# ALFALFA VARIETY EVALUATION PROJECT AND SUGGESTIONS FOR THE COMMERCIALIZATION OF ALFALFA

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**SUGGESTIONS FOR THE COMMERCIALIZATION OF ALFALFA PRODUCTION IN ROMANIA**

## DEVELOPMENTS TOWARD THE ESTABLISHMENT OF AN ALFALFA VARIETY TRIAL

### Alfalfa Seed Secured from American Alfalfa Companies

In preparation for this consultancy, the major alfalfa breeding companies were contacted regarding their interest in having their alfalfa varieties evaluated in Romania. There has been considerable consolidation in the industry and four companies were interested. I acquired the variety Dura 512 from Cal West seeds. This variety has been the overall top yielding variety in our tests in the intermountain area of northern California. From ABI who markets as America's Alfalfa, I received the variety Ameristand 403T. This variety was bred to hold up well under the abuse of livestock grazing and farm equipment traffic. We have not tested this variety yet, but it is expected to perform well. The Pioneer variety 53V05 has been one of the top producers in University of California trials in northern California and has produced well throughout the Pacific Northwest. The consultant obtained seed of 53V08 as well as two experimental varieties that are intended to eventually replace 53V08. One of the leading alfalfa-breeding companies, Forage Genetics, provided seed of one of their advanced experimental lines, FG 6R87. One of their breeding efforts is aimed at breaking the link between fall dormancy and winter hardiness—develop more nondormant alfalfa varieties that have good winter hardiness. The variety to be tested has a fall dormancy of 6, but the winter hardiness of a variety with a 4 fall dormancy. This concept is very attractive for Romania. The growing season is long enough and the temperatures warm enough that a more nondormant alfalfa variety would perform very well. However, winter temperatures are such that more nondormant varieties would suffer winter injury. Hence a more nondormant variety with improved winter hardiness could do very well in Romania.

Cal West requires a signed testing agreement prior to conducting a variety trial with their varieties. The agreement is included as an appendix to this report and will need to be signed by the Romanian cooperator of the trial. The Forage Genetics variety was to be shipped from Hungary directly to the WUADP Office in Bucharest and it arrived on September 9, 2002.

The six varieties and their source are listed in the following table.

| Variety | Seed Company |
|---|---|
| FG 6R87 | Forage Genetics |
| Dura 512 | Cal/West |
| Ameristand 403T | ABI Alfalfa, Inc. |
| 53V08 | Pioneer |
| 53Q60 | Pioneer |
| 5396 | Pioneer |

### Consultation with General Director of the Ministry of Agriculture Vasile Bacila

Arrangements were made for the consultant to meet with Vasile Bacila, General Director of the Ministry of Agriculture, to determine the requirements to import alfalfa seed into Romania for testing purposes and how to best pursue an alfalfa variety evaluation test in Romania. The consultant emphasized he is an employee of the University of California here on a consulting assignment with the Romanian Agribusiness Development Activity (RADA) and the Water User Association Development Program (WUADP) to study the feasibility of commercialization of alfalfa in Romania.

There are very few alfalfa varieties available in Romania while there are literally hundreds in the United States. American alfalfa varieties may be higher yielding and have better forage quality and pest resistance than Romanian alfalfa varieties. Mr. Bacila suggested that it would be helpful if we developed a letter from the University of California expressing our desire to do cooperative alfalfa variety research in Romania. With such a letter he could arrange a meeting with the director of Fundulea to enable us to do a cooperative variety evaluation experiment at one of their research stations. The alfalfa seed could be mailed from the US directly to Fundulea. Mr. Bacila also mentioned that an alfalfa variety could also be conducted in cooperation with one of the seed companies in Romania such as Pioneer or Monsanto.

The feasibility of importing seed of the best performing alfalfa variety in a field trial into Romania for commercial production was discussed. Mr. Bacila indicated if the varieties are not currently listed in the European Registry of Seeds, they must go through an approval process though a different Romanian institution called CIS before they can be grown on a commercial basis in Romania. A cooperative yield trial conducted with Fundulea could satisfy this requirement. If an improved variety was identified, it could then be imported.

**Meeting with Sam Johnson, Consultant for PA Consulting**

The consultant met with Dr. Sam Johnson to discuss the WUADP efforts in agricultural commercialization and the feasibility of alfalfa production within the two project areas. Sam is extremely knowledgeable about the current status of agribusiness in Romania. We discussed the structuring of WUA's and the challenges they face. Sam provided detail on the water conveyance system and the status of irrigation systems in Romania.

The potential for the commercialization of alfalfa was also discussed. The need for alternative profitable crops other than wheat and corn was emphasized. Sam also believes that there is potential for alfalfa as a profitable alternative crop for Romanian farmers in the country as a whole and in both project areas. The findings and recommendations in the consultant's initial report *Agronomic Feasibility Assessment of Alfalfa Production Potential in Romania* was discussed. A copy of the report will remain at the office of the WUADP PA Government Services, Inc. for Sam Johnson and others to review.

**Consultation with Contantin Cherciu of Pioneer Seeds**

The consultant then met with Contantin Cherciu of Pioneer to discuss alfalfa production and the feasibility of conducting an alfalfa variety trial in cooperation with Pioneer. Pioneer is currently not marketing alfalfa seed in Romania. Pioneer has merged with DuPont and they are focusing their resources on the sale of corn, sunflower and soybean seeds as well as DuPont's line of crop protection chemicals. Mr. Cherciu is responsible for seed sales in his territory around Bucharest, but also has nationwide responsibility for Pioneer's silage and hay inoculants. Therefore, he is extremely knowledgeable about forage production in this country. In fact, he is one of the most knowledgeable people I have met on the subject.

He stated that there is currently no company selling forage seed in Romania and that there is significant potential for a company to sell both alfalfa seed and red clover seed. According to Mr. Cherciu, at the present time, there are 360,000 hectares of alfalfa in Romania and there is significant potential for an increase. Alfalfa seed sells for $5.00 per kilogram. According

to Mr. Cherciu, because of the present status of Fundulea and their lack of resources, the seed that is currently marketed is not one variety but a blend of several varieties.

