are the what I call the blood-and-gut pioneers--whether they be management or

scientists--rarely are they qualified to remain and operate a Jari once it is established and stabilized and an economic, producing unit.

To walk away from your child that you have devoted your life to, day and night, and seen grow and develop and function, and to learn that you're not qualified to stay and participate is one of the most traumatic experiences. Unfortunately, some guys haven't survived it.

HKS: Let me ask the question one other way: Were most of the people who we're calling scientists Ph.D. scientists, or were they people like Welker, with a basic education and a lot of potential? You said McGuire made the mistake of saying you had to have a Ph.D.

CEP: Right.

HKS: Did you learn from that mistake?

CEP: We had many Ph.D.s over the period. In a situation such as that, I had several criteria in hiring. One was that the interview of the wife was more critical than the man.

HKS: I can understand that.

CEP: Because I knew that almost any professional would get so wrapped up in the challenge and in the activity that he would be satisfied. So if a wife did not have a burning desire to paint, to sew, to do ceramics, to be a volunteer in the hospital, to be a volunteer teacher--if she didn't have a burning desire to contribute to community.... [chuckling] I'll be shot for saying this. But through experience I learned that any wife who had to have her hair fixed once a week would not survive.

HKS: It's probably much more common today than it would be fifteen years ago, but you can hire a husband and wife team that are both trained in science. You could hire them both.

CEP: Right. Then it would have been very difficult.

HKS: That would explain why the lack of publications and so forth. They're just different. They're in a different universe. You didn't pull them out of the university setting.

Freedom to Make Mistakes

CEP: That's right. That's right. Essentially, what would occur is that a guy never dreamed of having so much freedom, and so if he had gone to work for an industry, in an industry you get pigeon-holed. I mean, you're an inventory specialist and you may become the best inventory specialist in the U.S., but you're an inventory specialist.

Unfortunately, in our country we pigeon-hole everybody, professionally and otherwise. Here, you hire a guy, and you simply say, "Your responsibility is establishing a silvicultural program for this project. Go get it. Do it." And the guy's mouth drops open, and he shudders, but that's what the job was.

So when the individual learns that latitude that he has to dream and that he can make honest, professional mistakes--and in an unknown situation, I guarantee you will make mistakes. If you don't have the ability to look back and say, "Hey, we scheduled pruning these trees at three years of age the first sixteen feet, and I've now discovered that sixteen feet is too much and it influenced the growth, we have to drop back to fourteen or twelve or something," you have complete freedom to say, "I goofed."

That goof is a positive learning experience, whereas in a structured society, if you pruned to sixteen feet and you wrote to your boss that you lost 10 percent of growth because I pruned too much, and 10 percent over the forty thousand acres we did is "x" volume, you're shot. So you don't allow yourself to dream and probe and do a better job, because you have to protect your job.

But in the kind of environment we had, because no one knew, we had not only the freedom but the direct responsibility to dream. You had to cover the tracks of your dream with real numbers, so that if you dreamed too far or if you didn't dream far enough, or even if you dreamed down the wrong path, you knew to change. These plantations grow so rapidly that when you dream incorrectly, you know within months. I mean, even inventory data would tell you within months.

HKS: It's amazing when you think of the time frame that I was trained as a forester. A twenty-five year rotation. A forester never actually lived with his mistakes because you're long gone before the forest is ready to cut.

CEP: Right. But in this situation, literally, the mistakes are seen on the same timeframe as the mistakes in growing tomatoes.

HKS: There's a certain management cliche that seems to apply to most institutions. The penalties for making a mistake are greater than the rewards for doing a good job, and so people tend to be conservative.

CEP: Absolutely.

HKS: But Ludwig had a situation where he turned that around.

CEP: Absolutely opposite. Ludwig had a saying that as long as you're correct, at least 51 percent of the time, we'll make it. His personality was such and his management procedure was such that if you got into a heated discussion and the shoe fell, so to speak, and he said, "Look, it's my idea. It's my money, and we're going to do it this way. I hear you. But we're going to do it this way," you'd say, "Fine."

If he knew that you picked up the shovel and did your absolute best, yourself and all the people that worked for you did the absolute best to make that work anyway, and it failed, he took full responsibility. Never did I see him blame anyone.

On the other hand, if he said, "We're going to move that mountain by six o'clock in the morning," and we only have three guys and only one of them has a shovel, and you didn't try, then it's the same as suicide. To me, there was absolutely no fear of blame and absolutely no fear of making a mistake in the process of learning.

Now, it's incredible that you would have that kind of attitude from a guy who succeeded in getting through the third grade, but in reality he was on a quest for knowledge. He had a lot of ideas that he wanted to prove, and he knew that those ideas could only be proven and become valid with proper information. Yes, he was impatient. He wanted the answer today. But bottom line, he realized that knowledge had to be there for success.

There's really no way to put into words the progress that can be made under freedom. We talked about Weyerhaeuser a while ago. On George Weyerhaeuser's first visit--he had heard about the project, and Weyerhaeuser people had been there before he was there. At the end of the first day, he said that he was absolutely amazed, and he asked me the question, "How could you have conceivably succeeded in doing what we're seeing here in such a short period of time?" I don't remember exactly what I said, but more or less I said, "Freedom." Freedom to proceed based upon best information available that day. And free from committees. Free from corporate structure that requires waiting.

There was another occurrence when we were working with Crown Zellerbach. We were preparing to make our first shiploads of Gmelina to Crown Zellerbach. We had done testing on a laboratory scale, but it was now time to do pulp testing on an industrial scale. So we sent a shipload of Gmelina to Crown Z in Washington, and it was pulped at Port Angeles and Camas. Once Crown Z had their schedule lined up to where they were prepared to handle that strange shipload, they told us the ship would be there in three weeks.

About the same time we got the message, they sent a guy down to see what stage we're in and get a feeling as to whether it could really be done or not. We took him to the spot where we would load the ship, and it was bare ground. There was no dock. He said, "I have to get to a phone. That ship's leaving. There's no way we're going to load a ship." I said, "See that guy standing right there?" The guy's name is Bob Gilvary. He's a civil engineer from Cornell, and he essentially designed, built all the roads, all the bridges, all the buildings, warehousing, everything at Jari. I said, "Don't worry about it. We'll load the ship." He said, "I have to cancel. It can't be done." I said, "Don't worry about it. Just send the ship."

Well, fortunately, he did that. In three weeks, the ship arrived. He came back. There was a beautiful, permanent dock, still being used today, that we built. He said, "I don't understand it. It would have taken Crown six months to a year to have done that." I had the same response to him that I did to George Weyerhaeuser, that in the presence of freedom and in the absence of fear of being eliminated because you make a minor mistake when knowledge is missing. Now, making a mistake when knowledge is available is a different ball game. That is absolutely amazing what man can do.

Building a dock in three weeks was a normal operating procedure for us, because we were building bridges and roads, and we had built docks before. Small docks, just for receiving supplies and parts and so on. But those things that appeared monumental to what I'll call "normal people" were normal tasks for people at Jari.

HKS: So your engineer wasn't concerned. He knew he could build a dock in three weeks.

CEP: I mean, what is a dock? You go to the woods. You cut some massaranduba, which is a wood that will last forever. We have a pile driver. You haul it to the port, and you start driving piles. You get a bunch of piles in, you put a deck on it. You also drive piles for fenders, to keep the ship from jostling into the dock. I mean, what's the problem? So [chuckling], it's--

HKS: Your engineer was already familiar with the depth of the water and soil conditions and whatever else an engineer needed to know.

CEP: Oh, yes. Knowing that someday there was going to be a plant there, we had already done all of the engineering for the major dock that would be required for the pulp mill. Had done all the soundings, so we knew how deep we had to go to bedrock.

And that was the other beauty of dealing with Ludwig. Even though something was five years away--when we started planting trees, he was not in a mode of waiting five years to start planning a facility, or where it would be. So we were doing port work the same day we were planting the first tree, so to speak.

So engineering work for the facility that would be there, the port facility, everything else, and of course kaolin was built in the early stages of the program, and engineering work had to be done for that. We did engineering work. We did the feasibility studies for a hydroelectric project to provide power for Jari, and that was complete before we ever said a word to anyone on the outside world that it was a possibility.

We had proposals with the World Bank for financing of the hydro project and the newsprint project, but the basic engineering, to know that it was feasible, was done before we ever brought the subject up with World Bank.

Amazon Topography

HKS: There were a couple of items you mentioned off tape that I'd like to have put on the record, because it was a new wrinkle to me and part of the stereotype, I guess, of what the "Amazon," in quotes, looks like. About the topography. How adverse it was. It's not flat. It's not swampy. It's rugged.

CEP: Part of the Jari property along the Amazon is flat and swampland. That we used for water buffalo to produce meat for our own population. We also used some of that

for development of our rice project. But for those a little bit familiar with geography and have traveled in the U.S., if you visualize western New Mexico and Arizona and Navaho and Hopi country, that land originally, maybe not originally but at one time, was a lake. And the mesa tops that you see driving I-40 west is the original level of the bed of the lake. The rolling land between the mesas is the result of erosion from that original level.

All of the sedimentary region of the Jari property is geologically almost identically the same as what I've just described in New Mexico and Arizona. All you do is apply a hundred inches of rainfall and move it out of a cold region, out of the temperate region. We had high plateaus, completely different soils, completely different vegetation. The airport at Jari was built on one of these high plateaus.

In sedimentary soils, it was either plateau or eroded, rolling land covered with forest. Then, when you get to the northern edge of the lake. Originally the Amazon flowed into the Pacific.

HKS: Before the Andes rose.

CEP: Before the Andes rose. The Andes came up and formed a lake. With a hundred inches of rainfall, the lake finally got full enough that it started flowing to the east; hence, the beginning of the Amazon River and the Amazon basin. There are islands that form French Guiana, Suriname, what is now Guyana, Venezuela, Colombia. There was a northern limit to the lake, and so there's a northern limit to sedimentary soils.

These sedimentary soils are deposited over parent bedrock, so if you go to the northern limit of what was the lake and the northern limit of sedimentary soils, or the boundary between sedimentary soils and soils formed in place, and you move south a hundred feet and drill a hole, it's not very deep to bedrock, whereas if you go a hundred miles south, close to the Amazon, where the weight of all of this sediment has depressed the earth's crust, then the sedimentary layer may be thousands of feet deep, down to this original parent material.

You leave north from where we live in Jari and you don't go very far until you leave the sedimentary portion of the Amazon drainage basin, and you get into soils formed from parent rock. From that point all the way north to the border of the countries on the northern portion of South America that I just named. From where you end the sedimentary soils all the way north to where the drainage changes into the Caribbean, it's uphill, and it's rolling highlands into mountains.

The better soils on the Jari property are in the non-sedimentary areas. The soils are much more fertile. There's a lot of variation because all the parent material wasn't exactly the same, but essentially all of the non-sedimentary soils are fertile, and you can grow almost anything. But it's rough terrain.

HKS: So that has all kinds of implications for management. You have the transportation system, harvesting system....

CEP: That's right. In fact, the harvesting procedure in the regions where soils were formed in place is totally different than sedimentary, which is more flat and rolling and

well-drained because it's sand. In the region where soils were formed in place, you have a much higher number of distinct streams, creeks, that flow year-round. I mean, it's the same logging thing you're faced with in broken hills in Appalachia. That doesn't fit people's concept of the Amazon.

HKS: What you're describing, your narration here, was this all surprises? Or was it obvious before you even got there that you'd have this variation to cope with?

CEP: Well, it wasn't obvious before we got there. But once I started flying, and we had aircraft and freedom to use them. Initially we did all site selection work on the ground. When we did site selection work looking at soils and taking soil samples, we also did inventory and species distribution. It didn't take us long to find that we could hop in the airplane and fly a region and pick out the better soils in a thirty-minute flight, and know where you're going next year. Now, you still went in and did the groundwork, but we identified from the air, based on vegetation.

Today I can get in an airplane and, based upon the presence of one species, show you where the Indian sites are. I can tell you what soil type it is. Species changes and species distribution are abrupt, as the soils are abrupt. Not necessarily the northern limits of the Jari property, but the northern limits of our activity, our development activity in a way--we did a lot of exploratory work. Close to the northern portion of the property, there's an escarpment. It's an escarpment that basically runs the full distance between the Jari and the Paru Rivers.

HKS: It's where the waterfall is.

CEP: No. No. The waterfall is at the break between soils formed in place and sedimentary soils. When you drop out of slowly erodible parent material to erodible sedimentary, that's where the waterfall is.

HKS: I had thought that maybe Club Med would put a resort there. That's a spectacular site.

CEP: Oh, it is. It's fabulous. It was our Sunday afternoon vacation spot.

HKS: I've distracted from you from the escarpment.

CEP: The escarpment stretches from the Jari to the Paru and in places is probably five hundred feet straight down. The soils are different on top on the escarpment compared to the bottom. The variation in habitat, the variation in, quote, "optimum use of land," and the correct species selection--I'm absolutely convinced that it would be ludicrous to think that Jari in three species--Gmelina, pine, and eucalyptus--even after twenty-five years, has the correct species on the correct sites. No way. There's too much variation. For proper and optimum management utilization of the resource, they need to continue--and I'm sure they are continuing--to search for the best use, depending upon what soils are there.

HKS: But there's a practical matter. A manufacturing plant has to be able to use this source.

CEP: That's correct.

HKS: So it's not just growing the trees.

CEP: If it were just growing trees, ignoring all economics, it would be much easier. Then the native species would kick in. If it were just strictly for the fun of it. But if it were just strictly for the fun of it, there would never have been Gmelina or pine to start with.

HKS: Did you ever think about oriented strand board, as opposed to pulp?

