United States Department of Agriculture

Office of International Cooperation and Development

Washington, D.C. 20250

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April 20, 1983

To : Portugal Advisory Committee

150-0023

From : Corwin V. Edwards, Jr.
USDA/OICD/TAD/Latin America Programs

Subject : Current Consultant Reports

Enclosed you will find copies of the most current consultants' reports for the Portugal Agricultural Production Project.

cc: Irving Wyeth
Jim Collom
W. Gerald Matlock
Morris Whitaker
Howard Olson
Katherine Alison
John Naegele
Jerry Hammond
Charles Hanrahan
Marx Sterne
Marcus Ingle
George Miller
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Kitty,
This was attached to the following 3 documents:
PN-AAP-798
" " 797
" " 796
Does this proj. match up - do you think?
Thanks,
Cindy
yes
KK

PN-AAP-796
ISN: 34273

SOME MICROECONOMIC CONSIDERATIONS FOR AGRICULTURE IN NORTH PORTUGAL

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He would especially like to express his appreciation to the support staff of PROCALFER who made his work in Portugal very pleasant and made it possible for him to visit many farms that he would not otherwise have been able to visit.

PREFACE

While there were several possible tasks to be undertaken during the TDY in Portugal, two activities carried a high priority. The first of these was to develop partial budgets to document the profitability of limestone and fertilizer use in Portugal. The second high priority item was to begin the development of base line or benchmark data for the purpose of documenting the effectiveness of PROCALFER in terms of increasing the use of limestone and fertilizer in Portugal and the effectiveness of PROCALFER's training program in the Portuguese Ministry of Agriculture in the various regions. I arrived in Portugal on October 19 and departed on November 26. I would point out that the development of benchmark data on the use of limestone and the effectiveness of training programs was addressed very little because of the complexity and problems associated with the development of budgets related to crop production costs, limestone and fertilizer use.

EXECUTIVE SUMMARY

Budgets on various grain crops, a dairy and a band of sheep were developed during the time in Portugal. These budgets cannot be viewed as representative of either Region 1 or Region 2 in North Portugal but rather represent only the farms from which the data was obtained. Representative budgets for North Portugal would require an extensive interview program and a good deal of time and manpower. The farms in North Portugal in general are very small and are centered around self sufficiency for the farm family. Not only is land a limiting resource on these farms; but it appears that in many cases labor, particularly unpaid family labor, is a limiting resource. Capital is obviously limited, but particular input items such as manure may also be limited. These limited resources may have an impact on the widespread use of limestone for fertilizer in North Portugal. With the lack of these inputs, it was not possible to make direct comparisons of the use of limestone and fertilizer on a crop, but it was found that farmers in general felt that limestone alone

and limestone and fertilizer had a positive effect on yield. It is felt that a more in-depth understanding of the structure of the more common farms found in North Portugal will be required before the likely impact of limestone use can be predicted. In an effort to develop budgets which would demonstrate the profitability of limestone and fertilizer use, it is recommended that the number of Procalfer demonstration plots be reduced to a number which can be effectively supervised by PROCALFER personnel in the various regions. It is further recommended that consultants with expertise in microeconomics be brought to Portugal to hold seminars with mid- and high-level PROCALFER and MACP personnel so that they might better understand the contribution that farm level analysis would not only make to PROCALFER but the overall program of the Ministry of Agriculture. The consultants should have practical experience in data collection and anslysis in the use of this data as well as experience in teaching firm level economic theory.

SOME MICROECONOMIC CONSIDERATIONS FOR AGRICULTURE IN NORTH PORTUGAL

Fred T. Cooke, Jr. 1/

INTRODUCTION

The goals and objectives of PROCALFER are to increase the agricultural productivity of Portugal through the encouragement of farmers to utilize limestone and fertilizer. A secondary goal of PROCALFER is to provide training to personnel of the Ministry of Agriculture of Portugal to improve their effectiveness. The purpose of this TDY was first to develop crop production budgets which would demonstrate, if possible, that limestone not only increased yield but increased net returns and profits to farmers.

DESCRIPTION OF ACTIVITIES

The first three weeks in Portugal were spent reading and studying reports of other PROCALFER consultants and of the Ministry of Agriculture of Portugal (MACP). A great deal of time was spent visiting various Portuguese organizations where I hoped to find published documents that would make it possible to construct either budgets or partial budgets to look at the impact of limestone and fertilizer use in Portugal. After it appeared that no existing reports or data would be useful in the development of budgets, I spent 12 days in Regions 1 and 2 interviewing regional MACP and PROCALFER officials and farmers. Data was collected from 21 farms on production practices and inputs utilized in the production of corn for grain, corn for silage, potatoes, rye for grain, rye for grazing, and mixed grasses used as green chop. These budgets and the interpretation of these budgets will be found in "Findings of Work" section of this report. It must be pointed out that the budgets presented in this report are not in any way representative of either Region 1 or Region 2 of Portugal and are for illustrative purposes only. The complexity of agriculture in northern Portugal would require a very large number of interviews with farmers before representative budgets can be developed.