Mr. Cherciu expressed a personal interest in conducting a cooperative variety trial with Pioneer and the consultant. He is unsure whether Pioneer will ever market alfalfa seed in Romania, although he hopes they will. His primary interest at this point is the overall health of the forage industry and he thinks that the importation of improved alfalfa varieties would be a major benefit for the forage industry. He is convinced that the yield potential of alfalfa here is not being realized with the varieties currently available.

According to Mr. Cherciu, it is not advisable to plant alfalfa now because it is too late. The availability of irrigation water at this time of the year is questionable. Without immediate irrigation, the alfalfa would have to rely on rainfall for germination and emergence. It is likely that the plants would not attain sufficient size by the onset of winter to be able to withstand the cold temperatures. He advised that a spring planting in late March to early April would be much safer.

Mr. Cherciu indicated that over the winter he could discuss this project with some of the best and most progressive alfalfa growers in the country and could find an interested grower cooperator. He would like to establish the trial close to a road so that it could be visible and marked with signs. Mr. Cherciu requested that the consultant return to meet with the Country Manager for Pioneer, Alexandru Covrig, and the Product Manager, Dr. Nicolae Parvu to further discuss alfalfa production and a cooperative alfalfa variety demonstration.

**Follow-Up Meeting with Pioneer Personnel**

Mr. Covrig and Dr. Parvu were very interested in the consultant's assignment in Romania and requested to receive a copy of the report *Agronomic Feasibility Assessment of Alfalfa Production Potential in Romania*. They reiterated that Pioneer so far has elected not to sell alfalfa seed in Romania but that there are limited sales of alfalfa in other European countries. They wish Pioneer would market alfalfa seed in Romania, as they feel there is significant potential for an increase in forage production in general, and specifically for alfalfa. They believe alfalfa seed production is feasible in Romania. Mr. Parvu indicated that for the first time since the revolution there was an increase in livestock production this year. Hopefully, this is the beginning of a long-term trend.

Pioneer is in interested in cooperating with the consultant on alfalfa variety evaluation. Dr. Parvu was previously employed as the director of the Romanian Institute in charge of registering seed varieties in Romania. He said that he could make arrangements so that the cooperative field trials we conduct on alfalfa varieties could serve as part of the registration process. When asked whether it would be possible to have replicated field trials or just non-replicated demonstrations, he said that either would be possible—whichever the consultant preferred. He said that we could conduct non-replicated trials in several locations and the locations could serve as replicates. The consultant is in favor of this approach, as variety performance can be tested under varied environmental conditions as well as management practices.

**Meeting with John Franchi (CSM UNIVERS)**

The consultant met with an American with an investment company, John Franchi, who is residing in Romania. Mr. Franchi is in the process of purchasing several farms in Romania and a Romanian tractor company in Brasov. Mr. Franchi is very interested in alfalfa production in Romania and requested assistance. A copy of the report *Agronomic Feasibility Assessment of Alfalfa Production Potential in Romania* was given to Mr. Franchi as well as the book *Intermountain Alfalfa Management*. Soil test results from one of the farms Mr. Franchi plans to purchase were discussed. Equipment requirements, marketing, and general production practices were also discussed.

**Dr. Ing. Constantin Cucu**

The consultant met with Dr. Constantin Cucu in his office in Craiova. A previous meeting had occurred during the consultant's last visit to Romania. Dr. Cucu is the Director of Extension in that part of the country. The consultant's desire to conduct an alfalfa variety trial was discussed. Dr. Cucu is very interested in cooperating on a trial but said that there would be expenses involved with the trial. The consultant requested that Dr. Cucu develop a proposed budget for conducting the trial and send it to the consultant and to WUADP to review.

**Dr. Catalin Popescu and Mr. Cosma and the owners of METACC**

Dr. Popescu and the consultant discussed the Water User Association in Sadova-Corabia and the potential for alfalfa production in that region of the country. Dr. Popescu is extremely knowledgeable about irrigation in Romania and the functioning of the WUA's. The feasibility of commercial alfalfa production in Romania and potential sites for an alfalfa variety trial were discussed. He suggested that Mr. Cosma, chairman of the WUA in Sadova-Corabia, would be a conscientious cooperator for a field trial.

Dr. Popescu and the consultant visited Mr. Cosma and the METACC Farm he manages. Irrigation water had been shut off but we were still able to tour the pumping station and the field where they plan to seed alfalfa in the spring of 2003. Soil test reports would be useful but were unavailable. Based on visual appearance alone, the field appeared to be suited for alfalfa production but soil analysis results would be helpful for a more thorough evaluation. Mr. Cosma has not previously produced alfalfa but appears to be an effective manager.

Later that evening, the consultant met with the owners of METACC ( Mr. Grigorescu and Mr. Iliescu) in Bucharest. The potential for alfalfa production and the feasibility of growing alfalfa for export on their property was discussed. They have a good location for producing alfalfa because the property is located on the first terrace and appears to have fertile soil. This year there was a good local market for alfalfa and the property is close to the Danube River so the farm is well situated to produce alfalfa for export.

There was considerable dodder, a parasitic weed that attacks alfalfa, along some of the field edges on the METACC Farm. Dodder was discussed in detail in the consultant's previous report. The consultant emphasized the importance of controlling dodder since it is a serious threat to alfalfa production.

The consultant and the owners of METACC discussed the possibility of conducting a non-replicated variety trial on their farm. They were very interested in cooperating on a trial

**Dr. Maria Schitea with Fundulea**

The consultant met with Dr. Maria Schitea, head of fodder crops department for Fundulea, at the Ministry of Agriculture to discuss conducting cooperative alfalfa variety trials at various locations in Romania. Dr. Schitea provided alfalfa variety trial results from research conducted at Fundulea. Romanian varieties were compared with several varieties from other countries but the test was completed in 1992. There has been considerable progress made in alfalfa breeding since that time.

The need for a variety trial to compare American and Romania alfalfa varieties was discussed. Dr. Schitea was interested in cooperating on field trials and suggested three potential locations, one at Fundulea and the other two at field stations near Craiova and Corabia. Dr. Schitea explained the protocol used to conduct alfalfa variety trials at Fundulea and the equipment available to plant and harvest. Fundulea has the necessary equipment to adequately conduct variety trials. The consultant proposed conducting a trial with approximately 30 entries at Fundulea and trials with approximately 10 or 15 entries at the field stations. Dr. Schitea said that it would be best to send the seed directly to her provided that a phyto-sanitary certification was provided.