CEP: Yes. Yes. But price of the finished price is so low that we never could make it work.

HKS: Have we covered the topography adequately, to show the variation and the management requirements, or is there more you would like to say?

CEP: One other thing, just a general statement to give a better feeling for the total region. What I just described was the Jari property. Of course, there are regions that you could go to that it would all be relatively level and nothing but sedimentary. You could go to another region and think the whole world was savanna. Obviously, a region as large as the continental U.S., which if you ignore national boundaries and look at the Amazon drainage basin, it's the same size as the continental U.S. So to imply that the whole place is like Jari would be like my description of a guy getting in a boat and going down a river and then writing a natural history of a continent.

HKS: Right.

CEP: So the Amazon is very varied. The river system is divided up into three categories. You have the main Amazon, which is muddy. Rivers flowing into the Amazon from the south are clear-water rivers, and many of them, the water is just absolutely clear and you could scuba dive and see as well as you can see anywhere. The rivers from the north, like the Jari, are black-water rivers, and there are more tannic acids in the water.

The Jari River looks dark, but if you got a glass of water, the glass of water looks clear. So it's a black-water river, but a bucket of water looks clear.

HKS: But it's not erosion. It's not soil particles.

CEP: No. No. Now, somehow in our environmental mode that the industrialized world is in, if a river is muddy, someone is a culprit and must have caused it. So we have had guests, and we'd be on a portion of the Amazon, and they want to go upstream to get pictures of and determine who is clearing land, creating the muddy water. Well, the Amazon has been muddy ever since the day that it broke out and started flowing into the Atlantic and eroding that part of the world. Somehow we've gotten under the concept that in the absence of disturbance by man, all rivers are absolutely pristine and crystal-clear. Of course, that's very far from reality.

HKS: So the harvesting technology--I don't know how much time you spent on this, but I was surprised, your decision on harvesting technology that you told me about off tape, the high-lead.

Harvesting Technology

CEP: Well, of course, harvesting is in two phases. There's harvesting of land being cleared, and that wood being used for power. Then there's harvesting of plantations. It's two different procedures.

I'll give this as an example of how our desire to be modern overrides common sense sometimes. In plantation harvesting we proved beyond a shadow of a doubt that the most economic means of harvesting pulpwood-sized plantation trees, whether it be pine or Gmelina, is with man and mule. Forget burning carbon fuels. Forget maintenance costs on heavy equipment. Forget the class associated with being modern. The cheapest way was to log and carry. We built racks to go on donkeys' backs--and carry half a dozen sticks or whatever to the roadside.

When we cleared and prepared land for planting in the sedimentary regions, the terrain simply allowed a grid system. We built a plantation maintenance and harvesting road on a grid, so that a tree was never more than a hundred meters from a road. We were super-concerned about equipment being on-site, having seen what happened in the initial clearing activity with dozers.

At that stage, we didn't know whether it was removal of the organic, whether it was compaction, a combination of many factors. So we were concerned with damage. Of course, we heard all kinds of horror tales, and we were fearful that disturbance of tropical soils was much more critical than what, in reality, it has turned out to be. We were in the process of devising a harvesting system out of these plantations so that equipment never would need to be anywhere but a road. We could either carry the material to the road or pull it to a road, using lightweight cable systems.

HKS: These were unpaved roads. Unsurfaced.

CEP: Unsurfaced. And ungraveled. Because of leaching, in most areas without going very deep you could find a layer of laterite. Laterite is simply particles where mineral elements, mainly ferrous elements, have leached out and accumulated and formed a layer. This material is common throughout the tropics, and it makes excellent road surface material. So where and what I'm calling a road in most cases is no more than simply removing stumps and pushing to the side material that didn't burn, so that you had single-lane truck access. Where drainage was excellent, we didn't put lateritic material. The lateritic material was normally used more on slopes, where, through natural erosion, the surface had a higher percent of clay to where you simply couldn't get traction up the hill when it was raining.

HKS: Could you log during rainy season?

CEP: Yes.

HKS: The roads would hold up.

CEP: Yes. Because you would be on a road one or two days. All of the "logging," quote, was designed to be hauled by small bobtail Mercedes trucks that would carry the material, then, to a concentration area, where you would go on larger trucks to the mill or larger trucks on surface spur roads to a railhead. There was never any intent to have all-weather roads throughout the plantations, surfaced for what we think are log trucks.

Because of the grid system and because it wasn't very far to a road, we could cut and haul on a donkey's back to a roadside cheaper than any other procedure. This turned out to be one of the examples among many where economics was overridden by desire to be modern. We never had the first group from a Weyerhaeuser, a Crown Z, Continental, or any other group that we were involved with that could bring themselves to advising going back in time and using man and donkeys.

The normal mentality of a gringo going to the Amazon is that you have to have chain saws. A chain saw breaks down. You have to have a saw shop. You have to have fuel. You have to have spare parts, and they're much more expensive there than here. For the most part, chain saws in the Amazon are a mistake.

HKS: You're cutting small diameter trees.

CEP: Large diameter trees are still a mistake. You can employ three guys to work all day to cut down a tree, and it provides them cash income. Cutting that tree down with three guys is cheaper than doing it with a chain saw. Now, it doesn't fit our image, but it's the best way to do it.

HKS: So there's all kinds of stereotypes. One is that the executive is truly addicted to the bottom-line and if you can show him a deal that saves, he'll do it. But there is an image.

CEP: In reality, that doesn't occur, because we proved--we have the numbers--we did it. We sent shiploads of material, of Gmelina, to Washington, to Crown Z. We sent shiploads of material to northern Finland. There were at least three shiploads of material that were produced mainly by ancient procedures, man and donkey. Or just man.

When we were asked the question, "Are you prepared and ready to harvest?", the answer is, "Yes." "How are you going to do it?" "This is how we're going to do it." This was a case where every industrial forestry group--Weyerhaeuser, Crown Z, whoever--every consultant that appeared out of the clear blue had a modern, mechanized scheme for harvesting. And we lost.

This is one of the many cases where we were run over and pulverized and lost. Really, we were right, and we're still right. It is in process of coming to that. Much of the massive harvesting equipment that was there the day the mill started has been sold, not replaced, and they have moved back toward reality. Reality is what I call simple, non-mechanized methods.

HKS: To jump the technology the other way, feller bunchers won't work because the soil won't handle it, the terrain's too steep? I mean, you're harvesting plantations.

CEP: Right.

HKS: In the American South, we use feller bunchers to harvest plantations. We don't use chain saws any more.

CEP: Right.

HKS: But that equipment wouldn't work.

CEP: When you clear and burn, maybe a third of the material is of a species and density that will burn. You have this massive mess that you have to crawl over and under and through. Now, after twenty-five years, there are sites that the amount of material on those sites has decreased to the extent that they now can go in and move that small percentage of what was there originally, and have a clear place where feller bunchers could function.

But because of the economics, the capital cost of the equipment, the damage to permeability of the soils, cost of fuel, cost of maintenance, I still would question, even though they could move freely, I would question the economic feasibility of it.

HKS: Was this before the price of energy went up so quickly in '74? I mean, energy was still relatively cheap.

CEP: No, it was high.

HKS: It was high then.

CEP: In Brazil it's like two-and-a-half times higher than what we're accustomed to. I can show you many examples in the Amazon, and we ended up with one of them at Jari, in spite of bloody battles. That subject is one of the last battles I lost. But I can show you mills that were built by the best engineers, the best technology of the day, selection of the best equipment, setting in the Pacific Northwest would have been a world-class mill that anybody would have been proud of. And it never functioned in the Amazon. We ended up with a massive mill designed for northwest standards, a big log mill that did not have a chance to function from the day it was put on a piece of paper.

HKS: Big logs. So you're talking of native species.

CEP: Native species. You asked a question about oriented strand board. All of the inventory that's there, probably 50 percent of total volume has a density in the range of 1.0, and to kind of get you worrying--hickory is probably 0.6--so there are many species and a lot of volume that will not float.

There are many species that have high silica content that, under today's technology, are simply not usable. You saw them, it ruins the blades. You chip them, it ruins the knives.

HKS: Never heard of that one before.

CEP: If you look at World Bank inventory of the Amazon, people say that it's the world's wood basket. Well, that is false, and not even anywhere close to reality. A lot of the inventory work that was done was based on total volume. It's an over-mature forest, so you measure a large tree and it has tremendous volume in it, but you cut it down and it turns into powder. Because you have an outer ring.

You're familiar with over-mature stands in the Pacific Northwest. I have harvested stands, old-growth stands, that had as low as 37 percent usable material. It was just simply too old to be used. Of this tremendous wood basket that is in inventory numbers, a high percentage of it is over-mature and the trees simply not usable, regardless of what species it is.

HKS: Can't get it out? Or has silica in it? Or--

CEP: No, it's too old. It's like an over-ripe watermelon. It's hollow. When you cut it, it shatters. It's just simply over-mature and non-usable, under any form.

Then there's a percentage of trees that are species that do not have a cylindrical trunk, trees that we call "crazy wood." The surface is convoluted. There are many common names for them, but they make up a significant portion of the total stand.

There are trees with such high silica content that under today's technology they're non-usable. There are trees without the silica but such high density that they can't be used in that under today's trades, if you give a guy a two by four that weighs three times as much as any two by four he ever picked up, and he can't use a gun to nail it, then of what use is it? Yes, it's beautiful. Yes, we can harvest it. Yes, we can figure a way to saw it and dry it and surface it. But if you can't nail it, and it takes two guys to pick it up, who is going to use it?

We had small mills, Mity-Mite, portable mills, that we produced the wood for our own use. We set those mills up in every forest type that we had, and when total inventory was a tremendous volume per acre, we never exceeded three to four thousand board feet, and the average was more like eighteen hundred board feet to the acre, usable.

HKS: Eighteen hundred.

CEP: Eighteen hundred.

HKS: That's not very much.

CEP: It's nothing. And in fact, in big trees, there is no economic means of building roads and logging to recover eighteen hundred board feet per acre.

HKS: I can understand that.

CEP: The concept is that there is tremendous volume there which, in reality, doesn't exist. It's like there's tremendous volume in the Pacific Northwest today. But it doesn't

exist as far as use is concerned because it is out of production. There is volume in the Amazon, not what people think it is, and it's basically non-usable.

HKS: It explains the numbers which show something like 2 to 4 percent of total tree removal is for commercial wood production. The rest is for land-clearance, for agriculture.

CEP: That's correct.

HKS: It's just because of the volume.

Amazon Belongs to Brazil

CEP: You have to ask yourself the question, Asia developed in wood use. Africa developed in wood use. With all these trees. You can get in a 747 and fly six hours and see nothing but trees. Why hasn't it been developed? With minor exceptions, there is no major forest products company there, and never has been.

One additional problem is that of that small percent per acre that is usable, it's distributed among hundreds and hundreds of species. So how do you develop an economic use for that natural resource under those limitations?

HKS: Basically what we know so far is that you need a Jari type project, where you clear the land and then put in a plantation. Otherwise, forestry is not a practicable enterprise in the Amazon.

CEP: Yes, there are regions where mahogany as a species is predominant. Yes, there are regions where another species is dominant. But for the most part, the diversity is so great that utilization.... There should be no fear of anyone going in and clear-cutting the Amazon for industrial utilization of the wood. The resource does not lend itself to that.

Clearing is a result of population pressures. It's not pressure for wood. I mean, 99.999 percent of every tree that gets cut gets burned where it falls, because there is no other use for it. The reason clear-cutting occurs is population pressures. There are no major land-clearing projects remaining. World Bank isn't financing any. Brazilian Incentive Programs is not financing any. So what is the clearing? It's population pressure.

The only way to control the clearing that's occurring is to develop products that come from that resource so that it doesn't have to be cleared, and in so doing, provide jobs so that people can eat without having to clear.

No amount of wailing from the thirty-fourth floor of some building in Chicago, no amount of anything is going to change the reality of that land being cleared. So if we as an industrialized people can get together and quit wailing about something that happened thirty years ago and start a positive approach to develop those lands that were clear-cut and abandoned, into a job-creating asset.

They should stop efforts of banning the use of any product from the region, because I see no difference between the southeast U.S. and Brazil or Lake States region and Brazil. When the South was first populated by pioneers, there was no market. They had to have something to eat. So they cleared and burned. Yes, they used some logs for a house and a barn and a fence, but there was no market. That material that we look at today and call a resource was an impediment and a barrier to his survival. There simply is no difference. That's what the Amazon is facing today.

HKS: Is there, by your observation, with individual families clearing their three acres, is there enough of that activity to generate the fear and concern you read in the popular press? Or are there large agricultural companies--

CEP: There is, and yes, there are large companies. You get in the State of Acre, for example, which is western side, you're out of the sedimentary region into soils like I described in the northern part of Jari, very fertile. The chance that those fertile soils can be allocated a value of zero and that those lands will not be cleared. The chance of that occurring, at least in my mind, is zero.

That would be equivalent to asking in the early days of the development of the U.S., asking the 1880 population of the U.S. not to clear another acre in Indiana, Illinois, Ohio, and that the U.S. should not have a corn belt.

I don't like to see it. But we as a nation cannot ignore the reality of people, masses of starving people, when we look at policy related to the Amazon. Number one, as I mentioned earlier, the Amazon is not ours, and it never will be. Brazil as a nation is interested in developing its resources to feed its people. There is no way that any amount of wailing is going to change that.

Brazilian Forest Practice Laws

HKS: That leads into another element of the same thing. Brazilian forest practice laws--I'll call them that. I'm not sure what you would call them. How does that influence the way Jari operates?