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ANALYSIS OF SITUATION AND PROBLEMS

It was unfortunate that a large body of data could not be located for the use of budget development for Protugal. However, I have never worked in a country in which budgets could be developed from secondary data. It was always necessary in the end to go to farmers and conduct interviews to obtain the information necessary to develop budgets. Due to the extreme variance of microclimate from valley to valley in North Portugal, an extremely large number of interviews will be required before representative budgets can be developed. Reliable partial budgeting and breakeven analysis of the use of limestone and fertilizer could have been developed if sufficient plot research data from one or more locations could have been obtained. The demonstration plots used by PROCALFER to attempt to document the profitability of limestone use in Portugal should and could provide such data if these demonstration plots were managed properly. I will discuss this further in "Recommendations." The macro level economic work conducted in Portugal by other TDY's and consultants appears to be excellent and to have received close attention from the Portuguese Ministry of Agriculture. Yet, all these reports indicate a lack of understanding of the nature of Portuguese agriculture, particularly in the north and more particularly relative to the organization and structure of farms in North Portugal. A better understanding of the contribution that micro level firm analysis might make towards improved productivity of Portuguese agriculture appears to the author to be lacking.

FINDINGS OF WORK

Various types of budgets were developed based on interviews with farmers and from data obtained from an extension farm management specialist in Vila Real. To develop budgets it is first necessary to develop costs associated with power sources, either tractors or cows, and machinery used to produce crops. Table 1 presents power and machinery performance rates, estimated life, estimated annual use, and purchase price which were obtained from farmers. Repair costs are based on similar tools used in the United States. Where estimates could not be made, similar type equipment used in the 1940's and 1950's in the United States were used to estimate useful life. Estimated total cost per unit of use includes both fixed costs (depreciation and interest on investment) and variable costs (repairs and fuel including service, labor, lubricants, or whatever may be appropriate). Depreciation per hour of use is based on the estimated total hour of use over the life of the machine and not the basis of average life in years. Hence, obsolescence is not a factor in these costs; and depreciation per hour of use is computed by dividing the purchase price by the total number of hours of life.

Table 1. Power and machinery: estimated performance rates, life, annual use, purchase price, repair costs, and direct and fixed costs per hour and per hectare, regions 1 and 2 of Portugal, 1982.

Item	Size or description	Performance rate per hectare	Length of life	Average annual use	Purchase price	Repair costs % of new costs	Direct costs per hour	Direct costs per ha	Fixed costs per hour	Fixed costs per ha
		hours	years	hours	escudos	percent	escudos			
Tractor	45 HP	--	15	400	1,000,000	150	708.0	--	391.7	--
Cows (pair)	draft	--	15	1,000	120,000	--	28.7	--	18.8	--
Moldboard plow	1 bottom	3.5	15	100	40,000	80	21.0	73.5	62.7	219.3
Moldboard plow 1/	1 bottom	7.0	15	100	40,000	80	32.0	224.0	62.7	438.7
Disk	6 ft.	1.0	10	100	60,000	80	48.0	48.0	114.0	114.0
Fertilizer distributor	--	1.0	10	50	70,000	70	98.0	98.0	226.0	226.0
Wagon - silage	--	--	12	--	120,000	80	--	--	--	--
Planter	4-row	1.0	10	20	176,000	70	616.0	616.0	1,672.0	1,672.0
Roller	10 ft.	1.0	15	20	10,000	60	20.0	20.0	78.3	78.3
Herbicide applicator	4-row	1.0	8	20	75,000	100	468.8	468.8	806.2	806.2
Manure spreader	--	6.0	10	50	180,000	80	288.0	1,728.0	684.0	4,104.0
Green chop wagon	--	3.0	10	50	280,000	80	448.0	1,344.0	1,064.0	3,192.0
Front end loader	--	--	15	--	80,000	60	--	--	--	--
Hay conditioner & cutter	5 ft.	3.0	10	30	81,000	125	337.5	1,012.5	513.0	1,539.0
Cable tow irrigator	--	--	10	--	1,100,000	50	--	--	--	--
Sprinkler irrigation system	1/4 HP	--	10	--	50,000	50	--	--	--	--
Electric motor	2 HP	--	10	--	20,000	--	--	--	--	--
Silage cutter	--	5.0	7	150	130,000	120	148.6	743.0	823.5	--
Hand fertilizer applicator	--	--	10	--	20,000	50	--	--	--	--
Little plow (animal powered)	--	5.0	20	150	3,500	50	0.6	2.9	3.3	16.4
Hand push planter	--	4.0	10	10	6,000	80	48.0	192.0	654.0	2,616.0
Grain drill	6 ft.	1.0	20	10	50,000	70	175.0	175.0	700.0	700.0

1/ Same rollover moldboard plow but performance rate lower for heavy soils.