Dr. Schitea indicated that funding would be necessary to conduct the trials. The consultant requested that she prepare a proposed budget and forward it to the WUADP and the consultant.

## PLANS FOR FUTURE ALFALFA VARIETY TESTING

It was not possible to plant a variety trial in the fall 2002 because a firm arrangement with a cooperating farmer or agency had not been made and the irrigation season ended in August. It would have been too risky to plant alfalfa in early September and depend on rainfall for alfalfa emergence. It is likely that there would be insufficient time for the alfalfa to mature enough to be able to survive the cold winter temperatures. In addition, no farmers or research stations are planting alfalfa at this time. A trial is most likely to be successful when seeded along with a commercial field—the farmer has a greater interest in the success of the field in this case.

Alfalfa variety trials are planned for the spring of 2003. The preferred planting time is late February to early April, depending on weather conditions. Arrangements for planting an alfalfa variety trial were discussed with Dr. Constantin Cucu, director of C.J.C.A., the Romanian extension system, in Craiova. A trial would be conducted in cooperation with an experiment station in Craiova and would involve a dependable forage researcher on the station. Dr. Cucu was asked to prepare a proposed budget for the land, labor and materials to conduct the trial on the field station. The field station has the harvest equipment and the expertise to properly conduct the trial. Further preparations for the trial will be discussed via correspondence between Dr. Cucu, Doina Cindrea (field consultant with the WUADP in Sadova-Corabia), and the consultant. Project leader Larry Nelson will receive copies of all correspondence.

As mentioned above in the section regarding the meeting with Dr. Maria Schitea, it is also feasible to conduct cooperative variety trials with Fundulea and Dr. Schitea. Replicated trials would be conducted at three different field stations. Twenty to 30 varieties would be evaluated at the Fundulea site outside of Bucharest because they are best equipped to handle a larger trial and approximately 10 varieties would be evaluated at two field stations in Sadova-Corabia. The consultant believes that perhaps it still would be possible to involve Dr. Cucu in the trial near Craiova. The consultant believes that Fundulea has the most expertise conducting alfalfa variety trials. Dr. Schitea was asked to prepare a proposed budget for conducting the three trials. Correspondence will be sent to Larry Nelson for review. At this point, the consultant believes that it would be best to conduct the replicated yield trials in Cooperation with Dr. Schitea and Fundulea.

In addition to the replicated trial(s), a series on non-replication demonstration trials could be conducted with cooperating producers. One trial could be conducted with Mr. Cosma, president of a WUA in Sadova Corabia, on the METTAC farm in Corabia. Dr. Cucu or Dr. Catalin Popescu could contact an additional grower cooperator in the Sadova Corabia area. Discussions occurred to conduct additional field demonstrations with Pioneer Seeds in Romania (Mr. Cherciu, Mr. Covrig, and Dr. Parvu). Pioneer Seeds is well connected with Romanian forage producers through their seed sales and sale of silage and hay inoculants. Pioneer representatives agreed to identify progressive dependable alfalfa producers that would be willing to cooperate on field trials.

Approximately 10 varieties of alfalfa will be evaluated at each location (possible 20-30 at the Fundulea site). The seed of the six American alfalfa varieties was left with WUADP project leader Larry Nelson. The consultant will review the list of European registered alfalfa varieties and select a few varieties that have the most potential for Romanian growing conditions. Two Romanian alfalfa varieties will be evaluated as standards (more at the

Fundulea site). These will be selected based on conversations with Fundulea and Romanian university experts on forages. Having the varieties planted with several growers under different environmental conditions and management will provide a better assessment of the yield potential of the varieties and more confidence in the performance of American varieties. A statistical analysis will allow a comparison of the relative ranking of the varieties under different field conditions and under replicated conditions at a field station.

## PROTOCOL FOR ALFALFA VARIETY EVALUATION

A protocol for conducing an alfalfa variety evaluation outlining the most important considerations was written so that the research can be properly conducted when the consultant is not present. A properly designed field experiment is essential to be able to compare the yield potential of different varieties of alfalfa. If appropriate protocol is not followed, the data collected may be useless or misleading. The following protocol is recommended to ensure the quality of a variety evaluation test.

### Seedbed preparation

Alfalfa seedbed preparation is presented in detail in the consultant's previous report *Agronomic Feasibility Assessment of Alfalfa Production Potential in Romania*. The key point is that a firm clod-free seedbed is necessary for alfalfa since the seed is small and emergence is dramatically reduced if the seed is buried too deep. A soil analysis is recommended prior to planting alfalfa. If soil test results indicate a deficiency, apply phosphorus and/or potassium prior to planting. The test area should be relatively level to ensure uniform irrigation and to prevent puddling.

### Selection of varieties for testing

Given the climatic conditions in Romania, varieties selected for testing in Romania should have a fall dormancy rating of between 3 and 6 (a scoring system of 1-9, which was recently increased to 11. *The lower the number the greater the dormancy and conversely, the higher the number the less winter dormant*). Yield potential would be reduced with varieties that have a fall dormancy rating of less than 3 and winter injury or winter kill is likely for varieties with a fall dormancy greater than 5 or 6.

Two or three Romanian varieties should be included as standards, preferably the best adapted most commonly planted varieties. Other varieties tested should be taken from the list of European approved varieties so that if they appeared to be superior, they could be planted immediately with no need for further approval or registration. Lastly, varieties or soon-to-be released varieties from the US should be included in the trial (selected from the six listed in the table above). The consultant would recommend that the total number of varieties evaluated not exceed 10 (except at Fundulea where they are capable of testing more entries). A greater number of varieties would increase the workload significantly and the likelihood of a successful test would diminish.

### Seeding rate

Recommended alfalfa seeding rates in Romania are from 20 to 25 kg/ha. These rates are consistent with recommendations in the US. An adequate stand is imperative so the higher seeding rate (25 kg/ha) is recommended.