CEP: The way Jari operates probably the influence is nil, because any acre that Jari clear-cuts today, Jari is not in an expansion mode. They have all the acres they need to feed the pulp mill. The only acres being cut and planted are those required to feed the power plant, and that is the reason that the hydro project has been approved by the government, so that land-clearing for power does not have to occur in perpetuity. There has to be an end.

Of course, a power facility wears out. Just because a power facility is depreciated out and gone doesn't mean that the plantations have to stop. So they're on the path of replacing power from burning wood to hydro. Any acre that's cleared is replanted. There's really no activity there that requires observance of any law. I mean, the law says if you cut trees, you plant. Well, obviously, they're doing that.

HKS: From time to time, a Brazilian forester would come out and do oversight procedure.

CEP: Right.

HKS: That you're doing what you're supposed to.

CEP: Right. Now, the law requires that if you cut a tree you plant, I don't remember, three or five to take its place. That obviously doesn't apply in a plantation, because when you cut a plantation tree, you plant one to take its place.

What the law has allowed, and this is what GP did when they owned property there--they no longer do--but there were forestry companies established. Let's say GP cut "x" number of trees. They simply paid a forestry company to go out and plant their quota of trees, and they did not necessarily own the new trees planted. So for a guy that was conscientious and had a long-term outlook, this was a bonanza, because big non-Brazilian companies that had to follow the law had to pay cash. So he could put in a plantation that didn't cost him anything.

They simply do not have the money to police and be sure that it's carried out.

HKS: So you bought the property. You didn't have to file a management plan and pay a fee or something like we would in the states.

CEP: No. No. One of the overall flaws in most any Brazilian regulation--and there are ample laws on the books to cover anything that's happening and anything that might ever happen. The problem is, there is no money for governmental agencies, and so in the Amazon there are people responsible for enforcing forestry regulations, but they have no budget. Not even a budget to pay their salary. Not even a budget to buy the gasoline for the boat. Not even a budget to buy the boat that they're supposed to ride in.

The only source of income that that organization has is fines. Basically, if you are doing anything down to being an individual in a canoe with three boards, you will be fined. You don't have to be guilty of anything. But in order for that Brazilian organization to survive, you will be fined.

HKS: Is it the same in southern Brazil, that they don't have a budget?

CEP: In much of southern Brazil you couldn't tell the difference between there and being around Savannah, Georgia. There's an open, honest, economic incentive to be doing what's right. You're already making a living off your plantations, and you need more. So yes, there are people there, but it would be like policing Oregon forestry laws.

In Oregon, if you're going to cut, whoever that's responsible has to put up a bond that is economic proof that you have the capability of replanting. If you don't replant within a given amount of time, the state replants and calls the bond. It doesn't take many people and much of a structure to see that planting is done. I'm sure there are instances, but I don't know of any instance where a bond has been drawn on.

Policing to that extent, where it's economically sound and feasible to fulfill the letter of the law, is not a major problem. In the South it's developed to the extent that it's either land in agricultural production or it's in plantations.

Key People at Jari

HKS: I don't know if it's useful or not for this interview to describe some of the key people who worked for you or with you.

CEP: I think it is, in that for someone who wants to learn or someone who comes along and needs specific information.

HKS: Okay.

CEP: There are people who still can be found, and they're still active professionally and can provide excellent information and advice from experience. So I think it would be critical to do that.

HKS: We talked about John Welker, for example. Maybe you should come up with your list.

CEP: Okay. I'll name a few, and it will be at risk of leaving people out. But what I'll do is list people that were active at one stage or another and, in all likelihood, still have information in hand on whatever area they were involved in.

HKS: Good.

CEP: I'll start in harvesting. I hired a guy named Mac Davis.

HKS: I know him.

CEP: I stole him from International Paper. He is old enough that he's inactive. I haven't talked to him in a good while, but he was the blood-and-guts doer in the development of the harvesting program, both native and plantation, at Jari.

The technical guy, who I brought in, that had experience in various places of the world with FAO and whoever, and later got his doctorate in, I guess, logging engineering, was John Sessions. He's at Oregon State. That's probably where you've heard the name. So from a procedural standpoint and the steps that we went through in developing the program, and what worked and what didn't work, Sessions would be aware of and have more information, probably, than anyone else. Welker would have the economic information of comparing this procedure with that procedure. But Sessions' background was developing logging systems.

Then, in the forestry side, Johan Zweede was involved from 1970 or early '71 until the date--until ownership transferred. He was more in management and administration, and

he knows step-by-step everything we did. We had contract labor companies with literally thousands of plantation workers. We set up a separate company for that, and he was responsible for that company.

We had a lady, a Brazilian lawyer, who ran that company on a day-to-day basis. She reported to Johann. So he was involved in budgeting, overall management of people and machines and so on. All of the production and research people, by the end of the project, were reporting to him instead of to me. I'm sure he still has information and, as I previously mentioned, he has a complete set of wood samples.

John Welker was responsible for planning, which included economic and plantation inventory, scheduling. So the details of the inventory system, plantation management procedures, economics of this procedure compared to that procedure, the growth effect of one procedure compared to another, comparative growth on soils, developing stand tables. All of the necessary tools that one would use in forest management, John was responsible for doing that.

In later years, the research program was under Ron Woessner, who was a Ph.D. in genetics from N.C. State. I haven't talked to Ron in a long time--but I think he is responsible for the forest management group with Mead in Columbus, Georgia. I know he's in Columbus, and I think that's his title. He would have information and certainly be willing to talk to most anyone.

Our soils guy was Djalma Chaves. He is Brazilian and presently is--unless it's changed recently--is responsible for a large forestry program in southern Brazil. Unless he's changed, Westvaco was one of the early pioneers in pine plantation development in southern Brazil. Westvaco still has that program, and Djalma went from Jari to Westvaco. It's a different name there, but it's Westvaco.

Then, the chief forester for probably five years during this developmental stage was Charles Briscoe. He was a Duke and Oxford product and presently lives in Costa Rica. Part of the time, since he left Jari, he's worked at Turrialba, and part of the time FAO and AID in various places in the world. He is in a much better position than myself or anyone else that I'll name to compare forestry-wise the development of Jari and what has happened in Jari, and comparing that with other programs throughout the world.

Another subject that we may want to hit after we get through with names is agroforestry. Because Jari was certainly involved in that type of program.

HKS: Ken McNabb. I just picked him up. He's a co-author with Welker of this article.

CEP: Ken McNabb was there for a few years. He worked in the what I call the applied research group, although it didn't have that name, and worked with and for Welker, mainly in the silviculture area.

There were probably twenty to thirty people that I could name that were there at some stage, but I think I've probably named the main ones that were the main leaders and dreamers that made the concept work.

HKS: How about cooperative agreements with Brazilian specialists? We sort of touched on this.

CEP: We named a name a while ago. There was a core of what I call consultants. Generally, consultants were nothing but absolute misery for us, but there were two classes of consultants. There were those [chuckling] that were rained down upon us by Ludwig, and there were those that, in areas where we knew we were in trouble and needed help, that we brought in. Those kinds of consultants were of tremendous help, comfort. If they never did anything but come and hold our hand and say, "No, I don't think you guys are crazy. You may be wild dreamers, but you're not crazy," and go home, they were worth their money.

Not having the economic constraints, we had the freedom. We didn't necessarily tell anybody. There was a stream of consultants that came through that Ludwig never knew they were there, maybe. No one else knew they were there. They were simply there to provide us with comfort that we were going in the right direction or to veer our direction off five or ten degrees or whatever.

One of those was Zeb White. He was there several times, and he was in the class of the comforting type of individual. There were times that we used him specifically when we were making World Bank presentations in dealing with forestry experts in the World Bank who were not forestry experts at all.

HKS: Now, you weren't trying to get money from World Bank. You were just reporting to them on tropical--

CEP: No. We were getting development money. We got to the stage with World Bank on the hydro project and on the newsprint project, mechanical pulp project, that the only thing that remained was approval on the Brazilian side, and we were in.

HKS: Is this something we should talk about? World Bank?

CEP: We worked extensively with World Bank.

HKS: Okay. We'll come back to that.

CEP: We had major battles with World Bank, just on terms such as mean annual increment. Now, everybody in forestry knows what mean annual increment is. We had our World Bank presentation completed, done, and a forestry expert came down and looked at three-year-old pine plantations. I don't remember the numbers, but let's say that our mean annual increment was three times greater than what you'd have in the South, which it is. And that's a lot of volume. He looked at three-year-old trees, and there was not that much volume there. So we couldn't know what we were talking about.

Well, a tree has to live its first year, and it has zero volume. It has to live its second year, and it has zero measurable volume, maybe. So in the States, an inventory system only starts once a stand is old enough to have a measurable volume. So a ten-year-old

stand in the States has very little measurable volume. So mean annual increment of that actual stand is zero.

But your average annual growth is based upon a rotation. You have to have a first year, even though there's zero volume. If you go out and measure a three-year-old plantation, you have zero growth. And he did that. He went back and reported to his bosses that our projections had to be horribly in error, because he looked at plantations that had very little volume.

HKS: Okay. Back to the use of consultants.

CEP: We would use consultants of our choice who had the stature and capability of standing up and explaining technical things to non-foresters. Tommy Thompson is in that kind of category in that he and Ludwig hit it off and got along extremely well. We were interested in development of the natural resource, and we were interested in milling capacity at Jari to match the volume that we thought we could sell on the world market.

We were not interested in milling capacity to mill everything that existed there, because there's a world of difference between what you can mill and market, and the total resource available. So Tommy helped us plan and design facilities along that track, and helped us deal with Ludwig on that subject when Ludwig had guys battering around the edges to build a monster.

In the end, the monster got built. But that was one of my major final battles.

HKS: That's the big sawmill you're talking about.

CEP: Yes. It's one of the big log mills in the Amazon that never functioned. One of many.

HKS: So the consultants of most value to you were those you selected. You had a specific problem, and needed specific sort of advice.

CEP: Had a specific problem. Had an innate fear that we might not be going down the right path and need somebody completely disconnected from the daily fray of battle to freely look over our shoulders and say, "Rah, rah. Keep going. Turn left." Or whatever. And in most cases it was never a formal report written. It was a hand-holding session.

HKS: Yes. Tommy told me he made sixty-two trips to Brazil or some large number. This was after he left GP he became your consultant from time to time.

CEP: Right. He was the only one that was our consultant and Ludwig's consultant.

HKS/CEP: [mutual laughter]

CEP: There were times he was there when Ludwig would call him and say, "Please go down." There were times he was there that Ludwig may not even have known he was there, unless Tommy called him and told him, because we didn't.

Jari was isolated, but it was not done in a vacuum. Yes, in all likelihood, we rejected the advice of hordes of people. But on the other hand, we had the freedom to and did call in large numbers of professionals in whatever kind of problem that we had. And for the most part, people we called in were older--I mean, we were a bunch of young, wild dreamers. Blood-and-guts doers. We recognized our limitation of experience. So most, and probably without exception, all the people we called in were successful, near retirement age people who could set the corner and rationalize and think.

When you're in such a hurry, and under such tremendous pressure, a lot of times what is blatantly obvious you can't even see. There was never a period of more than a few months that I didn't have someone like Tommy Thompson or Nat Walker, who was my forest management and economics teacher at Oklahoma State. Or a Zeb White or someone of that stature come down and do nothing but think and contemplate and hold our hand.

HKS: Did you look for and reject or feel a need to have European foresters with experience in let's say Indonesia or tropical Africa? That their experiences somehow would apply?

CEP: One has to recognize that before Jari, a Jari never existed. There is no comparison, either in Asia or Africa. Yes, some trees have been planted in Africa. Yes, some trees have been planted in Asia. The major companies who were in Asia had to do some replanting to continue harvesting. But there was simply nothing to compare it to.

HKS: So tropical experience is site-specific in that sense.

CEP: Yes.

HKS: If it had been Indonesia, you can't go walk into Jari and say, "Ahah, this is a type three. I studied this."

CEP: Right.

HKS: Okay.

CEP: In the flow of Weyerhaeuser people through Jari, many of them came through Weyerhaeuser-Asia first, before they came to Jari. In fact, the reason they were sent to Jari was because they had Indonesian experience. So whether it was plantation guys, harvesting guys, economic guys--whoever they were--they came through Indonesia first.

Now, the long-range planning management kind of people who were looking at Jari with a future decision in mind, they didn't necessarily come through an Indonesian experience. But everyone else did.

We had a steady flow of people from the African continent, and we went to Africa. Crawled all over it. We had an executive director at one time who was responsible for the Skelley project in Liberia, which was forest products.

So there were lots of African, lots of Asian. There was probably less European experience than from anywhere else. One of the reasons for that, and there wasn't a conscious decision, but one of the reasons for that is that European foresters tend to be more fixed in their ways, and know what's right. And guaranteed means of failure in a program like Jari is knowing what's right, because nobody knows. And no experience applied directly.

The second quickest way for me to buy a ticket for a guy--the first way was for him not to learn the language. The second way for me to buy him a ticket was to start doing things because that's the way he did it in a hardwood bottom in the Mississippi Delta. Or to log that way because that's the way we did it in Idaho. That was a surefire sign to me that we had a non-thinker and a non-dreamer, and it wouldn't work. And they got a ticket. Sounds cruel, but that was the reality of the situation.

Recruiting Workers to Work in Isolation

HKS: When you interviewed people for jobs, how did you characterize the job? You looked for some kind of response. The kind of questions they asked would tip you off what their concerns--

CEP: Job interviewing was the most inadequate feeling of any and all the responsibilities I had. That was the most inadequate, because they have such a preconceived idea that they hear your words, and they can write them down, but it does not register.