Charges for interest on machinery investment are also made on the basis of each unit of use. Interest is based on a rate of 18 percent 2/ per annum and charges per hour of use are computed as follows:

(1) $\frac{\text{Purchase price}}{2}$ x 18 percent = Total annual interest

(2) $\frac{\text{Total annual interest}}{\text{Average hours of annual use}}$ = Interest per hour of use

Repair costs per hour of use where appropriate are based on the estimated total repairs over the life of the machine expressed as a percentage of the new cost and computed as follows:

$\frac{\text{Purchase price x repairs as a percent of new cost}}{\text{Total hours of life}}$ = Repair costs per hour of use

In addition to repair costs, fuel is also included. It was estimated that the tractor reported in the table would use 4 gallons of diesel fuel per hour at a cost of 32$5 escudos per liter or 458 escudas of diesel fuel per hour. It was reported that it took about 100 escudas of feed per day to supply food for cows used as draft animals. Estimates were that 50 escudas per day for calf feed would be required. Estimates of fixed and variable costs for draft cows were developed as follows: Depreciation and interest were computed as for any other equipment. No veterinary costs were reported for draft cows but there probably should be some. Using 100 escudos per day for 365 days divided by 1,000 hours of annual use for the cows indicates a fuel cost of 36$5 escudos per hour for draft cows. Cattle were assumed to produce 6-1/2 calves over their life. A pair would produce 13 calves for sale. A feed cost of 50 escudos per day for these calves was deducted from their average sale price of 20,000 escudos divided by average hours of annual use gives a return to the draft cows of 7$84 escudos per hour for the useful life of the draft cows. The returns from sale of calves could be deducted from either fixed or variable costs, and a case could be made for either situation. For this report returns from sale of calves were deducted from the variable costs or the fuel cost for the draft cows. It should be noted that no information was obtained on breeding fees for draft cattle, but if such fees were incurred then these fees would have to be subtracted from the returns for calf sales.

Table 2 presents estimated costs and returns for one hectare of rye for grain. This budget represents data collected from two farmers in the same village and was averaged. These farmers are totally dependent upon animal and man power to produce this crop except for the thrashing which was done on a custom basis. It should be noted that all of the rye produced by these two farmers was for home consumption and none actually sold. Price reported was what they could have received had they chosen to sell it.

2/ Farmers reported interest rates of 16 percent at banks and 22 percent from government agencies with banks obviously being preferred.

Table 2. Estimated costs and returns per hectare by operation, rye for grain, labor 50$00 escudos per hour, regions 1 and 2 of Portugal, 1982.

Operation/description	Total power costs direct and fixed	Total equipment costs direct and fixed	Total hired labor costs	Total unpaid labor costs	Total materials costs	Total
	Escudos					
Apply manure	--		--	400	16,000	16,400
Plow	760	365	--	800	--	1,925
Plant (hand)	--	--	--	200	3,120	3,320
Small plow	237	19	--	250	--	506
Harvest	--	--	--	200	--	200
Thrash 1/	--	2,800	--	--	--	2,800
Totals	997	3,184	--	1,850	19,120	25,151

Income--2,000 Kg/ha @ 20$00	40,000$00
Total specified costs less unpaid labor	23,301$00
Returns above total specified costs	16,699$00
Total unpaid labor	1,850$00
Returns above all specified costs and unpaid labor	14,849$00

1/ Custom thrasher.

Table 3 presents costs and returns for rye for grain on another farm and in another village. The item of interest here would be the extremely large amount of unpaid family labor utilized in harvesting and thrashing of this rye. The returns to this rye were positive before unpaid labor costs were added. If unpaid labor were accounted for, returns would be negative for this particular farm.

Table 4 presents costs and returns associated with corn produced for grain on one farm. Note that a tractor was used for primary tillage and animal and hand power produced were used for other inputs of production. Again, before unpaid labor is deducted returns were negative. This corn was produced for human consumption by the farm family. Table 5 presents a very similar situation on another farm in another village where corn was produced for human consumption on the farm and returns are negative both for specified costs and unpaid labor.