**Seeding Method**
Specialized plot seeders are used for planting alfalfa trials in the US. These are cone seeders that evenly distribute the seed in a predetermined plot length. Alfalfa is typically drill seeded in rows about 6 inches (cm.) apart. It is doubtful that plot seeders are available in Romania. Plots can also be broadcast seeded by hand. Care must be taken to distribute the seed evenly over the entire plot area. This is accomplished by seeding in multiple directions in a zig-zag fashion. The entire perimeter of the plot should be seeded first. Then seed back and forth over the width of the plot. Next seed back and forth over the length of the plot. There should be enough seed to seed another time back and forth over the width of the plot. Continue seeding until all the seed for that plot is gone and is evenly distributed over the plots. This is usually accomplished by seeding in at least three directions.

Seed must be incorporating after sowing. A cultipacker or ringroller are appropriate farm implements for incorporating alfalfa seed. However, since the consultant has not observed these implements in Romania, it is doubtful that they will be available. Although far more labor intensive, alfalfa seed can also be incorporated by hand raking the seed into the soil with a standard metal garden rake. At least a one-meter border of alfalfa should be seeded around the perimeter of the entire plot. This eliminates the "border effect," increased growth of alfalfa next to a bare area due to the lack of competition.

**Plot Design**

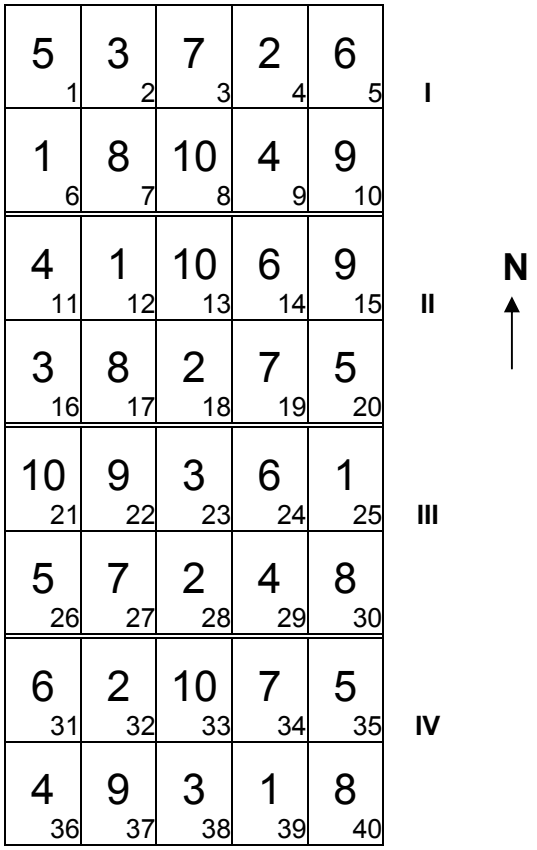
**Plot Size**
Plot size is determined to a large degree by the harvesting equipment. Plot harvesters in the US are normally approximately 0.75 to one meter wide. The plot length is approximately 5 to 8 meters. The desired amount of forage to weigh from each plot is between 7 and 12 kilograms. Actual plot dimensions are not critical, provided the total weight per plot is within the range above. Lower weights would reduce the accuracy of the test while higher weights would not improve the accuracy but would increase the amount of work. Unless there are other practical concerns that the consultant is unaware of, a plot size of 1.5 by 6 meters is recommended.

**Replication**
It is essential that the trial be replicated, meaning each variety is seeded more than once in separate plots. Replication is essential to account for natural variation that may occur in the field. There may be differences in yield due to such things as soil texture and fertility, irrigation, and pest pressure. These factors can mask the true differences between varieties and make it impossible to detect the relative yield potential of the different varieties in the test. Replication is needed so that the data can be statistically analyzed to determine which differences between varieties are true differences rather than just due to random chance. Three to five replications are typical for variety trials. The number of replications obviously increases the number of plots and the amount of work involved. Four replications are strongly preferred, but if this is not possible, three are acceptable. An alternative if replication creates too many plots at one location would be to conduct several non-replicated trials at different locations. The different locations can serve as replications in the analysis.

**Plot map**
A plot map is needed so that the location and identity of each of the plots is known. A plot number, the treatment number or variety entry number, and the replication should identify each plot. An example plot map is shown below. The distance from a corner of the plot to

permanent features on the edge of the field (i.e., a fence post or irrigation valve) should be recorded so that the plot can be located in the future. It is also recommended to mark each of the four corners with a permanent marker such as metal lids or plastic wire construction site markers. Wire flags are also useful to mark plots but they must be removed prior to harvest.

**Figure 1.** Sample plot map for a variety trial with 10 varieties indicating plot number, randomized variety entry number, and replication.




**Management**

**Irrigation**
Thorough uniform irrigation is essential. Improper irrigation is perhaps the most common cause for problems with an alfalfa variety trial in irrigated regions. Differences in yield between plots due to irrigation water application can exceed those due to variety differences and make it impossible to evaluate the varieties. Adequate irrigation with as uniform a system as possible is recommended. Watermark® soil moisture sensors (referenced in previous report) would help ensure proper irrigation scheduling.

**Pest management**

**Insects** An insect pest similar to the alfalfa weevil in the US can be damaging to alfalfa in Romania. This pest should be controlled when necessary. In absence of an economic threshold for this insect, control when the population reaches 20 larvae per sweep with a standard sweep net. If a sweep net is not available (most likely is not in Romania) treat when feeding damage is observed on about half of the alfalfa plants. If possible (this is not critical), visually score each plot for insect damage to ascertain if there is any varietal

difference in pest injury. A score of zero indicates there is no observable injury from the insect; a score of 10 means nearly full defoliation.

**Vertebrates** Control rodent pests such as pocket gophers, moles or mice as soon as they appear. These vertebrate pests can destroy stand and bias the results of the experiment.

**Weeds** Complete weed control is imperative to ensure an adequate alfalfa stand and for an accurate assessment of yield. If broadleaf weeds emerge with the alfalfa, they should be controlled with imazethapyr (trade name of Pivot in Romania and Pursuit in the US). If imazamox (trade name Raptor in the US) has just received registration in Romania as it has in the US, it would be the herbicide of choice because it controls both broadleaf weeds and grassy weeds in alfalfa. If imazamox is not available and grassy weeds are present, apply a grass herbicide (such as sethoxydim, clethodim, or fluazifop) in a tank mix combination with Pivot.