To give you an example, I hired a young geneticist who was one of my graduate students. I left when he completed his degree. I, very plain, in the English language, explained to them what the conditions were. At that time, which was early stages, the supermarket was a shed, no sides, and in the supermarket were bags of beans, bags of potatoes, cans of powdered milk, basic items. Rice. And that was the beginning and the end of it. And you got fruits in the forest. We hauled in daily, on our airplane, onions, tomatoes, fresh vegetables. You got fish from the river. But the supermarket was as I described. The housing for them was a house about twice the size of this room, and screened in.

They arrived. I took them to the supermarket. She stood there and cried. I took them to their house, and she cried uncontrollably. And after she got through crying, she said, "I'm sorry. I heard the words that you said. You told us exactly what the supermarket was, and that's what it is. You told me exactly what the house is, and I see that's what it is. But somehow, in my language and my experience, I could not relate to it, and it did not register. Now that the reality of it is before my eyes, I'm in tears."

That's a vivid example. That was the truth and the situation. Whether it's professionally, and the guy's job you were explaining to them. The fact that you were

telling the guy that he has to learn a language. He's never spoken another language before in his life. He's never studied languages. You're telling him he will learn a language or be gone. He's accepting that and saying, "Yes, I will learn a language." It's a new experience.

The thing that got many people was the cultural shock. You can explain cultural shock to people, and it's meaningless. We had people packed up and go to the airport because we were not taking care of the local population. The local population had health needs. The Jari health budget, our hospital and our health budget, was greater than the Brazilian federal government spent on the total Territory of Amapá. We, in our isolated situation, spent more money on people's health, free of charge, than the federal government spent on the total territory.

But there are still limits upon what you can do. If a sick woman showed up in a canoe at our hospital with a dying baby, it wasn't our responsibility, but guess what. We took care of that baby. But still, within that social framework, there are limitations. We could not physically take care of the total northern Amazon region. We couldn't take care of Brazil. We took care of those things that confronted us, but still there were tremendous needs. If you're not taking care of those total needs, you're the bad guy. So we turned into the bad guy, and this employee will no longer work for bad people, and he gets on an airplane and goes home.

So you have all kinds of problems associated with the society around you.

HKS: Did the supermarket become more sophisticated and better stocked in later years? And housing improved?

CEP: The supermarket today at Jari, you'd think you were in United in Brazil. Anything you can buy is there. But it takes time to get there. It takes demand. You can't have that kind of supermarket when you have fifty people.

HKS: The locals, the workers, that was the diet, rice and beans and flour, that's all they ate anyway.

CEP: That's all they knew. Yes. It's all we ate anyway. [chuckling]

The development of something like this confronts and creates tremendous social problems. To get clearing and plantation work done, we would bring in ten thousand employees at a time, that have to be clothed, housed, taken care of medically. We built plantation villages, and this is a whole other subject. But we built plantation villages, each village with its own health facility, school, recreational facilities, supermarket, everything.

HKS: Is that an example of what you're talking about?

CEP: This [showing a photograph] is Monte Dourado--the main town.

HKS: That's more advanced or more plush than what we were talking about?

CEP: Right. Plantation villages I think came along after this was published. But just the sheer size of the thing, you could transport workers from where the main town was to the furthest plantation. I mean, you'd get there at noon. Eat your lunch, and be able to come back home. So we built satellite or plantation villages out in the plantations, and moved in people from northeastern Brazil. These people came from a region extremely dry. It would be like moving a family from Arizona.

They had never had a permanent roof over their head, never seen running water, never seen ice, never seen a doctor. No child had ever been to school, and you move those into a planned community, with school, with water, with essentially everything that we in our society would expect. It is a tremendous traumatic experience for these people.

We designed the place so that each house had a garden spot. We had an agronomist. When a family would show up, each family would receive banana plants, manioc plants, fruit trees. The agronomist would work with these people, training them how to grow their own food.

Each village had an agronomist, had a trained social worker, a girl--in each case it was a girl with a degree in sociology--to help these people adjust to a new form of life.

HKS: Why was the labor recruited from that particular area? Is that the closest population?

CEP: Yes. See, Jari was established in a region. Yes, there were people, but they were gatherers, and population density extremely low. You'd see a scattered house along the river. The Amazon, except for specific cities like Belém and Santarém and Manaus and Iquitos and so on, except for specific cities on the river system, the Amazon is devoid of people.

Jari was established in a void region. Yes, someone had walked over the land, gathering Brazil nuts before. And yes, somebody had been up the river in a canoe. But basically it was devoid of people. So the masses of people required for Jari to function had to come in from somewhere else, and the logical place. You don't even have to go back in history. The northeastern part of Brazil is extremely dry. Some years it rains, and some years it doesn't. When it rains, it floods; and when it doesn't rain, there's just no water.

HKS: So that's the area north of Jari you're talking about.

CEP: No. It's east of Jari. Northeast. It was the state of Amapá, east of Jari. When it doesn't rain, people put a stick and a bag over their shoulder and head to a city. You have mass migrations starving people into places as far away as Sao Paulo. But that's still home. When it rains, they head back home.

It's a region that is way overpopulated in terms of what the region can support. We need workers and permanent employees, and they need permanent home and income. We transported people by the tens of thousands from northeastern Brazil. We had hiring stations throughout that region. Employees that went out and set up shop and they'd hire people.

So there was a steady flow of buses, boats, moving people to Jari and people out. In the early years, we hired tens of thousands, and they were temporary. Once we built the villages, to bring your family and come to Jari, you had to have worked at Jari in previous seasons. You couldn't just think, "I think I'd like to live in the jungle." They'd never seen a jungle before. If somebody came and wanted to move their family and had not worked there before, they didn't qualify. The only people that moved were those that had worked there as seasonal workers one, two or five seasons, and decided it would be a good home place.

HKS: Reading through the articles, and I realize you had to pick a particular year, maybe the time of year, but what was the population of the area? I mean, I've read ten thousand. I've read thirty thousand.

CEP: Originally?

HKS: No. When Jari was up to speed.

CEP: Population is a hard thing to get a hold of. Going back to just the subject of hospital. If you live on a river fifty miles away and you hear of a place on the river where there's a hospital, they give you an antibiotic if you walk in with a dying child, they save the child, what are you going to do? You're going to get in your canoe, and you're going to move.

There's a city that developed across the river from Jari that we tried to prevent and could have prevented. That city has more people in it than the total population of Jari and its employees. If you go there, what you see is the attractive city that lives off Jari. It's where Jari employees may spend their money. Get off work and go across the river and have a beer.

Regular commerce has developed. If you're a Jari employee and you want a refrigerator, in all likelihood you go across the river now and buy it. It started just as covered shacks along the river. So the population of that attracted city, at both Monte Dourado, which is the main town, and the port of Munguba, that population is greater than the Jari population.

If you count that population, you're probably looking at fifty thousand people that obtain their livelihood directly from Jari. Jari does not have that many employees.

HKS: In that city across the river, whatever benefits a Brazilian citizen gets theoretically is available there, but practicality--

CEP: It's all in theory. In fact, if you live in Belém it's in theory.

HKS: Is that right?

CEP: Yes. If you're a Brazilian citizen, you pay into a social security system which includes medical. If you get sick, in all likelihood you stand in line for days to get to the front of the line for them to tell you they can't help you. So it's a horrendous situation.

Agroforestry

HKS: Let's turn to agroforestry.

CEP: Okay. In much of the developing countries, specifically in the tropics, agroforestry is and has been a subject that FAO, USAID, and various organizations have pursued in attempts to look at food and fuel production.

At Jari, we started planting pine in '73, and pine was allocated to the sandy loam soils. One of the problems in the tropics is high rainfall and consequently leaching of nutrients from soils that tend to be highly permeable. Of course Jari was in an isolated region, so one of our objectives was to grow the meat and vegetables and as much food as we could for our own population.

We had water buffalo in the várzea, and we also had a cattle program. In the Gmelina plantations, once an area was cleared, burned, and planted, within a year on good soils you absolutely had complete cover. On sandy soils, it was probably eighteen months before you had coverage.

Pine starts much slower. When you plant pine, it sits there for a period of time, establishing a root system, and then growth begins. But even when it begins, it grows slower than Gmelina. So at the end of the first year in a pine plantation, you probably don't have any more than maybe 10 percent coverage of the soil. We had airplanes because of our other agricultural projects. As soon as an area was cleared and burned, we would sow grass seed. We used species that are bunch grasses, and bunch grasses, rather than having feeder roots on the surface, are deep-rooted. So they can function as nutrient pumps. We would sow the grass about the same time as we would plant the pine. But the grass, during the first season, would also be coming established and not present significant competition to the trees.

The second season, pine jumps out of the ground, so to speak, and grows rapidly and gets high enough that the bunch grasses, even though they will be more than six feet tall, the pine would never be in a position to where it would not get direct sunlight from above. It might have some side competition from the grass, but it would never have competition for sun from above, so we didn't feel that we were negatively influencing the growth of the pine.

In this process, this small pine tree could not reach out and grab all of the nutrients that were released as a result of the fire. But immediately planting grass, the grass could grab these nutrients, and the portion that was leached, the deep-rooted grasses would get the nutrients and pump them back up to the surface.

So the second season, then, the pine is tall enough--the cattle would not damage the pine--and the grass is established, and we would rotation-graze the pine plantations. We would fence it in blocks, and you run in a large number of cattle, graze the grass to feed the cattle and minimize the competition to the pine, take the mass of cattle off, put them on another area, the grass comes back, and when the grass gets to the point that it

needs to be grazed again, then you run cattle in. Then each successive year, as the pine grew and shaded out the grass, then there was less and less cattle, to the point that by the fifth year, depending on site, there was not enough grass remaining, because of shade, to justify opening the gate. And then you take the fence down, and you no longer need the fence until you clear-cut and plant pine again.

In this manner, you help the biological community get re-established after a fire, because you're providing shade and humidity at ground level much sooner than you otherwise would. You essentially prevent leaching. In fact, I think what happens is the deep-rooted grasses, as a nutrient pump, is one of the reasons that growth is better the second rotation than the first.

This gets back to a statement made previously, that all of the horror stories that I know of related to tropical soils can be true, in the absence of logical management. But with proper management, the horror stories are not valid, and they simply disappear.

HKS: Did you ever run into a problem where you had more cattle than grass? You had to import hay or something?

CEP: No.

HKS: Because trees were your number one priority.

CEP: Right. No. Because with forty thousand mouths to feed, we never had enough meat. So if there wasn't enough grass, there were plenty of hungry people. So we never had the problem.

HKS: It was growing your own food. There was never any really planned extra meat. This was part of one of the by-products of Jari.

CEP: No.

HKS: Or rice.

CEP: Well, rice, yes. And here again--

HKS: Did you ever think about--

CEP: The meat is not exportable. Yes, you could put it on a boat. But no, American people accustomed to the quality meat that we have here would not masticate enough times to get it down. [laughing] Yes, it physically could be put on a boat. But in general, not marketable.

HKS: I'm sure somewhere in forestry school you read about the controversies of allowing cattle to run free or not on forest ranges, what the damage it did to seedlings. So you must have had some apprehension when you first tried this.

CEP: No, because we had control.

HKS: The grass you knew was preferable for the cows that the seedlings, they wouldn't nibble off the terminal buds.

CEP: Right. The grass is absolutely luxuriant and high-protein, and pine is not. In our case, there were plenty of stumps and trees that did not burn for every head to have its own rubbing post. [chuckling] So the physical damage was not a problem. The other concern, going back to our school days, was compaction. The soils that we're dealing with here have a high enough sand content that they're essentially non-compactible.

Now, if you ran large numbers of cattle continuously, under those conditions you in all likelihood would alter and damage the structure, and in altering the structure, affect the biological community. But we ran such high numbers of cattle for such a short period of time that we didn't have those kind of difficulties.

Wildlife Concerns

HKS: Was wildlife damage ever an issue? I don't know what animals live in the jungle that were significant. I mean, in the States you have elk and deer and all that.

CEP: You're familiar with virgin stands in the Pacific Northwest. They're almost devoid of wildlife. It's a closed system. There's very little sun on the ground. There is very little food. In people's minds, this pristine, untouched environment must be loaded with wildlife. It's not. Wildlife is rare.

We keep hearing this word "diversity," and it's used from every direction for every purpose imaginable. But I have been on site-selection trips where we just take a compass and head out in "x" direction for days and go a hundred kilometers, and cross rivers, swamps, over mountains, just whatever is there in that straight line, because we're trying to determine what is there.

In let's say a fifty-kilometer trip, one might see three troupes of monkeys, and none of the three the same species. The next week, you might strike out on another line in another direction and see one, two or three troupes of monkeys, and none of those three species be any of the three that you saw the previous week. So the number of species is just absolutely startling.

Of course, things that people think about in the jungle, for example, is snakes. In the Jari region, snakes were so horribly bad that I was there thirteen months, in the woods almost every day, including Sundays, and Sundays with the family roaming around learning, was there thirteen months before I saw my first snake. Every strange, unusual snake that you've ever seen in the *National Geographic* magazine exists. It's real. But there are so few in number that it's unusual to see the same one very often. Once I was there for years, and I knew a little more about snakes and understood a little bit more about the habitat and where each lived, then, by knowing and searching, I could see more snakes. But as a casual observer, the only snake that you would ever see might be one sunning in the road.

HKS: You didn't have bird damage to your nurseries. Wildlife damage was not an issue.

CEP: No. In the forest, there's jaguar, there's what we would call here "black panther," there's ocelot, there's tapir, anteaters, deer, there's several kinds of the world's largest rodents, the cotia or agouti, the capivara, paca--most of them good meat. The population there eats essentially anything that moves.