It should be noted that a more detailed breakdown of the costs are presented in the appendix tables, that is Appendix Table 2A and 2B relate to Table 2 in the text, etc.

The next four budgets, tables 6, 7, 8 and 9, were obtained from a dairy farmer in Region 1. These budgets are included in this report principally to illustrate budgeting techniques. While the author is certainly not qualified to say what a typical farm is or is not in North Portugal, I think it would be reasonable to say that this farm is not typical of North Portugal. This farmer has 45 milking dairy cattle and uses a very high level of inputs and advanced technology. All activities other than irrigation, topping and pulling corn are mechanized. There are no returns included in these budgets, only costs.

Table 10 is a summary budget of the dairy itself and presents all specified costs associated with this dairy. Table 11 presents computations to determine the fixed costs for the dairy. Table 12 presents computations of variable costs for a dairy herd of 45 milking cows. One item of income is missing, that is the value of the cull cows from the herd. This dairy farmer was in the process of replacing his lower producing cows as fast as superior replacement heifers could be introduced into the herd. Therefore, the price he received for his cull cattle was considerably higher than for a dairy cow which had ceased to be economically productive. The farmer was not able to indicate an average price received for cull cattle because the price varied greatly and since cull cows were sold to other dairymen to be used as producing cows. The question of increased value of the herd as a component of income was raised in preliminary reports given in Portugal. The increased value of the herd should not be included in a production budget and would only be relevant within the rules of budgeting if the entire herd were liquidated.

Table 3. Estimated costs and returns per hectare by operation, rye for grain, labor 50$00 escusos per hour, regions 1 and 2 of Portugal, 1982.

Operation/description	Total power costs direct and fixed	Total equipment costs direct and fixed	Total hired labor costs	Total unpaid labor costs	Total materials costs	Total
	Escudos					
Apply manure	--	--	--	1,800	2,000	3,800
Plow	760	365	--	1,600	--	2,725
Plant (hand)	--	--	--	200	6,000	6,200
Little plow	237	19	--	250	--	506
Harvest	--	--	--	48,000	--	48,000
Thrash	--	--	--	48,000	--	48,000
Total	997	384	--	99,850	8,000	109,231

Income--2,000 Kg/ha @ 20$00	40,000$00
Total specified costs less unpaid labor	9,381$00
Returns above total specified costs	30,619$00
Total unpaid labor	99,850$00
Returns above all specified costs and unpaid labor	-69,231$00

Table 4. Estimated costs and returns per hectare by operation, corn for grain, labor 50$00 escudos per hour, regions 1 and 2 of Portugal, 1982.

Operation/description	Total power costs direct and fixed	Total equipment costs direct and fixed	Total hired labor costs	Total unpaid labor costs	Total materials costs	Total
	Escudos					
Apply manure	--	--	--	750	25,000	25,750
Mold board	7,698	663	--	350	--	8,711
Small plow	237	19	--	250	--	506
Plant	--	--	--	200	1,625	1,825
Weed and thin	--	--	--	9,000	--	9,000
Fertilize	--	--	--	800	3,180	3,980
Hoe x 2	--	--	--	6,000	--	6,000
Irrigate x 6	1/	1/	--	9,000	--	9,000
Cut	--	--	--	1,200	--	1,200
Pull	--	--	2/	2/	--	--
Total	7,935	682	--	27,550	29,805	65,972

Income--2,000 Kg/ha @ 15$00	30,000$00
Total specified costs less unpaid labor	38,422$00
Returns above total specified costs	-8,422$00
Total unpaid labor	27,550$00
Returns above all specified costs and unpaid labor	-35,972$00

1/ Inadequate data for calculation.
2/ Social affair.

Table 5. Estimated costs and returns per hectare by operation, corn for grain, labor 63$00 escudos per hour, regions 1 and 2 of Portugal, 1982.

Operation/description	Total power costs direct and fixed	Total equipment costs direct and fixed	Total hired labor costs	Total unpaid labor costs	Total materials costs	Total
	Escudos					
Apply manure	--	--	--	756	4,000	4,756
Plow	760	365	--	1,008	--	2,133
Small plow	237	19	--	135	--	391
Plant (hand)	--	--	--	126	430	556
Thin and weed	--	--	--	3,780	--	3,780
Fertilize (hand)	--	--	--	504	385	889
Irrigate x 5	1/	1/	--	3,780	--	3,780
Cut	--	--	--	756	--	756
Pull 2/	--	--	--	--	--	--
Total	997	384	--	10,845	4,815	17,041

Income--300 Kg @ 15$00	4,500$00	
Total specified costs less unpaid labor	6,196$00	
Returns above total specified costs	-1,696$00	
Total unpaid labor	10,845$00	
Returns above all specified costs and unpaid labor		-12,541$00

1/ Inadequate data for calculation.