Weed control will also be necessary during the dormant season after the alfalfa has become established. The consultant has not been able to secure a list of available herbicides for use in dormant established alfalfa. Pivot can also be used but there are likely other herbicides available for established alfalfa that control a broader spectrum of weeds and are less expensive. The consultant can make further recommendations on weed control once a list of available herbicides is available.

**Harvesting**

**Procedure** A flail-type or sickle-bar type of plot harvester is ordinarily used to harvest alfalfa in test plots. It is not known whether this type of equipment is available in Romania. It appears that Fundulea has one but the consultant has not seen its condition. If a plot mower is not available, the plots can be hand harvested with a scythe. A stubble height of 5 to 8 cm. is desired regardless of harvest method. It is important to harvest approximately the same area from each plot and accurately measure and record the area harvested. This is true whether the plots are harvested with a plot mower or by hand.

A swath is taken out of the center of each plot approximately 0.75 to one meter wide the length of the plot. Harvested material is collected with a rake and placed on a tarp. The tarp together with the alfalfa is then suspended from a hanging spring scale and the weight determined.

The consultant believes that five to six cuttings of alfalfa are possible with full irrigation. The actual cutting dates should be scheduled according to the growth stage of the alfalfa. The first cutting should occur at the late bud stage of the alfalfa, just prior to flower development. Subsequent cuttings should occur at the early bloom stage (when first flower appears up to approximately 10 percent bloom). The last cutting in the fall should occur in early September. Fall harvest management is important because there should be sufficient time remaining in the growing season after the last harvest for the alfalfa to grow and replenish its carbohydrate root reserves. Adequate root reserves are important for winter survival and for vigorous growth the following spring.

If trials are conducted with a grower cooperator, cutting dates are dictated by the grower's cutting schedule. Every attempt should be made to harvest the plots the day before or the morning of the day the farmer plans to harvest. This requires continual communication with

the farmer or the farmer himself should contract the harvesting of the plots. After all the plots are harvested and their respective yield recorded, the farmer should run his harvest equipment over the plot area to harvest the uncut border area of each plot.

**Data collection** The plot map can be used as a data collection sheet. Or, a data sheet can be made listing the plot number and the corresponding yield for that plot. Record the date of each harvest. Record the weight of the alfalfa harvested from each plot. The exact harvested area (only the length if a uniform width plot harvester is used) must also be recorded. Also note any problems that may be observed with the plots such as rodent damage, insect damage, moisture stress, etc. If the damage is isolated to certain plots, that should be noted as well.

**Subsampling** In most alfalfa field trials the harvested material is subsampled to determine the moisture content at harvest. One to two subsamples per replication are adequate. The subsamples are placed in paper or plastic bags and weighed to the nearest 0.1 grams. If the samples are stored in paper bags, it is critical to weigh them as soon as possible. Document the weight of the bag as well. If samples were collected in plastic bags, transfer them to paper or cloth bags. Oven dry the samples for 2 to 3 days and reweigh.

The dry matter content is determined by dividing the oven dry weight of the sample minus the weight of the bag by the wet weight of the sample minus the weight of the sampling bag. Provided the dry matter content of all the samples does not vary greatly, they can be averaged and the average used to calculate the dry matter yield of all the plots. Under most conditions, the dry matter content will range from 20 to 24 percent. Although not as accurate, the samples can be air dried until the stems can be easily broken and the leaves are crispy, if a drying oven is not available. If an accurate scale is not available capable of weighing to at least 1.0 grams, it is possible to forgo subsampling and apply a typical assumed dry matter content to all the plots. This is not as accurate for determining the actual yield of the plots. However, since the primary focus of the trial is to compare the relative yield difference of the alfalfa varieties, a standard dry matter can be assumed if the equipment is not available to determine the actual dry matter content.

**Stand evaluation**

In addition to yield, stand persistence is an important characteristic of an adapted variety. If the alfalfa does not persist and the plant density declines appreciably, the yield potential will progressively decline each year. A long alfalfa stand life is important so that the costs to establish a stand can be amortized over more years.

At the end of each production season, preferably in the spring when the alfalfa first breaks dormancy and resumes growth, the alfalfa plant population should be assessed. The alfalfa stand can be assessed by tossing a ring or square of approximately 0.25 meters in area on to the plot and counting the number of alfalfa crowns within the ring or square. This procedure is time consuming and tedious. Visual rating of the alfalfa stand usually suffices. A rating scale of 0 to 10 is commonly used where zero is no stand and ten is 100 percent plant cover. Unless there is complete winter kill, ratings normally range from 3 to 8.

**Analysis**

Data collected from the plot should be entered into a computer spreadsheet such as Excel. The columns in the spreadsheet should be configured as follows:

1. Plot number (the number that corresponds to each individual plot)
2. Replication number
3. Entry number that corresponds with the variety
4. The corresponding yield for each plot. The cutting number and the date of the harvest should be heading for the column.
5. Length of the plot to the nearest 0.1 meters.
6. Dry matter content for that harvest.
7. Repeat columns 4 –6 for each subsequent harvest noting the cutting number and the date of the harvest in the column heading.
8. The following columns will be used to determine for the dry matter yield per hectare for each cutting. This is calculated by dividing the yield per plot by the proportion of a hectare the harvested area represents. This figure is then multiplied by the actual dry matter content determined from the subsamples or by using a standard assumed dry matter content.

Data collected from the plot should be statistically analyzed to evaluate the reliability of the data and to determine if there are statistically significant differences between varieties or if the differences observed are just due to random chance. The analysis could be done using the analysis of variance (ANOVA) program in a standard computer statistical program. Alternatively, the consultant would be willing to analyze the data if it is sent in an electronic form by email.

