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French Intensive Truck Garden

Thomas D. Edwards
R2
Butler, Ky. 41006
(606) 472-3237

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French Intensive Truck Garden

The French Intensive approach to truck gardening has the potential to provide substancially higher yields and lower per acre costs than do conventional farming techniques. It was the intent of this grant to show that there is the potential to accomplish the gains that the French Intensive method has to offer. It is obvious that locally grown food can greatly reduce transportation energy costs but when there is the consideration of higher efficiencies there will also be energy cost reductions due to lower fertilizer and pesticide useage. As with any farming technique, there is a substancial time interval for complete soil recovery after there have been made substancial soil modifications. There were major crop improvements even though there was such a short time since the soil had been greatly disturbed. It was also the intent of this grant to accomplish two other major objectives: First, the garden was managed under organic techniques which meant that there were no chemical fertilizers or synthetic pesticides to be used. Second, the garden was constructed so that a handicapped person in a wheelchair could manage and have a higher degree of self sufficiency with the garden. As an overall result, I would say that the garden has taken the first step of success and each year should become better.

It was the intent of this grant to show the feasibility of a French Intensive Garden in this area so that the results could be extrapolated and applied to commercial farming practices. There can be realized a tremendous savings of energy when food is grown and supplied locally rather than being dependent on regional suppliers. Although the main intent of this grant was to show the potential to save energy by reduction of food transportation costs, there were also some secondary goals that were to be achieved. First, it was the intent to show the potential energy savings that are inherent in a system that uses organic techniques. Secondly, it was my intent to show that a wheelchair accessable garden could not only help a wheelchair disabled person to reduce their food costs, but also to provide an outlet for controlled activity.

The original proposal called for the construction of four 5 ft.x25 ft. beds which were to be double dug, fertilized and improved to a depth of two feet. As with any proposal, there are substancial modifications to the original document. As can be seen in the accompanying diagrams, the project more than doubled in scope. The only major design change from the proposed grant was that the proposed stone walls which were to line the bed were later changed to railroad ties because of the difficulty of using rock and a wheelchair together. Although the rock walls were tried and found to be workable, it was found that the railroad ties made a more satisfactory solution.

I was familiar with many of the problems that were to be encountered in the construction of the beds because prior to the grant award I had constructed a prototype bed. A major problem that is encountered when there is a major soil change is that there is a great disturbmance in the microorganisms in the soil. For example, when soil is worked when it is too wet in the spring there is a good chance that the soil will be unsuitable for crops for at least a growing season after that time. Fortunately there are techniques which hasten the recovery of the soil microorganisms. One technique that I have used is to cover the garden during the winter with piles of hay. Over the winter these piles will break down and help to re-establish the soil life.

Work was started immediately on the proposed garden (9/29/80). The area where the beds were to be placed was found to be heavily saturated with limestone rock and fill. The limestone ranged from marble sized to about a foot thick and about fifty square feet. It was decided at this time that hand digging would be out of the question. At this time a backhoe was employed to dig out the proposed trench areas. It was decided to place the topsoil on the space between the two trenches and to place the subsoil on the outside of the proposed trenched areas. Soil stratification would not be too greatly changed using this technique. At this time I decided to expand the trenches to fit in an area that was enclosed by fence. The use of mechanical digging allowed me to expand on the scope of the grant at this time. This would make four trenched areas: two would be about 55 ft.x 5 ft. and two would be about 75 ft. x 5 ft. long. It was decided that the trenches be five feet wide because this is the widest that the beds could be and still be reached from either side. The separation of the rock from the dirt looked to be an extremely tedious procedure. At this time I chose to backfill the trenches myself without labor charges so that I could use funding of the grant in other areas that had been under budgeted.