2/ Social affair.

Table 6. Estimated costs per hectare by operation, corn for grain, labor 63$00 escudos per hour, regions 1 and 2 of Portugal, 1982.

Operation/description	Total power costs direct and fixed	Total equipment costs direct and fixed	Total hired labor costs	Total unpaid labor costs	Total materials costs	Total
	Escudos					
Apply manure	6,598	5,832	126	252	20,000	32,808
Mold board	3,849	292	--	220	--	4,361
Disk	1,100	162	--	63	--	1,325
Apply fertilizer	1,100	324	--	63	8,600	10,087
Apply limestone	1,100	324	--	126	3,600	5,150
Disk	1,100	162	--	63	--	1,325
Plant	1,100	2,288	--	63	1,200	4,651
Roll	1,100	98	--	63	--	1,261
Apply herbicides	1,100	1,275	--	63	5,500	7,938
Thin	--	--	252	504	--	756
Apply fertilizer (hand)	--	--	126	252	6,360	6,738
Irrigate x 2	1/	1/	504	1,008	--	1,512
Top	--	--	1,260	2,520	--	3,780
Cut	--	--	1,260	2,520	--	3,780
Pull	--	--	3,780	7,560	--	11,340
Totals	18,147	10,757	7,308	15,340	45,260	96,812

Total specified costs less unpaid labor	81,472$00
Total unpaid labor	15,340$00
Total specified costs including unpaid labor	96,812$00

1/ Inadequate data for calculation.

Table 7. Estimated costs per hectare by operation, green chop forage and hay behind corn, labor 63$00 escudos per hour, regions 1 and 2 of Portugal, 1982.

Operation/description	Total power costs direct and fixed	Total equipment costs direct and fixed	Total hired labor costs	Total unpaid labor costs	Total materials costs	Total
	Escudos					
Apply manure	6,598	5,832	126	252	3,000	15,808
Apply fertilizer	1,100	324	0	63	1,654	3,141
Small plow	474	38	0	630	0	1,142
Grain drill, 6 ft.	1,100	875	0	63	0	2,038
Apply fertilizer	1,100	324	0	63	1,654	3,141
Cut green chop	6,598	2,551	126	252	0	9,527
Haul green chop	6,598	5,832	126	252	0	12,808
Apply fertilizer	1,100	324	0	63	1,654	3,141
Irrigate x 3	--	--	252	756	0	1,008
Cut hay	3,299	2,551	0	189	0	6,039
Bale hay	--	--	189	189	0	378
Haul hay	3,299	--	189	378	0	3,866
Totals	31,266	18,651	1,008	3,150	7,962	62,037

Total specified costs less unpaid labor	58,887$00
Total unpaid labor	3,150$00
Total specified costs including unpaid labor	62,037$00

Table 8 . Estimated costs per hectare by operation, corn for silage, labor 63$00 escudos per hour, regions 1 and 2 of Portugal, 1982.

Operation/description	Total power costs direct and fixed	Total equipment costs direct and fixed	Total hired labor costs	Total unpaid labor costs	Total materials costs	Total
	Escudos					
Apply manure	6,598	5,832	126	252	3,000	15,808
Apply limestone	1,100	324	--	63	3,600	5,087
Apply fertilizer	1,100	324	--	63	5,963	7,450
Mold board	3,849	292	--	220	--	4,361
Small plow	237	19	--	315	--	571
Plant	1,100	2,288	--	63	1,350	4,801
Roll	1,100	98	--	63	--	1,261
Apply herbicides	1,100	1,275	--	63	5,550	7,988
Apply herbicides	1,100	1,275	--	63		2,438
Apply fertilizer	1,100	324	--	63	3,180	4,667
Irrigate x 3 1/	1/	1/	252	756		1,008
Harvest	5,498	1,566	315	882	--	8,261
Haul	5,498	1/	--	630	--	6,128
Total	29,380	13,617	693	3,496	22,643	69,829

Total specified costs less unpaid labor	66,333$00
Total unpaid labor	3,496$00
Total specified costs including unpaid labor	69,829$00

1/ Inadequate data for calculation.

Table 9. Estimated costs per hectare by operation, permanent pasture for green chop, 3 years, labor 63$00 escudos per hour, regions 1 and 2 of Portugal, 1982.