## SUGGESTIONS FOR THE COMMERCIALIZATION OF ALFALFA PRODUCTION

### Introduction

In order for Romania's Water User Associations, and irrigated agriculture in general, to be economically viable and independent from government subsidies, it must generate enough revenue to cover all the production costs and produce a reasonable income for the farmers. This is not possible with many or most of the commodities currently produced in Romania. At current yield levels, and perhaps even potential yield levels, the market value of grain crops (both small grains and corn) is insufficient to be economically viable if producers are required to pay for the true costs of irrigation water. Potential profit margins are greater with vegetable crops. However, the market is typically more volatile and subject to problems with over production. This is especially problematic with perishable crops where there is very limited market flexibility.

The consultant continues to believe that there is significant potential for commercial alfalfa production in Romania. With the yield levels believed to be achievable in Romania, alfalfa could provide greater returns than other commodities. An additional advantage of alfalfa is that it is not perishable and can be safely stored for extended time periods provided it is properly cured and protected from rain and snow. Another advantage for alfalfa is the benefit it provides to the soil as a rotation crop. It improves soil and, as a legume, fixes nitrogen in the soil. Therefore, including alfalfa in the cropping system will improve the yield of subsequent crops.

## PILOT PROJECT

Even though there is significant potential for commercial alfalfa production in Romania, it is premature to recommend wide-scale plantings. Greater market development and experience with the crop is recommended before producers should be encouraged to cultivate alfalfa. The best approach would be to establish a pilot project with a progressive Romanian farmer

interested in producing alfalfa. Perhaps financial assistance could be provided to help with the purchase of the specialized harvest equipment needed. The pilot project would help:

- establish an anticipated commercial yield level,
- determine the quality potential and whether that quality is suitable for export
- alert to potential production and marketing problems

Before conducting a pilot project, or especially before alfalfa production is encouraged, the following issues should be addressed and deserve further attention.

## IRRIGATION

### Alfalfa Water Use

Alfalfa has relatively high consumptive water use compared with other crops. This is because of its long growing season and the fact that it has full canopy cover for most of the growing season. Alfalfa goes dormant over the winter months, and under Romanian growing conditions would break dormancy and resume growth in February. It would again cease active growth in October.

While adequate water supplies are important for maximum yield, alfalfa can tolerate partial irrigation or an interrupted water supply better than most other crops. Alfalfa growth is reduced if soil moisture is inadequate. If soil moisture is low enough, the plant goes into a drought-induced dormancy. While yield if adversely affected, the plant does not die and will eventually recover once irrigation resumes or rainfall occurs. In contrast, without nearly full irrigation, some vegetable crops such as potatoes, onions, watermelons, etc. may not produce a harvestable crop.

### Irrigation Water Supply

The length of the irrigation season may negatively affect alfalfa yield in some parts of the country, especially in dry years. It is anticipated that active alfalfa growth will occur from late February through late September or early October. Therefore, alfalfa uses water both earlier in the season and later in the season than most other crops. For example, Figure 1 compares alfalfa water use with corn grown in Caracal, in the Sadova-Corabia area. While mid-summer water use is similar, note the difference in the crops for early and late-season water use. In fact, alfalfa evapotranspiration would actually start earlier than April, the first month for which data was available.

It appears that in many areas, irrigation water is only available from May to August. Depending on rainfall, this may be problematic for full yield potential. In dry years irrigation water may be needed as early as March. If water is limiting in spring, yield will be reduced. Typically, the highest yield and forage quality of alfalfa is obtained in the first cutting. Similarly, if irrigation is curtailed in August, the yield of the fall cutting(s) will be reduced. The duration of the irrigation season should be lengthened in order for the maximum yield potential of alfalfa in Romania to be realized.

Not only should water be available for most of alfalfa's growing season, irrigation water needs to be available on demand. Irrigation must be scheduled around alfalfa cuttings. Alfalfa cannot be irrigated too close to a cutting or the drying rate of the crop is affected. And, the crop cannot be irrigated during the curing process until the bales are removed from the field. Irrigation should resume as soon after cutting as possible to avoid yield loss.

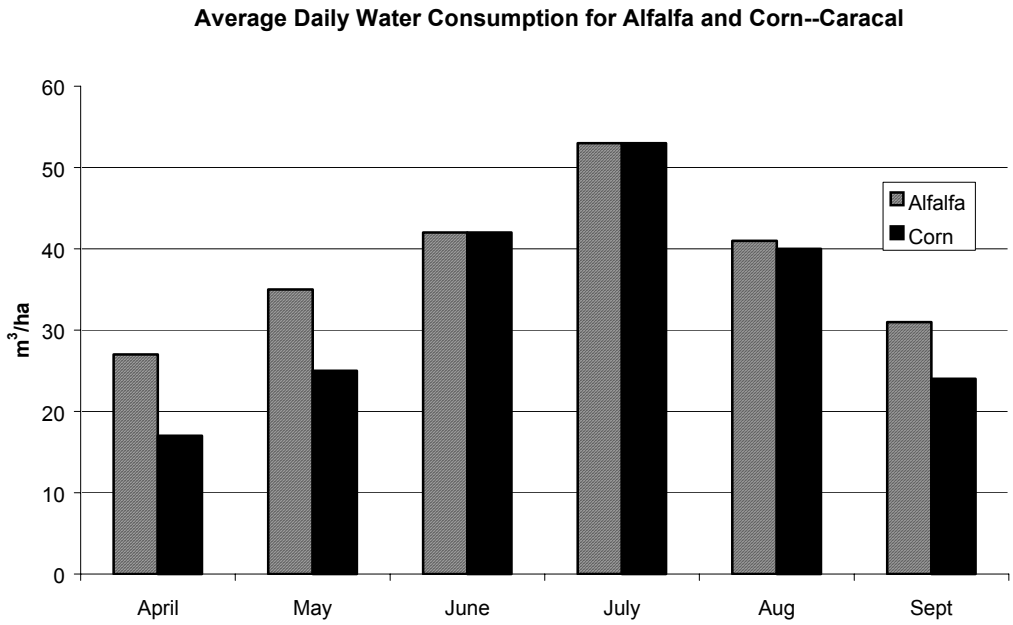
**Groundwater Pumping Potential**

Further investigation is needed regarding the aquifers and the potential for groundwater pumping for agricultural use in Romania. The consultant was unable to obtain sufficient information regarding groundwater resources in Romania. The assumption appears to be that the groundwater would be at the same depth as the Danube River. This is probably not a valid assumption—the groundwater is likely more shallow. Groundwater pumping rather than pumping out of the Danube to centralized pumping stations would provide individual growers more flexibility and control as well as lower power demand. There would not be the friction loss that occurs when pumping to sites located far distances from the Danube River. The appropriate pump could be selected to enable growers to sprinkler or surface irrigate depending on which irrigation system is better suited for the terrain. It would also allow them to lengthen the irrigation season and to irrigate when water was unavailable from SNIF. In the case of alfalfa, they could irrigate earlier in the season and later into the fall when necessary, especially in drought years. It would also make more crop options open to growers—some crops need irrigation at times other than the normal irrigation season. The consultant believes that further investigation into the depth to groundwater and the flow rate from wells in needed in the different agricultural production zones of Romania.