We always had concerns and criticisms based on clearing and destroying wildlife. Our world is much more versatile than people would want to think it is. You can have a horrible disaster, and the environment recovers. Not necessarily in exactly the same way, but in our plantations, whether it be Gmelina or pine, because of the edge effect of roads, so that wildlife have a place to be and the forbs and fruit-bearing plants that would develop wherever light occurs along roads. As an example, the deer population just explodes.

HKS: There is deer there.

CEP: Yes. Wildlife comes back into these plantations with a roar, so to speak. Again, not in the same percentage and the same species distribution, but the numbers, if you counted numbers of individuals, including snakes, the population is several times greater in a plantation a few years old than in a native forest.

Birds that one has learned are attracted to and normally can survive in the upper canopy of the natural rainforest are happy dwellers in the plantations. We don't know enough about it. They may come there and nest there because their natural enemies are not there. They go back and forage in the surrounding rainforest. We don't understand enough of those combinations and inter-relationships and things that happen. But the wildlife is certainly there in large numbers.

HKS: My only experience was a one-day tour of the La Selva operation of OTS, Costa Rica. You could hear the birds calling. It is very exotic and all that.

CEP: The outside concept is that the whole Jari world, so to speak, was cleared and planted to a monoculture. Less than 10 percent of the ownership is in plantations. There are areas set aside for Brazil nut reserves. The timber along streams in many areas is left. And, of course, in a plantation where the objective is an economic return, you don't just start at one corner of the property and start clearing and go to the other. You plant those areas that give you the greatest chance of growth for the particular species that you're planting, and at minimum logging costs.

So when you have a region as diverse as Jari, there are a lot of strips and a lot of large blocks just not touched. That does not mean that there are not large blocks of plantations, because there are. But it's certainly not a situation where you start at one corner and clear everything.

HKS: You read in what I'll call the "concerned" literature about the need to maintain corridors, that animals need to migrate for various reasons in their life history. It's the elimination of corridors that's more devastating to the wildlife than the clear-cuts and so forth, because they need to move around. They wind up in islands, and they can't move to their summer sites or winter sites. Was that part of your management plan?

CEP: You're dealing with a very large region. Yes, there are corridors, but when one thinks of clear-cut and the number of acres that were cleared at Jari, in your mind you see that many acres cleared. Let's make it easy and say three hundred thousand acres are cleared and you're on a ten-year rotation, then only thirty thousand acres is cleared at any one time. We never observed that in, let's say, plantations after the fourth or fifth year, wildlife didn't hesitate in coming in, living, going through.

I certainly don't understand the edge effect, but one of the best places to observe the macaw, which is a large parrot, is on the boundary roads between plantations and the untouched rainforest. Part of that is that simply the rainforest is closed and so high that when you're in the forest it's rare to see one of them. You can be going through and make noise and disturb them, and they leave and make a noise, and you recognize the sound, but you never see the bird.

HKS: Is it worthwhile for us to talk about plans for expansion of the second pulp mill and hydropower? Did that affect the decisions that you were making because you were in phase one, in your mind, or not?

CEP: Well, [pauses] my mind is still clicking on--

HKS: Agroforestry.

CEP: You're bringing up a broader subject that we need to discuss. That subject we started earlier. That subject is related to why we left and why the property was sold.

HKS: Let's talk about that.

Plans for Expansion and the Sale of Jari

CEP: We had planned a forestry expansion and planned a fifteen hundred ton per day newsprint facility and a facility to reduce bauxite to the alumina stage, because we had, as I mentioned earlier, developed a bauxite mine on the Trombetas River. We were going to barge the bauxite to Jari, because Jari would have a source of power.

The aluminum processing facility, the hydro project, the fifteen hundred ton a day newsprint plant was essentially all in one presentation and in one package with the World Bank. From the beginning, the concept was that Ludwig would put in his money to prove that the program was viable. He would determine what the resources were in the region, which we did. We would prove that growing wood on an industrial scale could be done. We'd build a town, hospital, schools, everything. But once all that was proven, then it was time for government to kick in.

So we did all of the planning and engineering. We had the dam site cored, everything to the stage that we had halfway decent estimates of costs. One of the keys in the total equation was the government kicking in and taking up the responsibility of the infrastructure, so that we as a company would no longer be responsible for being mother and father and everything to everybody all the time. I never did feel and

Mr. Ludwig never did feel that it was bad intent on the part of anybody in government, but worldwide occurrences....

Remember at this stage Brazil had gone through and was still in the midst of the horrible economic beating they had taken as a result of the international oil embargo. They had borrowed billions of dollars from the industrialized world for economic development, and for the most part, compared to many other countries, in Brazil you can see where the money went. I mean, it went into airports and education and infrastructure. We didn't get the money back, but you can see where it was applied, at least.

So they were hit with extremely high oil prices because they were importing 92 percent of their requirements. And double-digit interest rates. They were literally on their backs. The compounding effect of those two factors were at their maximum when we were ready to proceed in the second stage of Jari, and the second stage was over a billion dollars. We had meetings with government, the president, various ministers. There was not a single one of them that did not feel their responsibility and there were none that did not want to proceed. But they simply had zero money available and could not see how they could politically survive by applying that much capital in a developmental program when the population in general was going backwards.

It became obvious that if we proceeded we would have to proceed on our own, as we had done from the beginning. The decision was made that it was not logical to do that. Once that was decided, then we obviously dropped negotiations with World Bank and with everybody else, and embarked on a path of selling the property.

HKS: Mr. Ludwig wouldn't approve of saying "What if?" If there hadn't been the oil embargo, it looked feasible. The whole thing could have worked. Brazil would have stepped in according to plan. World Bank would have helped, and so on and so forth.

CEP: Right.

HKS: It was a combination of factors. It wasn't, as one of the authors wrote, "jungle madness" to have been there.

CEP: No. Not at all. There is a Ludwig counterpart in Brazil that I've mentioned. His name was Antunes. He has many holdings, but he is Cummings Diesel-Brazil. He is what used to be Hanna Mining-Brazil. He is Swift Foods-Brazil. He is Scott Paper-Brazil. A long list. He's a major industrialist, and when non-Brazilian companies wanted to come into Brazil and set up operations, he would go in with them. They would bring in their capital. He would own part of the new venture. So all those companies that I named, plus many more, he owned, controlled, depending upon circumstance.

The large-scale pine plantings that we started in the Territory of Amapá belonged to him. He, being Scott Paper-Brazil, being in the wood products business was not foreign to him. He and Ludwig were close friends. His organization took 51 percent of Jari and a consortium of twenty banks, the other 49 percent.

The media would lead you to believe all kinds of erroneous things. Remember that I said previously that Ludwig would put in whatever amount of money of his own that was necessary to get a project off the ground, but the minute that it was feasible, then he would go the normal financing route. So, just in global numbers, Jari cost somewhere in the range of a billion dollars.

The pulp mill was built in Japan at shipyards that Ludwig controlled immediately after World War II, and it was the shipyards where he built the bulk of his fleet. He knew the people. He knew the management. Knew the capabilities. The pulp mill was built at a time that Japan was in tough economic straits, and so we negotiated a Japanese export-import bank loan, because they needed to create jobs, shipyards sitting there idle. So we negotiated financing for the pulp mill, power plant, chemical plants, the whole deal, at low interest rates and zero interest until the mill was running. So interest didn't even start when it was completed in Japan, or when it was towed across the Pacific. Interest started once it was running.

The Japanese export-import bank loan then was guaranteed by the Brazilian National Development Bank. Of course, what I'm describing here is not all of the financing that was done, but it's an example. When we sold Jari, it was a transfer of financial obligations from us to the new organization that was accepting that responsibility. If you go to *Fortune* magazine or somewhere, whatever the total amount of the pulp mill or whatever it costs--say six hundred million dollars--Ludwig lost six hundred million dollars.

If you accumulate all of the so-called losses, his losses were tremendous and put him on his knees. Really, all it is financially is that if you have an asset that you owe a dollar on, and that asset has a value of a dollar, then you have a dollar on each side of your balance sheet. If someone else assumes the liability of that dollar, you no longer have that dollar on either side of your balance sheet.

HKS: Would it be proper for you, or do you have the knowledge of coming up with the real number, in the ballpark, of the loss or the gain or was it a wash?

CEP: Yes, I do. But I won't.

HKS: Okay.

CEP: Ludwig is no longer here. He passed away last year. But I wouldn't tell. I wouldn't want to do that then, nor now.

HKS: It was a billion dollar investment. You're definite about that.

CEP: Let's put it this way: About a billion dollars went into Jari. The pulp mill was considerably more than half, and that was a financing package. There were other financing packages that were also assumed in the transfer of ownership. There were all kinds of financial arrangements.

For example, one of the largest iron ore export projects in Brazil was a company called MBR, and that was jointly developed by Antunes and Ludwig. I guess the only thing I

should say is that at the time that Jari was transferred, there were other transfers of ownership in different companies and organizations, to where no one except probably Ludwig knew the end result.

This is speculation, not fact. But let's say he owned "x" percent of MBR. After the close of the Jari transaction, he owned "x plus." So if you look at Jari in a vacuum, yes, he lost money. But not anywhere--because of the various financing packages and their assumption by the new owners--no, he didn't lose anywhere near what the media would think. And because of various transactions not directly connected to Jari, his losses were even less.

HKS: I'm thinking as an editor here. Somewhere down the road, this interview may be combined with others for publication. One of the issues that need to be addressed are the accusations in the popular media we've been talking about. You have dealt with a large number of those.

At some point, we're going to have to come back to an estimate of some dollar amount. It is still an incomplete story, because so much has been made out of the bad judgment that went into it. You've talked about the oil embargo had more to do with it than anything else. And all the rest of it.

CEP: I contend that there was very little bad judgment. When you look at it from a standpoint of a banker lending other people's money, then perhaps you'd say it's bad judgment, because we had all the facts available that day, but it was still no facts. You had to learn as you went. I do things today based on a hunch.

I have a small company that occurred as a result of a conversation one day with my local banker. I did no planning. I did no budgeting. I did absolutely none of the normal things that one would do to establish and determine if you should embark on this new endeavor. That is the only company I've ever owned that has been profitable from that first day to this, and it's been fifteen years. I followed zero of normal business practices in doing that.

Let me say it this way: The bulk of the criticisms against Ludwig is that he was an individual, who expressed himself. And you're not supposed to do that. You're supposed to be pigeon-holed, and you're supposed to fit a pattern.

HKS: And you're supposed to be able to be interviewed. He was reclusive.

CEP: That's right. Now, to give you an insight into maybe the way he thought. You've seen the *National Geographic* article. After the last *National Geographic* article was published, a *National Geographic* person--and I won't call the name--was in our office. He said, "You know, it's a fabulous program, and we appreciate you having us here." We spent a tremendous amount of management time and money providing everything they wanted, whenever they wanted it, so they could do a *National Geographic* kind of story.

And he was expressing his appreciation to Ludwig for having done that. He said, "But I really don't understand how you can justify pouring that kind of money into an

isolated region and in a country that you may wake up one day and they have just nationalized it and taken it away from you."

Without hesitating one second, he said, "You must realize that in Brazil that company is mine, and we pursued the ideas that we have. We're doing our absolute best to develop the region because we're convinced that this region, which contributes relatively little today, can make a significant contribution to mankind, and we have the freedom and the ability to pursue those concepts. Yes, it is my money. And yes, it is a risk. And yes, we may wake up one day and it's been nationalized and it's gone. But when that day occurs, I'll know it. And knowing it, I will simply go somewhere else and do something else, because the situation will be defined."

He said, "Contrast that to this country, where you do not have the freedom to pursue these kinds of ideas. You own a company. You're responsible for it. But you do not run it. Government regulations, from whatever agency, of whatever form, decide who you can hire, what you can pay, what you can or cannot do, so that one's economic and mental capacities cannot be expressed. So here you're responsible. You pay taxes, and you don't control it. I choose the other."

HKS: What did Mr. *National Geographic* say to that?

CEP: Nothing.

HKS: Nothing.

CEP: It's hard to respond to.

HKS: Yes, I'm sure it is.

CEP: Because it's so true.

Leaving Jari for New York

HKS: You left Jari apparently in '75, and the sale took place in '81. Why the gap? Why didn't you stay till the end?

CEP: I was forced to leave.

HKS: Oh.

CEP: By '75, '76, we were at the stage that we knew we were nowhere perfect, but we knew beyond a shadow of a doubt that biologically we could make it work. And so it was time to start the industrial development stage. He came down one time. Of course, we talked about it all the time. But he said, "We have to move." He said, "Who do you know that we can get to plan the industrial stage so that it matches what we're trying to do here?"

He said, "Sure, I can pick up the phone, and I can call Brown & Root. I can call whatever worldwide engineering firm and tell them what I want to do, and they'll take my money and do what I say. But," he said, "I really don't want to do that."

We said we'd work on it. Well, in like a month, he came back and he said, "What's the decision?" I said, "Haven't come up with anybody yet." He said, "You do it." I said, "Look, one of the promises you made when I came to work with this organization was that I would never, under any circumstance, be forced to move to New York City. I'm not interested in changing that promise."

This is one of his abilities of controlling and forcing people. He said, "Fine." At that stage, he didn't say anything. But when I took him to the airport, he said, "Fine. That's your decision, and I respect it, and so whoever I hire and cram down your throat you have to live with. And however they mess up Jari, you have to live with it." I said, "Well, okay." So I moved to Connecticut. Until I left Jari, there was no State-side structure or organization associated with Jari. There was Mr. Ludwig, and yes, everybody in the New York office knew about it, and yes, New York purchasing purchased things on our behalf, and so on. But there was no structure related to Jari.