Operation/description	Total power costs direct and fixed	Total equipment costs direct and fixed	Total hired labor costs	Total unpaid labor costs	Total materials costs	Total
	Escudos					
Apply fertilizer (1/3)	367 1/	108 1/	0	21 1/	551 1/	1,047
Small plow x 2 (1/3)	3,667 1/	1,080 1/	0	210 1/	0	4,957
Plant (1/3)	367 1/	291 1/	0	21 1/	0 3/	679
Apply fertilizer	1,100	324	0	63	1,654	3,141
Cut and haul 2/	6,598	10,268	126	252	0	17,244
Cut and haul 2/	6,598	10,268	126	252	0	17,244
Apply fertilizer	1,100	324	0	63	1,654	3,141
Cut and haul	6,598	10,268	126	252	0	17,244
Total	26,395	32,931	378	1,134	3,859	64,697

Total specified costs less unpaid labor	63,563$00
Total unpaid labor	1,134$00
Total specified costs including unpaid labor	64,697$00

1/ One-third of cost.
2/ Two tractors, one cutter, one green chop wagon.
3/ No cost. Farmer saved own seed.

Table 10. Summary of costs and returns for a 45 milking cow dairy, Region 1 of Portugal, 1982.

Income:	
Bull calves sold 17 at 25,000$00	425,000$00
Milk - 4,500 liters/cow/year at 19$75	3,999,375$00
Total income	4,424,375$00
Variable costs	2,703,753$00
Returns above variable costs	1,720,622$00
Fixed costs	659,900$00
Returns above fixed and variable costs	1,060,722$00
Unpaid labor costs	89,800$00
Returns above all specified costs	970,922$00

Table 11. Fixed costs for a 45 milking cow dairy, region 1 of Portugal, 1982.

Item	Value	Life	Depreciation per year	Interest @ 16%	Repairs @ 50% of life
	Esc.	Years	Esc.	Esc.	Esc.
Barn 1/	2,250,000	20	112,500	180,000	56,200
Silos x 3	550,000	--	--	44,000	--
Milking cows x 45	60,000	--	--	216,00	--
Bull	100,000	--	--	8,000	--
Heifer x 18 2/	540,000	--	--	43,200	--
Total	--	--	112,500	491,200	56,200

1/ Slatted floor barn plus milking parlor, pens, hay and feed storage.

2/ 30,000 escudos per head.

Table 12. Variable costs for a 45 milking cow dairy, region 1 and 2 of Portugal, 1982.

Item	Cash costs	Unpaid labor costs
	- - - - - - Escudos	- - - - - - -
Veterinary service	26,000	--
Feed	850,000	--
Corn for grain 1/	--	--
Corn silage, 13 ha	871,533	45,448
Green chop and hay, 13 ha	765,531	40,950
Labor for operating dairy 2/	--	--
Permanent pasture for green chop, 3 ha	190,689	3,402
Total	2,703,753	89,800

1/ Corn for grain--some sold, some used for home consumption, and some traded. If portion of corn fed to cattle could be determined, that portion would be included in cash costs.

2/ Unable to determine.

Table 13 presents a budget for rye planted for the purpose of grazing sheep. The data for this budget and the following budget on a band of sheep was obtained from a very large farm operated by a manager in Tras-os-montes. Again we have an example of a crop which is produced to provide feed for livestock. This rye was produced to graze a band of 140 sheep in the winter and spring. Table 14 presents a budget for a band of sheep. No fixed costs are included in this budget for two reasons. The cut, unmortared stone buildings used to house these sheep were well over 50 years old and were shared with other animals on the farm. It was not possible to determine a value for the animals in this band of sheep. Thus, no annual interest charges are included for the sheep. An annual cost to the sheep herder was obtained, but perquisites such as food and housing are not included because they could not be estimated. Veterinary services were obtained and are included. This band of sheep existed on grazing left over rye harvested for grain, forage produced under olive trees, and forage from the surrounding mountains. Therefore, there were little if any other costs involved in the production of these sheep. Again, this budget is presented for illustrative purposes to point out the process that one must go through to look at the contribution of a crop to a livestock enterprise.

Partial Budgets for Corn for Grain and for Potatoes

The only data obtained other than from interviews with farmers relative to budgets and cost of production in North Portugal was in Vila Real. An extension farm management specialist located in Vila Real had obtained one year's data from 13 farmers on quantity and cost of fertilizer and seed used to produce corn and potatoes and other cash expenses where appropriate. These data would be referred to as partial budgets. A superficial look at these data would indicate that little or no clear cut information on the value of fertilizer could be obtained. Of these 13 farmers, 11 used fertilizer and two did not. Note that the four farmers with highest yields had the highest average cost but the lowest returns of any of the groupings of farmers made. The farmers who used no fertilizer and only incurred seed costs had the highest returns. The farmers with the lowest yield actually earned almost 3,100 escudos more per hectare than the farmer with the highest yield. A superficial judgment of this might indicate a negative return to fertilizer, but let us look at this in greater depth before drawing such a conclusion.