Backfilling started as soon as the trenches had been completed with the backhoe. The process of backfilling worked quite well because an extremely dry fall made the soil clods easy to split and break apart. Most of the trenches had been dug to a depth of three to four feet instead of the desired two feet. It would be wise to watch this phase in the future if mechanical digging were to be used. The additional cost of the digging is not nearly as important as the additional time required for backfilling. Still, there is no disadvantage in digging to this depth of four feet because the roots of some of the root crops penetrate as deep as ten feet. I am sure that the removal of the dirt and rock to a depth of four feet was fortunate even though there would be the additional time for backfilling. Gardens A&B were started. It was necessary to add about 240 pounds of Gypsum to these two gardens because of the heavy clay content. Gypsum is a good mineral to help break up clay. Fertilization of the garden was started at about 18 inches below final grade level of the garden. Prior to the addition of the fertilizer, there was the addition of organic matter to the garden beds. This organic matter took the form of sawdust and leaves. Greensand added the potassium that was needed by the soil. Greensand was selected because it is considered to be an organic fertilizer and leaches back into the water of the ground very slowly. This material should remain available to the plants for as long as ten years. A little thought will show the cost effectiveness of this type of fertilizer compared to the conventional chemical fertilizers. There is little danger of grounwater contamination because of the slow breakdown of this fertilizer. Also, because there is little breakdown of the fertilizer in the soil, there will not be any concentration of chemicals that will threaten life in the soil. It was necessary to terrace some of the plant beds because the original land contour was sloped to the north as well as to the east. It was necessary however, to have the ends of the plant beds sloping to the east because this soil would warm up quicker in the spring and crops could be planted in these areas much earlier. These beds could be used for some of the earliest spring crops like onions, cole, and peas. Beds A&B were completely dug, backfilled, terraced, and bordered during the first half of the grant period. Beds C&D were completed during the third quarter of the grant period. Third quarter also saw the completion of all of the walkways between the beds as well as the application of nitrogen fertilizer (bloodmeal) to the growing beds. There was approximately a total of about 20 tons of limestone rock that was removed from the four beds. Most of the rock was used as mulch and rock walls in other areas in the garden.

There were no major problems that were encountered in the construction of the four beds. The limestone rock that was encountered was a difficulty, but it was not an unreasonable problem. Later during the fourth quarter of the grant period a new raised bed was constructed and dug to a depth of 18 inches. Although the grant funds were not used in the construction of this bed, it was built to see what difficulties would be encountered if no mechanical digging had been used. The bed was dug completely with shovel, crowbar, and sledge hammer, but there were really no major difficulties that were encountered. Although I am in a wheelchair, I have found that the work can still be done.....it just takes time. There was some difficulty with the rock, but the job was still successfully completed.

After the beds had been double dug, fertilized, terraced, and walled it was time to install the watering system. A drip irrigation system was chosen because it would be most conservative in its useage of water. There is the need for some sort of watering system because all of the beds are raised and therefore drain much easier. One obvious advantage of this is that the beds will be ready for planting much earlier in the spring, but the disadvantage is that the beds will also dry out much easier. It is neccssary for the beds to have an additional water supply for the ve their optimum growth. The design of the drip irrigation system ght forward and the manufacturer's design recommendations were followed. the water "emitters" were to be buried with the distribution pipe itters were to be spaced from each other by two feet. Two dis- were to be laid along the length of each trench. The system had a tor which would maintain supply pressure of 10 psi to each of the nes. It was required to place a wye hose switch at each of the ly one bed could be watered at a time. This was necessary because ed water supply capability and the required ten pounds of pressure intained otherwise. This however, did give more flexibility to the Each emitter had a flow rate of four gallons per hour before it e distribution lines were buried in beds A&B and the lines were op of the surface in beds c&D. Later the lines in beds C&D were covered h would shield them from the detrimental effects of ultraviolet light shown that it is better to have the distribution lines close to the cessable for several reasons. First, the emitters can be checked for ediment and then cleared to function properly. Secondly, there is less y to the lines due to digging when they are accessable under mulch. ht pressure differential in the distribution lines because there is a bout ten feet from one end of the garden to the other. This rence will translate to a pressure difference of about 5 psi. blem was eliminated by placeing the pressure regulator at the center hich reduced the apparent differential to 2.5 psi. A cap sealed h distribution line so that each line could be periodically flushed verall system had a stainless steel screen which acted as a filter. y to clean this filter daily because alge laden water was being earby lake for use in the garden. It was found that the irrigation uite well and there were no suggestions that could be made for

nting of the garden began in early spring as soon as it was warm ting and working with the soil. Peas were planted first with an ssion of radishes, spinich, onions, and the cole family. As the ed the warmer weather crops were planted. The following table s the results of these plantings. As with any garden there are ns why there were particular crop failures. When you consider the urbance that was made in the soil, it is a wonder that the garden ul as it was. Since this is the first year for planting the new be more accurate to compare the results from an old portion of newly worked beds. Fortunately, there was another plat of garden to this new garden. This new garden had been used for garden before, consistantly poorer than any other area because of the underlying not allow deep root penetration. The following chart give some the new garden compared to the old:

New	Old
20" high	6" high
6" high	18" high
2.05 lbs/ft.sq.	.92 lbs/ft.sq.

re were no insect problems.....a very common problem in monoculture were some problems with worms eating the cole family, but the use of a bacterial spray immediately solved the problem. The striped and spotted cucumber beetle were a problem in all of the planting beds; but adjacent to the beds were two bucket gardens which were filled with 100% "compost" made from spoiled hay. These tubs or bucket gardens which were immediately adjacent to the planting beds had no problems with the cucumber beetles. It is unfortunate that the yields of these two bucket gardens were not measured because their yields of cucumbers were extremely high. The concept that insects and disease organisms do not bother healthy plants is demonstrated in this case. This concept is one of the major tenets of the followers of the Biodynamic Approach to gardening. One of the main interests of this grant was the production of celery for truck garden purposes. This particular garden was not successful in producing a good crop of celery; but a similar garden that I have been managing for the last few years has been producing a good crop of celery annually. It is necessary that the celery be protected from early and late frosts so that a long growing season can be obtained. This technioue was not followed on the celery planting in the garden this year because of the many schedule pressures associated with this project. If one were to follow the technique of covering the plants from frosts then it can be expected to yield a crop which is about five times the national average (480 plants/100 sq.ft.). This type of plant works extremely well in an intensive garden. It was also found that the intensive raised bed technique of gardening has the potential to supply off season vegetables whichcan command higher prices than usual. Snow peas were producing at a high rate in this garden when they were commanding a store retail price of $2.40 a pound. When there are premium prices available the French Intensive method has excellent potential.

The reader of this report should notice that there have been given very little quantitative data on preparation of the planting beds. The techniques which would be used to duplicate this project would be completely different in another application and therefore have not been listed. There are many excellent references on the subject as these techniques are centuries old. Each new application would requirespecialized techniques which may or not be similar to the techniques used in this grant. I have found that the reference book by J. Jeavons to be an excellent source book for almost any project. The techniques used in the book can be used on almost any scale. The author of the book was doing truck farming using the French Intensive Techniques. To quote:"Our initial research seems to indicate that the method can produce an average of 4 times more vegetables per acre than the amount grown by farmers using mechanized and chemical agricultural techniques. The method also appears to use 1/8 the water and purchased nitrogen fertilizer, and 1/100 the energy consumed by commercial agriculture, per pound of vegetable grown."

One of the great advantages of these techniques is that these types of gardens can serve a multitude of needs. First, they can be used on a small scale or a large scale and operated as a truck garden which could supply produce grown under highly efficient conditions. Secondly the garden can serve to provide an outlet for market quality produce at retail prices to any grower. How?...the grower can sell the produce to himself by using it and thereby free those dollars to be used in other purchases. Crop excesses can be disposed of as in any other farming community because they can be traded with another person who has another type of crop excess. They can also be given away to help reduce the burden on another person's food bill. When all of this is brought down to a local level

ransportation and distribution costs. Another
or the small producer is that these techniques
at physical, emotional, and spiritual benefits.
bargin at the supermarket. Whatever the degree
sive Truck Garden there is potential in it for
ation---Decentralization of the society---
ter health--- and best of all:A BETTER YOU!!!