Once we moved into the industrial development stage, then there had to be structure. When I left, I was still responsible for Jari and responsible for industrial development.

HKS: Was this when you became vice president for the forest products division?

CEP: Yes.

HKS: Okay. Which was Jari, or were there other forest products operations worldwide?

CEP: No. Now, here I am, a forester. Yes, I had had tremendous and probably unequaled opportunities in management, politics, legal, because as manager of Jari, because of his ship's captain mentality, you were legal, political, social, everything, and because of the mining projects and other exploration projects, I had those kinds of experiences, too.

The mining project on the Trombetas had a mining engineer as project manager, but supply, all support, was through Jari. There was just no way to describe or imagine the kind of experience for a young guy. Of course there were a lot of young guys like myself. Whether it was financial or whatever, we got it all.

But still, here we are, entering an industrial development stage, and I'm responsible for it. Yes, I've seen a pulp mill. I've been in pulp mills. I know the paper-making process. I know the chemistry of it. But that's it. So pulp mill, chemical plants, the whole shmear.

I mentioned that one of the means of survival in the organization is knowing when to do, yourself, what he says do, and knowing when to--knowing your own limitations and hiring and getting help in carrying out the objectives that he gives you.

This is probably a spot to step sideways a moment and discuss participation, including contributions, of other organizations. As I stated earlier, this program was not done in a vacuum, as many people assume.

Joint Ventures and Federal Constraints

CEP: Early on, one of Ludwig's objectives was to have a knowledgeable, experienced, joint venture partner. He did not want to force himself, and us, in a position where we started a world-class manufacturing facility in a vacuum. He previously knew Weyerhaeuser people, and he and George Weyerhaeuser became friends. As a result, we had Weyerhaeuser people living with us for a significant period of time.

Yes, we taught them a lot, but they also taught us. Now, on the average, let's say we had a John Welker, who was fresh out of school with a masters in economics, a brilliant kid. But he's a kid. And Weyerhaeuser in general, when they were sending people to visit us, they were not sending kids. They were sending experienced guys in silviculture, in forest management, in planning. So yes, John was responsible and he had the basic education required to do his job, but not the experience.

But here sat a Weyerhaeuser guy with maybe fifteen years experience, maybe thirty, who was delighted with the opportunity of sitting up till three o'clock in the morning every night discussing technical things with this young guy. So the program with Weyerhaeuser functioned both ways, and because the Weyerhaeuser program came to an end before they got their share, so to speak, the relationship was one-sided, and we got more from Weyerhaeuser for our young guys than Weyerhaeuser got from us.

Now, they got plenty from us, but because of the way the world turns, they were not able, or decided not to, proceed down the tropical path. What they learned from us was not utilized. The moment it was occurring, they were giving and we were giving. It just happened that they didn't get to apply theirs.

HKS: Had they pulled out of Borneo by the time they were talking to you, or was that all happening at the same time?

CEP: Same time.

HKS: Okay.

CEP: The reason some of the people were available to us is that they were leaving Borneo at the time. So Weyerhaeuser was with us during let's say the second half of the forestry development phase. The first half we were by ourselves, but the second half Weyerhaeuser was with us.

About the end of the forestry development stage, the program with Weyerhaeuser ceased, and Crown Zellerbach came in. Remember I stated that Reed Hunt and Ludwig were friends.

HKS: Right.

CEP: Reed Hunt was Crown Zellerbach. Crown had what they called a central engineering group based at Boeing Field in Seattle, and when they decided to build a pulp mill, they designed their own mill. When they decided to build a plywood plant, they designed their own plant. So Crown had their own central engineering to cover everything, all manufacturing facilities, that they built.

When Weyerhaeuser left the scene, Crown forestry came in, and Crown facilities planning came in. This is not to say that we did not have Weyerhaeuser facilities planning people, because we did. But during the Weyerhaeuser stage with us, it was a long-range planning and what-if's for the future. When we were with Crown, it was real because the wood was there and imminent, and there had to be facilities to utilize it.

During this search stage, when Ludwig was trying to find a joint venture partner, we dealt with Weyerhaeuser, with Crown, with Continental Can. With Continental Can it was probably no more than a two- or three-month learning relationship with each other, and they bowed out. We worked with Boise-Cascade in much a similar situation as Continental Can. It was a few-month learning period, and then we stopped.

When we went through all of the forest products companies that we were interested in, and none of that worked, then we started on other companies, including Standard Oil. We worked with Standard Oil probably six to eight months. We worked with ARCO, and we worked with Gulf.

Here's an example of how things that occur in the world alter situations, but I think the first oil company we worked with was Gulf. We were at the stage that all data had been presented, all discussions were complete, and the yes or no joint venture subject was scheduled at the next board of directors meeting, and everything we knew at that stage was that it was a done deal.

That very board of directors meeting--and I don't remember whether you remember this historically or not--but that very board of directors meeting is when the subject of payoffs in international business came up, and the president and chairman, Bob Dorsey, was--it was claimed that he had made payoffs. There was so much turmoil that our subject never came up in the meeting. I don't remember if it was plea bargain or whatever, but that case was essentially the beginning of the large-scale attempts by U.S. government to stop, control, whatever, activities in international business that were deemed to be incorrect, unfair or whatever.

HKS: What was at issue? Lack of regulation caused problems.

CEP: Today, if I were to get back in, which we are in international business, but if I were to get back in international business large-scale, I would not darken the door of any U.S. bank. I would go to an international bank based in the U.S. I'd go to San Francisco, I'd go to Houston, I'd go to Miami.

Because U.S. banks are regulated to the extent that they have no possibility of competing in the international marketplace. Let's say you go back ten years, the largest

banks in the world were U.S. banks. I don't know the exact number, but probably the largest U.S. bank today is probably eighteenth on the list. Now, why? It's because of federal regulations that prevent U.S. banks from competing in the world marketplace.

It's so severe that many giant U.S. banks don't even have the know-how anymore to function in international trade. The U.S. Treasury control is so severe and complete in all forms of documentation that, I mean, in American culture and American mentality, it may be correct and fair by our standards. But by the way the world functions, it eliminates U.S. from the competition.

HKS: So an American company like Weyerhaeuser wants to get involved overseas. Is it free to go to an international bank, or does that somehow look like it's a shady deal? To avoid U.S. regulations.

CEP: It would appear to be shady.

HKS: Okay.

CEP: It has a devastating effect on U.S. companies dealing in international trade. [pauses] I'm trying to think of an example. The U.S. Treasury feels that it is responsible to guarantee that Sri Lanka receives its fair share of income from the goods produced in Sri Lanka. So if an unfair price is paid by a U.S. company to a Sri Lankan organization, it's Treasury's responsibility to prosecute. And then it is the U.S. company's responsibility to prove that it's innocent.

As an example, Brazil has a minimum export price on all goods exported from Brazil. That is Brazil's decision. But if that price, established by the Brazilian government, is determined to be unfair in the international marketplace, and you're a U.S. company and you bought it, you're at fault. You get slaughtered by some U.S. agency. So international trade for U.S. businesses is an absolute nightmare.

To continue down this path. We worked with I don't even know the number of companies, searching for a joint venture partner. Almost without exception, everyone wanted to join us. This is my description of why it never worked. From the beginning I told Ludwig that it was futile. We could do it and yes, we could learn something from all of them, which we did. But with his personality, the only way that we could participate with any of these people and reach the objective that he was after in a joint venture was for him to accept a minority position. Almost everyone--Weyerhaeuser, Crown, Gulf, Standard--anyone that we went through the complete procedure with, wanted to do it.

A chief executive officer of a company held by stock-holders was enthralled with it. He was intrigued, delighted, excited with the adventure, but when he came up to the trough, the reality would hit them that they are joining forces with an, in their minds, unpredictable person who, two days after they signed, would decide to plant half of Africa and would drag them by the tail wherever. It simply would not work.

So there was no means to structure an agreement whereby a privately-held, strong-willed company could marry a stockholder-held organization. Because of the magnitude

of what we were doing, the importance of what we were doing--we could get people to the trough, but they couldn't drink.

HKS: Why were Gulf and ARCO interested? Because they had a lot of cash to invest? They wanted to diversify? I mean, there was no ultimate energy production involved, was there?

Early Work with CZ

CEP: They were interested for two reasons. During this stage, they had liquidity. But they also were in the energy business, and the project at Minas Gerais that I had mentioned, which was very large-scale alcohol production, was of interest to them. The várzea where we had developed the rice project, ARCO specifically was interested in a large block of várzea for sugar cane for fuel production.

During those years, because of liquidity, they were interested in diversification, so the total package of alcohol production for fuel, forestry, aluminum. They were interested in that magnitude of package and that kind of diversification because all of it was natural resources.

Now, with Crown Zellerbach, we had the access to their forestry people and facilities planning, engineering. To drop back in history again, Ludwig and Reed Hunt, back in the I believe late '50s, envisioned and did the initial planning on a floating pulp mill. I mean, when we built the floating pulp mill in Japan and took it to Jari, people thought that was the beginning of the idea. It was not at all, because Ludwig and Hunt conceived of and did initial planning on a floating pulp mill I think in the late '50s, to sit off the coast of Honduras and utilize the pine of that region.

Because of political occurrences, they never did do it, so when it became time for us to plan facilities, those initial ideas and concepts and plans were simply pulled out of the drawer. It was a '50s concept, not a '70s.

HKS: The advantage was that you could manufacture it under first-world conditions, with labor and supply and raw material supply, as opposed to building it on site?

CEP: Right.

HKS: Difficult.

CEP: Right. Now, to build it on site, we would have had to have built an additional town for all the construction workers, and you're building under adverse conditions instead of ideal conditions, and a complete package facility--with pulping, power, chemical, everything--built on site, in a completely isolated region, is not easy.

Doing what we did--building towns and railroads and bridges and clearing and planting--is one thing. We did build a kaolin refinery under those circumstances, but the first kaolin refinery is like a ten million dollar adventure in isolated conditions, compared to six or seven hundred million. So yes, we did it small-scale, but to attempt

that in an isolated region--and when I say isolated, I'm talking fifteen hundred miles to the nearest industrialized anything. And fifteen hundred miles to two thousand miles to the nearest engineer that can help with anything.

HKS: So Belém is just a place on the map. There's nothing really there.

CEP: It's a city of about, at that time, about a million and a quarter. But it is a city based on a gathering economy. It's not an industrial city.

HKS: I see. So Rio was the next industrial town.

CEP: And Rio is a political play town, and not industrial at all.

HKS: Caracas. Where was your--

CEP: Sao Paulo.

HKS: Sao Paulo.

CEP: Which is further south than Rio. So if you want a water pump, it comes from Sao Paulo. If you want plastic pipe for plumbing, it comes from Sao Paulo. The combination of factors, and the fact that financing was available through the Japanese, it was a shipyard where Ludwig had built all his ships, it was.... And the difficulties of doing it at Jari. It was a monumental undertaking, but it worked.

All of the initial engineering was done by Crown. Essentially we built a mill that was a carbon copy of an existing Crown facility. It's no longer Crown today, but it was an existing Crown facility. So we weren't trying new concepts. It was a mill that had been running for years and yes, where they knew there were problems, there were improvements. So the mill was absolutely modern, up-to-date. But it was not a wild guess deal out in the jungle.

Outside Help

CEP: To carry this another stage, once we realized that we were not going to have a Weyerhaeuser or a Crown with us, then another employee and I--his name is Gordon Douglas, who is from Vancouver--went to Finland and developed a relationship with a Finnish company. We signed an agreement whereby that Finnish company would come live with us during construction and startup, and train all of our Brazilian employees.

So we sent shiploads of Gmelina to Finland. We hired all of our mill operating people and management, and sent them to Finland. So they had the mill startup, with Gmelina, in Finnish mills, with the supervisor that was going to accompany them back to Brazil. So at startup time, we had a complete complement of some of the best, if not the best, pulp people in the world running our plant.

And they stayed there. It was not a given date that they would leave. It was man-by-man, section-by-section, so that if the Finnish guy responsible for the digester said,

"Look, this Brazilian guy, he's fabulous and he's learned everything I know, I'm ready to go home."

The Finnish contingent left one-by-one, rather than en masse on a given day. I don't know all the mills anywhere, but I know that our mill's startup was probably--even though in its isolated condition--one of the easiest and the quickest startups in attaining of capacity of any mill around. The mill has been operating above capacity ever since.

Then, on marketing, we went to a London worldwide marketing firm, called Price & Pierce, and we contracted with them to do the marketing. We blood-and-gut dreamer pioneers of Jari knew better than to try and start up a pulp mill on our own hook and knew better than to try and do world marketing. Independent, new company, no one ever heard of you before, no one ever heard of the fiber before, and pulp is a commodity.

One of the reasons that it has functioned efficiently since day one is that the market existed because of Price & Pierce, and the quality and quantity has been good because of the Finns.

HKS: The time is often blurred in these articles I've read, so I don't know if this is before or after the sale, but Jari imports 15 percent of its wood supply from southern Brazil. The local supply of wood was inadequate, and apparently 85 percent of capacity was reached by the local supply. Was that during your time?

CEP: Let me come back to that.

HKS: Okay.

CEP: This gets back to the previous question. Yes, I left Jari in '75. I left the organization in '81. So after startup, after sale of Jari, and after sale of much of the assets of Mr. Ludwig worldwide, then I left.

HKS: That's a question I was going to ask you. Off tape the other night you mentioned, you said, "We recommended." It sounded as though you were part of the recommenders to Ludwig to go totally liquid. I thought it was in the '60s when this happened. You're saying now--please clarify that.

CEP: No, this was '80s.

HKS: '80s.

CEP: Yes.