Table 15 lists each farmer among the 13 growing corn, the expenditures for fertilizer and seed, and the yield in kilograms per hectare. The item under the column heading "Field Size Factor" is simply the multiplier required to convert the actual field size to one hectare. All farms averaged a return above specified cash costs of 9,893 escudos per hectare. It should be pointed out, however, that some of this corn was sold but the exact quantity was not determined. A great deal of the corn was used for home consumption, principally for the making of bread.

Table 13. Estimated costs per hectare by operation, rye for grazing sheep, labor 50$00 escudos per hour, regions 1 and 2 of Portugal, 1982.

Operation/description	Total power costs direct and fixed	Total equipment costs direct and fixed	Total hired labor costs	Total unpaid labor costs	Total materials costs	Total
	Escudos					
Mold board	7,698	663	350	--	--	8,711
Plant (hand)	--	--	400	--	4,800	5,200
Small plow	237	19	250	--	--	506
Totals	7,935	682	1,000	--	4,800	14,417
Total specified costs	14,417$00					

Table 14. Specified costs for a band of 140 sheep, region 2 of Portugal, 1982.

Eight hectares of rye for grazing sheep	Esc. 48,000$00
Sheep herder (no perquisites included)	Esc. 96,000$00/year
Veterinary services	Esc. 20,000$00/year
Labor for shearing and other things 1/	--
Total cost for 140 sheep	Esc. 164,000$00/year

Gross from 140 sheep	
Milk	40,000$00
Wool--600 Kg/year at Esc. 40$00	24,000$00
Lambs 80/year at Esc. 2,500$00	200,000$00
Total	264,000$00

Gross	264,000$00
Specified costs	164,000$00
Returns above specified costs	100,000$00
Returns above specified costs per sheep	714$29

1/ Unable to determine.

Table 15. Estimated direct costs, yield and returns per hectare, corn for grain, 13 farmers, region 2 of Portugal, 1982.

Farm No.	Field size factor	Fertilizer cost	Seed costs	Yield
		- - - - Escudos	- - -	Kg.
1	3.33	11,585	671	2,000
2	4.00	11,360	542	1,800
3	4.00	3,600	271	1,440
4	3.33	7,133	452	1,200
5	3.33	0	226	1,600
6	3.57	33,964	969	3,427
7	5.26	40,344	713	4,102
8	24.57	0	823	2,948
9	12.50	12,313	424	900
10	6.67	22,266	563	2,388
11	6.67	7,129	904	3,001
12	5.00	8,350	339	2,400
13	4.12	51,883	1,117	3,461
Totals	--	209,927	8,014	30,667
Average per hectare		16,148	616	2,359

Average returns per hectare 2,359 Kg @ 11$30 = Esc. 26,657$00

Average specified costs per hectare 16,764$00

Average returns above specified costs 9,893$00

Look at Table 16 and note the inputs and yields for the four farmers with the highest yields. Notice that three of them had the highest fertilizer uses among the 13 farmers, yet one of them had a very low cash expenditure for fertilizer. Also note that these expenditures for fertilizer resulted in a higher yield but a lower return than for the average of the 13 farms. Table 17 presents the yield, fertilizer and seed costs for the four farms with the lowest yields in the group. Note that the average returns are higher for these farms than for the four farms with the highest yield. Table 18 indicates the seed costs and yield for the two farms which used no fertilizer. One of these farms was among the four which reported the lowest yields. The other farm which used no fertilizer actually ranked fifth in yield among the 13 farms. Table 19 is a summary of each grouping of farms.

Some of the same discrepancies can be noted in Table 20 which reports fertilizer, seed, pesticide and other costs associated with potato production. In this case, the farmer with highest total cost did in fact produce the highest yield. It would appear that while some of the potatoes produced in this village and by these farmers were sold away from the village, a large proportion were probably sold within the village or consumed at home. This may be concluded since only three of the six farmers from which data were obtained purchased sacks for their potatoes which are among the items listed under "Other Costs."

Now what do these partial budgets tell us? They may or may not tell us that fertilizer use was too high in some instances and that a lower level of purchased inputs would result in a greater profit to the farmer. But, before we can reach such a conclusion we must take into account other factors which can and do have significant impact on yields. The first and most obvious in North Portugal would be the quantities of manure used on farms. This partial budgeting effort only obtained information on cash or out of pocket costs and not on non-cash cost items. Yet, the quantity of manure used could significantly affect yield.