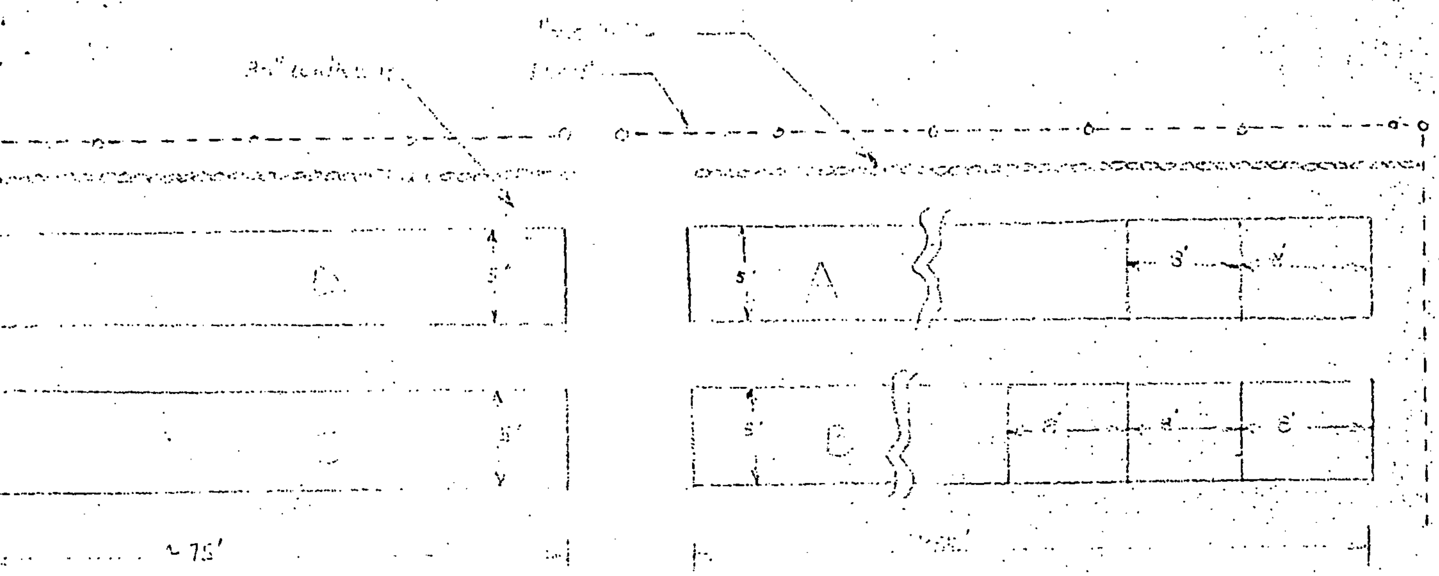
TABLE 1

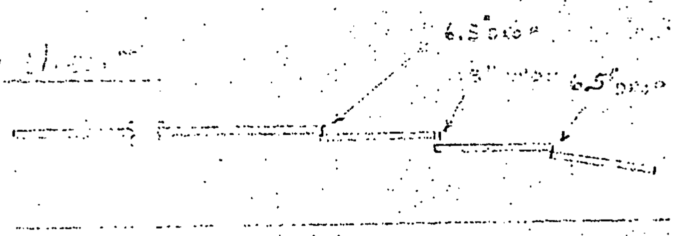
Plant Type	Yield/100 sq.ft.	Potential Yield/100sq.ft.	U.S. Average
Lima Bean	A		
Pole Bean	A		
Cranberry Bean	A		
Beet	B (excellent yield)		
Broccoli	57.75 lbs.	26-39-53	17.4 lbs.
Brussel Sprouts	B (good yield)		
Cabbage, regular	154 lbs.	96-191-383 lbs.	45 lbs.
Cabbage, Dutch	75 lbs.		
Carrots	B (good yield)	— —	
Cauliflower	115.5 lbs.	44-100-291 lbs.	23 lbs.
Celery	A		
Corn	A		
Cucumber	A (see text)		
Leaf Lettuce	B (excellent yield)	— —	
Onion sets	205 lbs.	100-200-540 lbs.	68.6 lbs.
Pea (a)	2.25 lbs./20 ft. row		
(b)	2.75 lbs./20 ft. row		
(c)	10.75 lbs./20 ft. row		
Pepper, green	B (good yield)		
Potato, red	B	— —	
white	85.71 lbs.	100-200-540 lbs.	?
sweet	A (too late)		
Radish	100 lbs.	100-200-540 lbs.	
Spinich	A		
Squash, Zuchinni	A (cucumber beetle)		
Patty Pan	B (good yield)		
Winter	B (excellent yield)		
Crookneck	B (good yield)		
Tomatoes	A (too late)		