**Irrigation Costs**

Total irrigation costs are a major concern. *Halcrow and Associates* indicate that actual costs for irrigation may be in the order of $180 per hectare. If this is true, the costs for alfalfa may actually be higher due to it's the higher water use compared with other crops (see figure for comparison to corn). More precise irrigation costs for alfalfa specifically is needed for an assessment of whether the revenue with alfalfa would be sufficient to cover the cost of irrigation. Alfalfa production, even if only on a pilot project basis, should be encouraged on the first terrace initially, where the pumping costs are less and the likelihood of income above and beyond irrigation costs is greater.

**Figure 1.**




On-farm irrigation equipment for alfalfa production is another important consideration. The *Assessment of the State of On-Farm Irrigation Systems of WUAs in Sadova-Corabia and*

*Nicoresti-Tecuci Irrigation Schemes* by German Sabillon states that for the near future rehabilitation of the current sprinkler system is the best option. The report states that under current government policies other technologies are not considered eligible for subsidies because of the high initial investment. While alfalfa can be irrigated with hand line, alternative irrigation systems would be far superior in the long run. In the US the most popular irrigation systems for alfalfa are in order of use are: surface (border-strip flood), center pivot, wheel line (side roll sprinklers), linear move, and lastly hand line. Irrigation of alfalfa with hand-lines is extremely rare because it is so labor intensive. Hand-line can be difficult to move, especially as the alfalfa crop matures and gets taller. For future development, surface irrigation would be far preferred for level or nearly level areas. For undulated terrain center pivot, linear, or wheel line (side roll) would be preferable over hand line.

## MARKETING NEEDS

### Need to Establish in Association with Dairy

Alfalfa producers should not rely completely on potential export sales. This would be the case even for a pilot project. One of the consultant's primary concerns with alfalfa production in Romania is the likelihood for rain damage to the hay while it is curing. The occurrence of rainfall while the hay is curing reduces it value by bleaching the hay and by leaching nutrients, thereby lowering the nutritional value of the hay. Rainfall during the growing season will pose a significant problem for Romanian alfalfa producers. The frequency of rainfall during the growing season in Romania will result in a significant portion of the alfalfa hay getting rained on. While this is not a problem for alfalfa that is fed green, it is a significant problem for alfalfa hay production. Bright green color is typically a requirement for alfalfa hay that is sold on the export market. Because of the likelihood of large quantities of non-export grade alfalfa, it would be important for commercial alfalfa producers or for a pilot project to establish a marketing agreement with a domestic livestock operation to purchase the non-export quality alfalfa.

### Domestic Market Analysis

A thorough analysis of the domestic market for alfalfa is needed. As livestock production increases, there will be a concomitant increase in the demand for alfalfa. The current domestic demand for alfalfa is unknown. Reports are conflicting and may depend on individual contacts with livestock producers. For example, during the consultant's last assignment in Romania, representatives from Fundulea in Craiova indicated that there was virtually no market for the alfalfa produced on research facilities. In contrast, in discussions with Sam Johnson, he mentioned that a farmer in Corabia indicated that he could sell green-chop alfalfa (fresh alfalfa that has not been cured and baled) for 10 million lei per cutting. Alfalfa could be very profitable at this price.

A thorough analysis of the domestic market potential for alfalfa is needed before wide-scale alfalfa production could be recommended.

### Market Development

There currently is not a structured market for the sale of alfalfa. Most of the alfalfa that is produced in the country at the current time is used on site for livestock operations or is transported short distances and sold to neighboring operations. A more structured market is needed for the commercialization of alfalfa to occur to put producers in touch with users.

The commercialization of alfalfa in Romania could be accelerated with the development of a cooperative marketing association. The marketing association can facilitate the sale of alfalfa to domestic dairies and marketing alfalfa to export markets. A directory of alfalfa producers could be developed and sent to large livestock operations to put alfalfa producers in contact with buyers.

**Assessment of the Export Market Requirements**

An understanding of the packaging requirements of countries that may potentially import Romanian alfalfa is needed. Most of the alfalfa exported from the US is exported as rectangular 3-tie bales weighing approximately 50 kg. The bales are then double compressed with a stationary compressor. There is some exportation of large (3/4-ton bales) and some interest in one-ton bales but this market is not yet well developed. The smaller 50 kg bales would be better for Romania than big bales because the alfalfa can be baled at a higher moisture content and safely stored.

Once the packaging requirements are known, the harvesting equipment needed can be determined. Only specialized harvesting equipment will be needed. The equipment needed to plant and produce alfalfa is the same equipment used for the production of other crops. However, the fleet of equipment needed to harvest alfalfa is specialized and is not useful for other crop production operations. This equipment includes swathers, balers, rakes and bale wagons. Most of this equipment is not produced in Romania. Therefore, the availability and cost of European and American-made harvesting equipment should be compared.

**Transportation Availability and Cost**

The limited alfalfa produced in Romania at the present time is not transported long distances and is not exported. The transportation costs to move alfalfa within the country by truck or rail need to be determined. In addition, freight charges to ship alfalfa to importing countries must be ascertained.

**DETAILED COST ANALYSIS**

A critical step for the commercialization of alfalfa in Romania is the development of an accurate and detailed analysis of the costs to produce alfalfa. This is especially true if Romanian producers wish to compete in the export market. Presumably the costs to produce alfalfa should be at least as low in Romania as they are in competing countries. At the present time it is not known whether this is the case or not. If the costs to produce alfalfa are higher than in competing countries, producers would have to rely on subsidies to be profitable or accept a lower rate of return than their competitors. Several of the input costs necessary to produce alfalfa must be determined for a detailed analysis to be developed.