HKS: The assets were being transferred to his clinic, to his facility in Switzerland, the cancer research institute.

Swiss Institute

CEP: One of the things that probably hurt Ludwig more than all occurrences in the years that I was involved was the foundation situation. The subject of organization and structure was always on the table and could never get resolved, and because it couldn't get resolved, the only alternative was a foundation and elimination of all of his operating assets, and to turn those assets into paper assets that can be managed in an office and does not require Ludwig.

So those kinds of discussions were around and ongoing from the day I got involved. He and everybody realized the problems and importance of it. His hope and dream was to establish a U.S. foundation. At the time, it would have been probably the largest U.S. foundation in existence, and a free gift. Guess what? Our government would not accept, would not allow the American people to accept a free gift.

The bulk of his assets were worldwide. So a coal mine that he owns in Queensland is an offshore asset. He may take a dollar from that, and put it into an office building in Honolulu, whatever he wants to do with it. And so, a dollar he makes on that coal mine--I shouldn't have said Honolulu, because that's U.S. But a dollar he makes on the coal mine, put into an office building in Sydney, is not taxable in the U.S. But when he sells all of these assets and brings those dollars to the U.S. to establish a foundation, it's all taxable.

HKS: Aha. I see the problem.

CEP: So you take billions of dollars in assets and bring it to the States. There's nothing left for a foundation. That was fought and fought and fought. So one of the hardest things he had to do was admit that he could not give to his own country a gift. It had to be offshore. And that is a terrible comment on our system. But there was simply no way around it.

HKS: The articles I've read said the Brazilians had a real problem at Jari because it was going to be owned by an outfit in Switzerland. And this bothered the Brazilians.

CEP: That's a figment of the media's imagination.

HKS: So the problem was really Ludwig's personal problem in terms of what he wanted to do, he wasn't able to do. But in terms of Jari, it didn't have an impact.

CEP: No.

HKS: Okay.

CEP: Bottom-line decision point on the subject of Jari is social responsibility and the government's inability to pick up and carry the load that they had agreed to carry.

HKS: So he picked Switzerland, because obviously the tax situation is more advantageous.

CEP: Correct.

HKS: And it was dedicated totally to cancer research, this foundation? This is what I've read.

CEP: Yes. Funds from the Swiss foundation can come into the U.S. to U.S. organizations doing cancer research, and not be taxed.

HKS: Oh, I see. So they're not doing research in Switzerland. That's just where the money is. That was never spelled out.

CEP: So it's Swiss simply because the asset base can be in Switzerland without being taxed, and therefore the revenues can be distributed worldwide to other foundations without being taxed.

HKS: Okay.

CEP: But if you put a U.S. type tax load--state, federal, everything else--on a gift coming in, then the money left that can be distributed for medical research is diminished dramatically.

Okay, you asked a question, and I went back and veered back into the past.

Living and Working Conditions and Isolation

HKS: Is there more on living and working conditions?

CEP: Very rapidly, we established the basics of a nice place to live. From a standpoint of medical facilities, water, sewage, roads, supermarket, communications, today essentially are there. And has been for a long time.

But the limitation for people being there is isolation, not things. At first, we had almost nothing, a cleared spot on the edge of the riverbank and a supermarket, a shed, and a lot of times not even a doctor on the site. On my oldest son I can show you four scars--he was a kid that was afraid of nothing, so he was always getting beat up and hurt--where his daddy sewed him back together, and his mother was unhappy with the sewing job. Those would always happen at times when there was no doctor there.

Even when physical conditions were bad, compared to when physical conditions were good--with swimming pool and movies and everything--I could detect no difference in the attractiveness of the place or ability to hold people. Isolation was the problem, and isolation is the same whether you're living in a shack or a mansion. It may take a few extra days for isolation to get a hold of you in prime surroundings, but if you're susceptible to it, it still gets you.

This gets back to the thing I said about if you have to have your hair fixed every week, it won't work. So you're there. You have freedom of movement. On Sundays it was a

going thing for almost anybody in management that had access to a vehicle to take their wife and kids and go to the end of the road. Because we were always building roads, you could go a kilometer further this Sunday than you went last Sunday. But still, you couldn't get out.

The road might be a kilometer longer, but it was still jungle at the end. The feeling and the concept of isolation affects some people much greater than others. Even with prime world-class physical conditions, some people can't survive.

HKS: There's no way to know in advance.

CEP: There's no way of knowing in advance.

HKS: If you never had that experience.

CEP: Right. To me, I got on the airplane and went to Belém when I actually had to. If somebody took a switch and ran me off, I went to Belém. But I would much rather be in the jungle than in Belém, but most people are the opposite.

It depended a lot on husbands, also, in that if the husband could not realize what his wife was faced with, they didn't survive. If he realized that, while he was out beating the bushes and learning and seeing all kinds of things and having all this tremendous challenge, she was staring at the same four walls. If he couldn't grasp the significance of that, they didn't survive.

HKS: Much like the early settlers in Oklahoma. The husband was farming; the wife was in the house. No neighbors to talk to.

CEP: Right. It's exactly the same. On occasion, I would see stress developing. Understand that men will get so tied up and so challenged that nothing else exists. I mean, they don't write their momma back home. They come in at night dead-tired, and their wife is there, and they say, "Hi" and take a shower and go to bed, and get up at four the next morning. They know they're married, but she doesn't exist.

Yes, they love their wife. But they never dreamed in the wildest dream they ever had that they would ever be able to participate in something like this and have such wide-ranging responsibilities and be able to allow their professional mind to expand at its rate of capacity rather than at an organizational rate, or be pigeon-holed.

This was one of the responsibilities of my wife. When she would detect those kinds of things developing, she would advise me. It normally did me no good whatsoever to tell an employee that he needed to take a few days off. You might get a response, "Sure," on his way out the door to go have his fun. On many occasions I would arrange something for them and tell the wife, and the guy comes home one night and she's so excited because he's taking her somewhere, and he doesn't know anything about it. But then it hits him that something has happened, and she's all excited and stirred up, and there's no escape. He has to go. [laughing]

HKS: Is it part of the compensation package a plane ticket to the States once a year? Or some such thing?

CEP: You had a month's vacation, if you were non-Brazilian. You had a month's vacation in the States every two years. If you were Brazilian, you had a month a year.

Inside Brazil, we were always limited on space on the airplanes. You'd go on a boat any time you wanted to. But you normally could go to Belém once a month for a weekend. You'd leave Friday afternoon and come back Monday morning. But some people, including myself, didn't use the once a month to Belém and didn't want to. Some people needed it every other day, which means that they didn't survive.

HKS: A few Australians I know have a sense of isolation. Even though they can go places and everything is there you could possibly want, it's just that they are so far away from England or whatever they identify with, it's a problem.

CEP: Yes. I think anything you could ever want is in Brazil. Somewhere. But for most people, it's two thousand miles away.

Agricultural Crops

HKS: The speculation that the world had of Jari was that it was an experiment to see if development would work in the Amazon. Somebody wrote that 70 percent of the Amazon could be developed. I don't know what the other 30 percent is. Too mountainous or something. In a sense that was Ludwig's plan, too.

CEP: Well, they're probably assuming that the part that can't be developed is savanna or várzea. But contrary to what most people think, probably the best and the most suited and easiest land to develop for agricultural purposes is várzea. Generally--and this is one of the concepts that is used that is not very valid--agriculture is not one of the ways to develop the Amazon.

We spent I don't know how much money--low millions--in trying to develop agricultural crops. Cotton is a tree, and it's native in the Amazon. We have taken this tree and genetically reduced it to a little bush that can be managed on an agricultural basis.

HKS: I didn't know that. How about that!

CEP: There are cotton trees at Jari, and we tried to grow cotton. And yes, you can grow cotton. But when you have sufficient moisture year-round and no dormant season, by the time that it decides to flower and provide some cotton, you have a tree.

The problem with soybeans. We grew soybeans. You can produce some of the most fabulous soybean plants the world has ever seen. But plants are triggered to flower and reproduce, produce seed, based upon environmental circumstances. Of course, a lot of activity in plants is controlled by photoperiod. So if the mechanism of photoperiod for a given plant doesn't occur in the tropics, it doesn't flower. If you're growing forage for cattle, you can produce tremendous amount of vegetation in soybeans, but you don't get much of a seed crop.

The standard thing that you see on TV is land-clearing, burning, and then big agricultural tractors preparing the land, and somebody growing soybeans. Rest assured that that's not in the Amazon basin.

HKS: It's farther south.

CEP: It's south. A horrible comment, and one of the things that as a newcomer to the Amazon was extremely difficult for me to believe, but in the market in Belém, you can get fish, herbs, and everything you can imagine, and fresh fruits and vegetables, and whatever. Guess what? They're grown by Japanese in southern Brazil. Every airplane daily flight had fresh fruits and vegetables that we bought in Belém, but they came from southern Brazil.

There's cashew, there's banana, there's pineapple, there's papaya. There are all kinds of fabulous and delicious and nutritious foods in the Amazon that native people eat and that I prefer above anything else. But in terms of foods that most so-called, quote, "civilized" people eat, they're not grown there. Growing almost anything there is extremely difficult.

We grew fryers so that we had chicken. We produced bananas, papayas, all kinds of things for people to eat. Of all activities that were the most miserable, it was trying to produce vegetables for the table. We had tropical agronomists hired specifically for that purpose, and never really succeeded. Yes, we could occasionally get a tomato. And yes, we could occasionally get a leaf of lettuce. But--

HKS: Is that world-wide on the Equator? The problem because of photoperiod?

CEP: Yes. That's not the only reason. Things that we normally consider as necessary food items are not tropical plants. They did not originate there. They were not selected and bred to function in that kind of environment. So for people to have fear that the Amazon is going to be cleared for large-scale agriculture is not valid. I mean, even if there were varieties suitable, the soils are not suitable.

Rainfall is a horrendous problem. Name me anyplace on the face of the earth, including valleys in California, where tremendous volumes of foods are grown. They irrigate, but they would have a wipe-out if they had a hundred inches of rain. I mean, a hundred inches is an inch every third day.

So you have horrendous pathological problems with almost any garden plant. The only way to get a tomato is that there are distant relatives of tomatoes native to the Amazon. The fruit on them is not edible. The plant is thorny. It's a very unlikable plant. Because they're related, you can graft a tomato onto the root stock of that plant. That plant you can graft on is taking the brunt of the attack of the natural world of pathogens and insects and whatever, because it's in the ground, and the part that's producing the tomato you're after is the aerial part of the plant. So you have a much better chance of getting a tomato.

But the problems with agricultural production as we know it today are so daunting that there are too many other places in the world that it's too easy to grow something to eat on to mess with the Amazon. And yet people think it's the opposite.

HKS: What is the potential for developing the Amazon for the Brazilians, other than what's going on: land clearance for small-scale agriculture?

CEP: The natural forest itself produces a tremendous volume of items that are usable.

HKS: Non-wood items you're talking about.

CEP: Well, wood and non-wood.

HKS: Okay.

Forest Clearing

CEP: A lot of activities that we are involved in are either collection activities, which follow the native pattern.

I think there is room for additional Jari's for mass fiber production for the world, which creates lots of jobs. I'll give an example. The region that we operate out of mostly is called the Island Region in the State of Para, centered around the small towns of Breves and Portel. There's been a plywood plant in Portel operating day and night for at least thirty years. I don't remember exactly. There are shiploads of material, of sawn material, leaving that region every month, going worldwide.

I can take you on an airplane flight of the region, and you point the direction, go anywhere you want to go, and, with the exception of small clearings of families growing something to eat, you can't tell man has ever been there. It has been logged, at one rate or another, ever since the Dutch got there in about 1620. For a, quote, "environmentalist" from an office building in San Francisco to fly over it, he'd say, "It's a good thing we kept people out of here."

HKS: It reminds me of a comment by Harry Morgan of Weyerhaeuser. You must have met Harry.

CEP: Yes.

HKS: He was puzzled by all the things he saw on television because he said, "You can fly all day in the Amazon and never see the ground. All you see are trees."

CEP: I used to fly quite frequently, all the time we were dealing with Weyerhaeuser and Crown. My normal flight pattern was Belém, Manaus, Bogotá, up the coast to Seattle. You can get on a flight in Belém. As soon as you gain altitude, you're away from the clearing that one would anticipate around a major metropolitan area, and you've got five-and-a-half hours, straight-line, non-stop to Bogotá, and you won't see another clearing until you let down in Bogotá. The first day that I went to the Amazon in '69, it was all going to be gone in ten years.

HKS: You read the statistics. A clearing the size of Rhode Island every twenty-four hours. Numbers like that. You see that.

CEP: I don't have any means of contesting that number. The difference is that what's cleared does not remain cleared. And yet, in the numbers that are accumulated, if it's touched, it disappeared and it's cleared forever. I can take you to places that, to a casual observer, has never been touched and never been cleared. And once you've decided it's never been cleared, I can do some digging around and prove to you beyond a shadow of a doubt that it was cleared and burned. Yet that area that you would accept as never having been touched is in the acres that are cleared and barren and eroded.

HKS: That *Science* article that I showed you deals with some of that, using Landsat imagery.

CEP: There's a large difference between the agenda that some people have, and reality. That is not to say that problems do not exist, because they do. But like I said earlier was what we as an industrialized world need to do is quit crying about the mistakes that in reality did occur, and turn those mistakes around to create jobs to minimize the people out in the jungle clearing it. Yes, those large-scale areas in several lifetimes will not be a climax rainforest. Today that's a given. But take advantage of that, instead of just crying about it. I mean, let's do something, and turn it into a usable resource that creates jobs.