Notes:

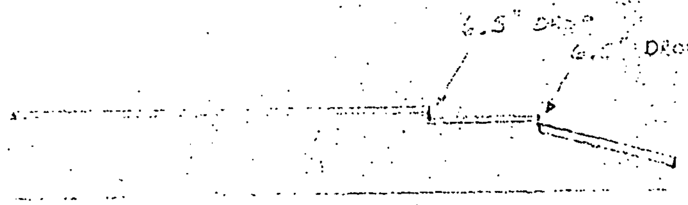
A- crop did not do well and no quantitative data was taken. The reasons for this varies from one particular case to another.

B- The crop did do well, but there was no quantitative data that was taken. This is usually the case where a single row was tested and there could not be calculated a true per square foot yield.





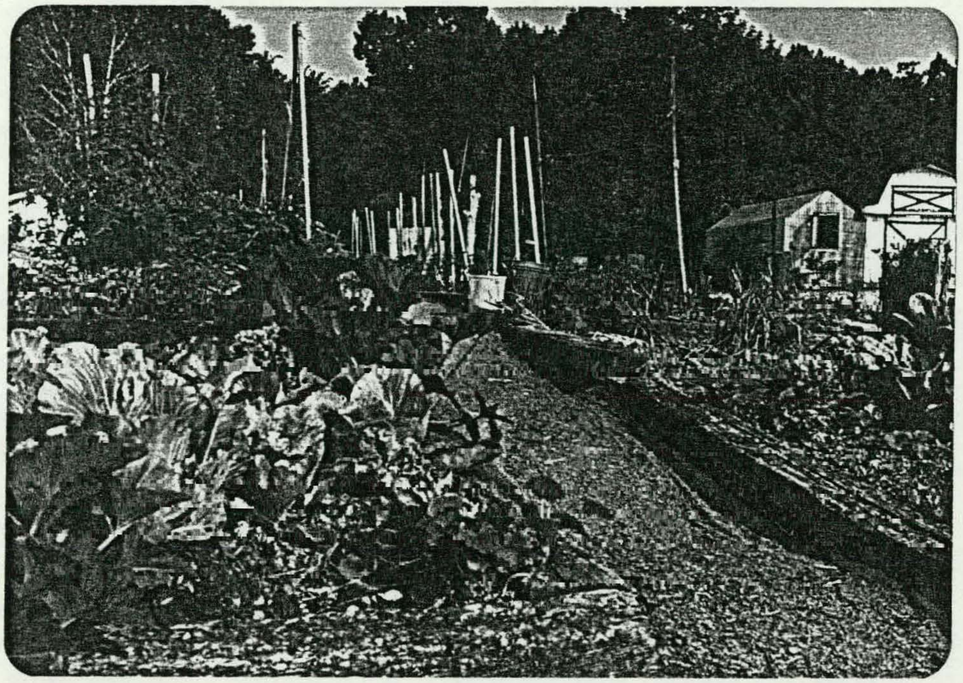
Side View Garden B



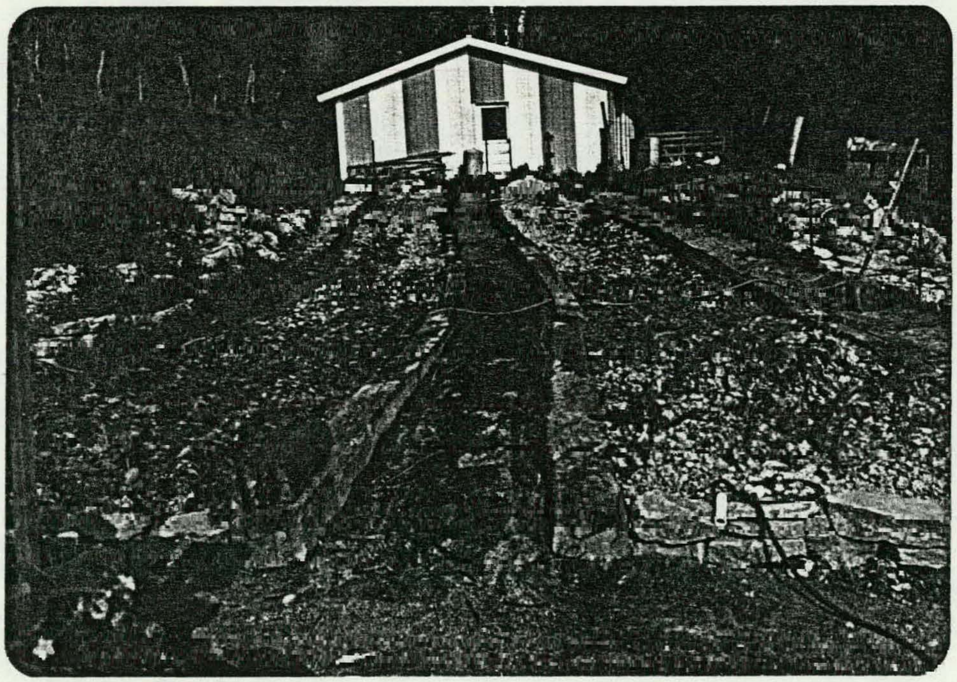
Side View – Garden A

Figure

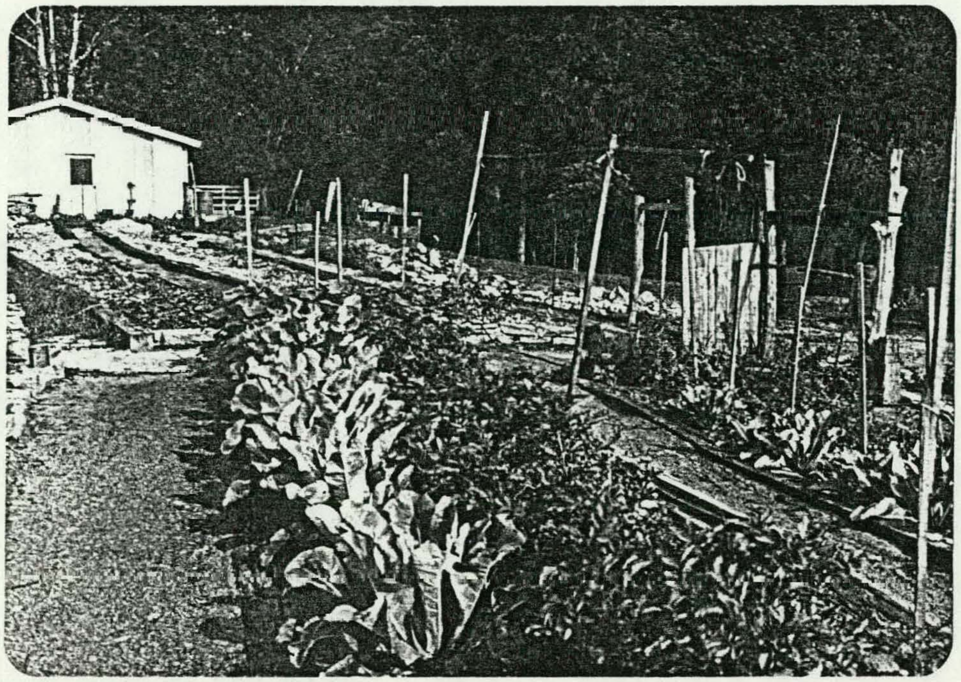
Note:



Lower Elevation: Garden B left, Garden A right



Garden C left, Garden D right



Garden B left front, Garden A right front
Garden C left rear, Garden D right rear

Garden A left, Garden B right

References

Acuatias,A- Intensive Culture of Vegetables, French System. Harrisville New Hampshire: Solar Survival Press, 1978

Fields, C.P.- The Forgotten Art of Building a Stone Wall. Dublin New Hampshire. Yankee Inc., 1971

Jeavons,J.-How to Grow More Vegetables. Berkley California: Ten Speeed Press,1979

Newcomb,D. - The Postage Stamp Garden Book. Los Angeles California: J.P. Tarcher,1975

Organic Gardening- Getting the Most from Your Garden. Emmaus Pennsylvania: Rodale Press,1980