**Seed** The cost of Romanian alfalfa seed produced by Fundulea must be determined. A Pioneer Seed Company representative quoted an alfalfa seed cost of $2.50 per kilo. This cost needs to be validated from more sources. Additionally, the cost for importing American alfalfa seed must be compared with that of Romanian seed to determine whether the potential yield advantage for American alfalfa varieties can more than offsets the higher cost of the imported seed.

**Fertilizer cost and availability** As a legume, no nitrogen fertilizer will not be needed for alfalfa production. However, both phosphorus and potassium can be deficient in Romania. From the prior consultancy in Romania, it appears that fertilizer selection is limited. Information on the availability and cost of different phosphorus and potassium containing fertilizers is needed.

**Water** The true and subsidized cost of water per cubic meter are needed. Recognizing that alfalfa has a longer growing season and uses more water than other crops, an average estimate of irrigation costs per hectare is not sufficient.

**Equipment** Specialized harvest equipment, not readily available in Romania, is necessary for commercial alfalfa production. After determining the bale configuration requirements of anticipated alfalfa importing countries, the cost of importing appropriate harvesting equipment (such as a swather, rake, baler, and balewagon) from both Europe and the US must be known.

**Crop Protection Chemicals** A complete list of the agricultural chemicals registered for use on alfalfa in Romania and their approximate cost is necessary so that a cost-effective pest management strategy can be developed.

**Labor** Typical wages for farm labor, both skilled (equipment operators) and unskilled labor, is necessary to determine the cost to produce alfalfa.

# Appendix 1

## Testing Agreement with Cal/West Seeds of Woodland California

# Testing Agreement

This TESTING AGREEMENT, made on Thursday, December 12, 2002, between Cal/West Seeds, a California, U.S.A. corporation, having its principal place of business at Woodland, California, U.S.A. (hereinafter called "Cal/West"), and _____ having it's principle place of business at _____ ,Romania, (hereinafter called _____).

WITNESSETH:

RECITALS:

A. Cal/West has conducted extensive breeding and development work and is the owner of the varieties DURA 512, _____, and _____hereinafter called "the varieties."

B. Cal/West is desirous of having the varieties tested in the territory herein described.

C. _____ is desirous of testing the varieties in the territory, and, subject to suitable performance, marketing seed of the varieties in the territory.

THEREFORE, the parties here to agree as follows:

1. _____ shall have the right to test the varieties in the territory of Romania.

2. Cal/West agrees to supply samples within the limitations of current supplies of the varieties, along with the required phytosanitary documents. Seed supplies may be limited, and any seed requested above 2 kg will be invoiced to _____ at current prices.

3. Cal/West agrees to pay freight costs of "no charge" samples to the territory.

4. Cal/West agrees to supply technical information and descriptions of the varieties.

5. _____ agrees to provide a detailed report along with the data comparing the varieties to other standard and commercial varieties for the territory.

6. _____ shall test the varieties at its expense either in private evaluation trials or in trials of institutes or companies specialized in testing.

7. _____ understands that seed supplied under the terms of this agreement is to

be used for testing purposes only. Any selection, breeding, biotechnology process or seed multiplication is strictly prohibited without the signed written consent of an officer of Cal/West. _____ will take steps to ensure that its cooperators and associates both private and public will adhere to this policy.

8. _____agrees to test the varieties under its own code number system as follows:

| Cal/West # | Hygrotech Seed # |
|---|---|
| DURA 512 | |
| | |
| | |
| | |
| | |

9. At such time that a variety(s) proves acceptable performance in test, the parties hereto agree to enter into negotiations to establish a marketing agreement. Should official testing and licensing be required, the parties agree to share the costs on a 50/50 basis.

10. This agreement shall remain in effect for a period of (3) years or until such time that the variety(s) is commercialized. However, the stipulations specified in item 7 remain in effect until such time that Cal/West signs a written release.

GOVERNING LAWS

A. This agreement shall be governed and construed according to the laws of the State of California, U.S.A. and the parties here to agree to submit themselves to the jurisdiction of competent courts of the same state for all matters arising out of this Agreement, thereby waiving the jurisdiction rights they may have by reason of domicile. It is agreed that the laws of said State of California shall be applied by any forum within which any such claim or controversy may be brought. In the event of an irreconcilable dispute, FIS rules will govern.

NON-ASSIGNABILITY:

A. _____ shall not assign, transfer, or otherwise alienate this Agreement or any right, title, or interest here in or here under, either voluntarily or by operation of law, except with prior written consent of Cal/West. In such cases such assignment will

be effective only upon the written agreements of the assignee or transferee to assume and be bound by the obligations of this Agreement to the same extent it would have been bound if such assigned had been the original party to this Agreement.

B. Subject to (A) the provisions of this section shall be applicable not only to the original party to this Agreement, but also to subsequent assignee or transfer and their assigns.

NOTICE:

Any notices required or permitted to be given pursuant to this Agreement shall be deemed to have been given when deposited in the U.S. Mail, postage prepaid, or by prepaid telegram, fax or telex addressed to the addresses listed in Par. 1.

AMENDMENTS:

**This Agreement represents the entire agreement between the parties. Neither party shall claim any amendment, modification, or release from any of the provisions hereof by mutual agreement, acknowledgment, or acceptance of orders or otherwise unless the same is in writing and signed by both parties here to. As of the date of this Agreement, it supersedes all previous agreements, oral or written, between the parties except only uncompleted sales contracts or orders for such seeds.**

Nothing contained in this Agreement shall be construed as establishing or creating an agency relationship, express or implied, between Cal/West and _____ .

IN WITNESS WHEREOF, the parties hereto have executed this Agreement in duplicate at Woodland, California, U.S.A. the day and year first above written.

**Cal/West Seeds** **_____.**

By:_____ By:_____

Title _____ Title _____

Date:_____ Date:_____

# Appendix 2

# List of Alfalfa Varieties in the European Registry

## \\SERVER\Users\International Consultants\SteveOrloff: ReportRomaniaOrloffA4.doc