What's happening today in regions that I'm most familiar with, what's happening today is that jobs are being eliminated. People who did work and have a cash income are fading back into the jungle and beginning to clear land again because they have no alternative. That's a direct effect of activities of people who think they are helping, and they're damaging.

I probably should give an example of what happens when people who do not understand the situation are intent upon helping and forcing their attitude and their concepts upon other peoples. This is kind of a standard thing that happens worldwide. But until just recently, the region in which we operate in Brazil had no clear-cuts, with the exception of shifting agriculture by families who were growing something to eat.

There's so much pressure on Brazil by World Bank, IMF, this environmental group, that environmental group, that they physically have to do something and provide evidence that something is being done. In the kind of operation that GP used to be involved in, which is a gathering operation--GP's operation over thirty years never clear-cut the first acre. They were buying logs from individual people who live on the land over a seven hundred mile radius.

A guy needs some medicine for a kid, and he goes out and chops down a tree, and he floats it down the river until he finds somebody who is accumulating logs, and he sells it to him. It's a gathering kind of economy. But there's no way to measure it. There's no way to prove what is happening. A log sitting in the log pond. You pick that log right there. Where did it come from? There's no way to prove that it wasn't stolen.

There's no way to prove that it didn't come from a clear-cut, although if you get an airplane you can't find a clear-cut anywhere, and so that log is bad.

Silviculturally, there is no way to develop and present a beautiful package based upon selective harvesting. Yes, we go out and we cut down a jatoba tree. You can count and identify fifty young jatoba seedlings that are going to take its place. Now, what is the logic of following the law and going out there and planting five jatoba seedlings among fifty that are already there. But that's what the law says.

You cannot show under a selective harvesting system that has functioned for centuries within that region, you can't show how much was spent on silviculture, on how many employees were involved in management of the forest, anything else. It's a natural system.

In order to prove that things are being done properly in our region, clear-cutting projects have been approved and the land is in process of being cleared, because you can have a plan. The book is two inches thick, and it's got color prints and computer-generated graphs. And organizations love it. You can show the number of people employed in planting that clear-cut block, the number of people employed in growing the seedlings, the number of people employed in beating down the brush to allow those seedlings that were planted to grow. You can show the annual growth rate. Everything in a nice package, that these people that I'll call "wailers" require.

They, in their attempts and in reality honest desires to stop clear-cutting and improve conditions for those people, are through bureaucratic processes creating exactly the thing they are trying to prevent.

HKS: Interesting.

CEP: We can't gather up and take everybody to the Amazon. I have done it on four occasions. About three years ago I hosted a group from Stanford, and some individuals who were developing educational films to be used in the U.S. to try and help U.S. teachers and U.S. children to understand the relationships. Those are tremendous experiences, not only for me but for those people who are absolutely awestruck with the difference between what they knew when they got on the airplane in San Francisco, and reality.

But how do we educate enough people so that the truth is known and so that the money and efforts can be beneficial instead of detrimental? I don't know the exact figures, but California school kids have activities to raise money to buy an acre of rainforest. An acre of rainforest is about three thousand dollars. I can provide you all of the millions of acres of rainforest you want for probably less than a dollar an acre.

Where does that money go? It goes to BMWs. It goes to a beautiful home on the coast. It goes to where I do not know, because in my twenty-something years in the Amazon I have not seen the first dollar. There's plenty of money out there. There are plenty of people who would give, and are giving. There are plenty means to channel that money in the right direction to reach the objectives desired. But it's certainly not happening.

There's such a void between reality, what I'm calling reality, and what people who listen to media and have never been there think, that there's no communication. I can go give a presentation. In fact, I was invited to give a presentation recently at an international business forum in Tulsa. They asked me to provide an outline of what I would say, and I said, "Basically, I'm going to present concepts that are contrary to what you already know." They canceled the presentation, because I'm so biased that there's no reason to come.

If I went to a senior ecology class at Stanford, I couldn't tell the truth, because the truth would be so biased that it would be non-acceptable.

HKS: If you were invited to come to a conference that deals with sustainability or biodiversity or whatever, would you read a paper? Are you interested in being invited?

CEP: Well,--

HKS: As a way of getting your story out.

CEP: Yes, and I have. But, unfortunately, and maybe I could change my mentality. People who know everything based upon nothing stretch my patience to the limit in five seconds. I have a horrible time tolerating them.

Ludwig the Man

HKS: The way of the world. Let's return to Ludwig the man.

CEP: Ludwig's wife is named Ginger. She was a red-headed Irish girl just slightly younger than he. She controlled his life much more than anyone dealing with him on a daily basis would imagine, because you would think no one would control his life. But any Christmas present, birthday present, anniversary present that she ever gave him, he'd grumble about it, wasted money. He didn't need another shirt. He'd take it to the office and have someone return it and get his money back. If you have thirty shirts in your closet, you only wear one at a time, what's the logic of another one? Obviously, if he needed a shirt, he'd buy one. But to spend money on a shirt when you had thirty simply did not fit his pattern of thinking.

She was participating in the building of a children's home somewhere in the region. As I understood it, not far from their apartment. She and he were contributing the landscaping. After dinner one evening on his birthday she took him by the arm to show him the progress they were making in landscaping for this children's home. They go out into the area being landscaped, and she said, "Here is your birthday present." It was two truckloads of chicken manure to be used in establishing the plants. She said, "If you don't like this present, you take it back yourself."

HKS/CEP: [mutual laughter]

HKS: Did he have a sense of humor?

CEP: Yes.

HKS: He got a kick out of that, I'm sure.

CEP: That one was so delightful to him that he relayed that to all his friends.

HKS: That's interesting. Was business really all he had in his life?

CEP: Socially he mixed with the Reagans. Clark Gable was one of his closer social friends. Socially he enjoyed the fact that he had power and could associate with those people. What do you call it, the Bohemian Club?

HKS: Yes.

CEP: Where these powerful guys occasionally get together. Well, he was part of that group. But socially, he was definitely more business than anything else, and his social activities were, in one form or another, really related to business.

HKS: But if he liked Clark Gable he didn't buy a movie studio or something.

CEP: No, no, no. Let's say he was trying to get a large U.S. corporation interested in a mining or oil or whatever kind of venture on the other side of the world. He would call the chairman, and the guy would already know about the program and be following it. Ludwig now has it to the stage that it's time to go big-time in development.

He calls the guy and says, "We're ready, and we need to go look at it and really determine if you're interested in participating or not." The guy says, "Fine. I'm ready to go." Ludwig says, "I'll meet you at the ticket counter in New York, and we'll go together, and we'll discuss it as we go. From there I need to go"--let's say they were going to Africa--"From there I need to go to Brazil, so we'll part company in Nairobi."

The guy knows that Ludwig flies coach and knows that he doesn't need any of the so-called luxuries that this guy has to have, so within an hour the guy calls back and says, "You know, I've checked and our corporate jet is not doing anything next week. So we might as well go in it." Ludwig says, "Well, whatever you want to do. This trip is for you, to show you what we're doing. Whatever you want to do."

Well, that saves Ludwig a round-trip ticket to the other side of the world.

HKS: [chuckling]

CEP: Time and time and time and time again [chuckling], the cost of doing things he would accomplish in getting it done without bearing the cost, and without the other person ever knowing that he paid for it.

HKS: But if he had to buy his own ticket, he was reluctant to do that.

CEP: Oh, no.

HKS: Did he like to travel? Or was that just part of his job?

CEP: It was part of the job. He traveled a lot, traveled easy. He had the ability to prevent things beyond his control from bothering him. If it was something he was supposed to be able to control, he could go ballistic on you. But he could have a meeting the next morning with the most important guy in the world, and if a plane was broken down, it was broken down.

Things beyond his control just simply he didn't allow them to enter the equation, because if he got upset because the plane was delayed and he wasn't going to be able to make the flight or make the meeting, and he got upset and frustrated about it, it would steal from him his thinking time.

HKS: I can understand that. Something more of us ought to pay attention to.

CEP: Yes.

HKS: We all stew and fuss at airports when making connections, and there's nothing you can do about it.

CEP: Yes. One of my recreational activities in airports is walking around and finding airlines in trouble, and then standing and observing the reactions of people against the guy behind the counter. He has nothing to do with the fact that the plane is down and they can't find the part, has nothing to do with the weather in Chicago and that's the reason they can't take off. I certainly don't have the personality for it, and I admire the people that can take punishment from the public for things that are totally beyond their control. One of my fun things is to observe people and learn what I consider to be the absurdities of their actions in those kinds of situations.

Projection of Supply

HKS: That says a lot about Ludwig and his values, making use of the moment. Let's go back to projection of supply.

CEP: The subject is the raw material for the pulp mill. Is that not it?

HKS: Yes, that's it.

CEP: At day one, your projections are mere speculation. Each day that goes by, as you collect data, the projections become more valid.

Not knowing exactly what would happen, we started making contingency plans. One of the things we did, which I've really never heard anyone else comment about, but we started and we (Gmelina is a short-fibered, white-colored wood) identified about four hundred and sixty native species. Out of those four hundred and sixty, we identified and tagged, so to speak, all species that were white in color and/or were at least light-colored and could be easily bleached, because Gmelina was to be a market-bleached pulp.

Any species that conceivably could be mixed with Gmelina we collected, and I took samples to either Herty Foundation in Savannah, Institute of Paper Chemistry in Appleton, or N.C. State, and did pulping studies. Because, number one, if those species can mix with Gmelina and we're clearing land to plant pine, Gmelina, and eucalyptus, what is the logic of burning those species when they could come to the mill.

At that stage we did not know what the logical rotation period should be. If you could feed the mill with a 20 percent mix of white woods from the rainforest that you were burning, that means you conceivably could increase your rotation period a year, if you needed to. So if the mill is there, functioning, and you missed the calculation of what the biological and economic rotation should be, you could extend the rotation and still run the mill full capacity.

We identified all the species, upland and lowland, that would meet that criteria. As it turned out, the volume of those species was significant. Planting of pine in the Territory of Amapá started in earnest probably in I guess '71. I need to back up a little bit. There was an FAO project in the Amazon and I've forgotten the years but probably late '50s, early '60s. It was mainly tropical species, but they did plant *caribaea* scattered around in different places, and one of the places was in the savannas, where we started planting in '71.

They weren't maintained. They were abandoned. But they were surviving, and they were there. So at least we had an idea of what a twenty-year old tree in a savanna would look like, same species. Had no idea of the seed origin or anything else, but at least there was an indication there.

At the time the Jari pulp mill started, pine was available from the plantings in Amapá. Remember that the owner of the plantation in Amapá is now the owner of Jari.

HKS: Okay.

CEP: To an outsider who doesn't know, he sees wood being cut and put on barge and hauled to Jari, and so Jari doesn't have enough wood. He sees jungle species on a barge going to Jari, so Jari doesn't have the capability of growing their own trees. One of the things that did happen that contributed to the use of native wood and Amapá pine is that the last year or two that we were at Jari, when we knew that we were leaving, but before there was change in ownership, the money available for plantation maintenance decreased dramatically.

That was a major effect on growth. Remember I said that growing plants there is like tomatoes in your backyard. If you do not do what is supposed to be done on schedule, tomorrow you know, based on growth, that you didn't do it. It's not consequences that you pay after you retire. It's consequences that you can see. You don't have to have a diameter tape. You don't have to have an altimeter. You can drive down the road and see the difference between what you did on this side of the road and what you didn't do on the other side. That was the beginning influence.

The second thing was that new management were mining people. The owner was a miner. The new manager was a miner, and with a mining concept, you utilize what you have. What you have is a given. But the difference between a deposit of manganese and a fast-growing, sensitive organism is totally different. So, number one, the management of this organism disappeared in the change. The money for caring for this organism disappeared.

There was a critical period of three to five years that they had to learn the reality of the kind of tiger that they had by the tail. There was a dramatic influence on growth rates. Without material from Amapá and without the planning we had done on native species, they would not have been able to operate the mill full tilt.

Growth is not below projection. In reality silviculture was dramatically less than projected activities thus contributing to less volume growth. Our pine growth, based on today's growth, is about 50 to 60 percent greater than we projected, and we were projecting unbelievable numbers. In fact, we had trouble with them because they were so high we couldn't believe them, but there were the numbers. The actual is greater than what we projected.

As I mentioned earlier, Jari management has done a fabulous and beautiful, fortunate turnaround, and they now fully realize what they have and are doing. I have not been there recently, but people that have been there say that they are carrying out silvicultural practices that are giving excellent results. Of course, that's part of the reason that growth rates are higher than what we originally had projected.

HKS: I guess people just wanted it to fail.

CEP: That's right.

HKS: That you can't conquer the Amazon.

CEP: It can't be done, and we don't believe it can be done, and so the fact that you did is immaterial. It still failed.

HKS: I don't know anything about major developments in Africa.

CEP: South Africa is an exception. South Africa has large-scale, beautiful plantations, mainly pine. Well-managed, productive. But in tropical Africa, I won't say everything because I don't know, but everything I know about failed. Not necessarily for any biological reason but because of lack of government continuity, political continuity. The British might go in and start something and do it right, and it's progressing and it's beautiful, and they leave, and the government changes, and the next government doesn't allocate one cent to the maintenance of what was established, and in a short time it doesn't exist. It exists in a record book somewhere, and that's it.

For example, we collected seed in many countries in Africa. Nigeria, Malawi, what was Rhodesia, everywhere that they planted. In many instances the soils were fine. There wasn't a thing wrong, except that there wasn't a single area that was successful because management was zero. You can't grow tomatoes with zero management.

HKS: So Ludwig was correct in not putting Jari in Nigeria. The instability would have prevented his success.

CEP: Right.

HKS: That's a good place to end. Thank you very much.