In this particular village a great concern was expressed relative to the limited amount of irrigation water available for crop production and individuals felt strongly that if greater quantities of water were available yields could be dramatically improved. To properly evaluate the yields reported by these farmers, the number of irrigations and the quantity of water used per irrigation by the different farmers must be known. Conversations in this village indicated that these quantities were quite variable as a result of the relationship to water source in the case of water available to the village. It was also reported that some farmers had individual or jointly-owned wells available to themselves and not others.

Table 16. Estimated direct costs, yield and returns per hectare, corn for grain, four farmers with highest yield, region 2 of Portugal, 1982.

Farm No.	Fertilizer costs	Seed costs	Yield
	- - - - - - - Escudos	- - - - - - -	Kg/ha
6	33,964	967	3,427
7	40,344	713	4,102
11	7,129	904	3,001
13	51,883	1,117	3,461
Totals	133,320	3,701	13,991
Average per hectare	33,330	925	3,498

Average returns per hectare 3,498 Kg @ 11$30 = Esc. 39,527$00

Average specified costs per hectare 34,255$00

Average returns above specified costs 5,272$00

Table 17. Estimated direct costs, yield and returns per hectare, corn for grain, four farmers with lowest yield, region 2 of Portugal, 1982.

Farm No.	Fertilizer costs	Seed costs	Yield
	- - - - - - - Escudos - - - - - - -		Kg/ha
3	3,600	271	1,440
4	7,133	452	1,200
5	0	226	1,600
9	12,313	424	900
Totals	23,046	1,373	5,140
Average per hectare	5,762	343	1,285

Average returns per hectare 1,285 Kg @ 11$30 = Esc. 14,521$00

Average specified costs per hectare 6,105$00

Average returns above specified costs 8,416$00

Table 18. Estimated direct costs, yield and returns per hectare, corn for grain, two farmers who use no fertilizer, region 2 of Portugal, 1982.

Farm No.	Seed costs	Yield
	Escudos	Kg.
5	226	1,600
8	823	2,948
Totals	1,049	4,548
Average per hectare	525	2,274
Average returns per hectare	2,274 Kg @ 11$30 = Esc.	25,696$00
Average specified costs per hectare		525$00
Average returns above specified costs		25,171$00

Table 19. Summary of estimated direct costs, yield and returns per hectare, corn for grain, region 2 of Portugal, 1982.

Number of farmers	Yield	Yield value @ 11$30/Kg	Cost	Returns
	Kg.	- - - - - -	Escudos	- - - - - - -
All 13 farmers	2,359	26,657	16,764	9,893
11 farmers (use fertilizer)	2,374	26,826	19,717	7,109
2 farmers (no fertilizer)	2,274	25,697	525	25,171
4 farmers (highest yield)	3,498	39,527	34,255	5,272
4 farmers (lowest yield)	1,280	14,464	6,105	8,359

Table 20. Estimated direct costs, yield and returns per hectare potatoes, 7$50/kg, region 2 of Portugal, 1982.

Farm No.	Field size factor	Fertilizer costs	Seed costs	Pesticice costs	Other costs	Yield
		- - - - - - - - - - Escudos - - - - - - - - -				Kg.
1	25.00	13,275	24,938	365	0	4,625
2	5.00	14,708	39,900	416	3,375	9,500
3	13,57	21,664	54,144	1,129	6,107	24,426
4	2.63	20,033	20,987	438	0	6,312
5	2.00	6,581	23,940	499	0	14,700
6	4.00	20,224	31,920	666	5,063	11,200
Totals		96,485	195,829	3,513	14,545	70,763
Average/hectare		16,081	32,638	586	2,424	11,794

Average returns per hectare 11,794 Kg @ 7$50 = Esc. 88,455/Ha

Average specified costs per hectare 51,729$00

Average returns above specified costs 36,726$00

Another unknown factor affecting yield is the inherent fertility of the soils associated with each of the fields and farms from which these data were obtained. Some farmers reported that they were very pleased with fertilizer and all of the farmers who used fertilizer expressed an intention to do so the next year but perhaps at different rates. They all expressed an intention to use some lime for the 1983 crop but none was used in 1982 or in prior years. Another factor affecting yield would be any difference in pH between fields. A low pH can have considerable effect on fertilizer utilization.

I would like to point out that this was the only cost of production data that I was able to obtain other than from farmers during my stay in Portugal. This effort certainly reflects the most positive attitude in terms of production economics or farm management work in research that I was able to find. However, this analysis, while useful, needs to be supplemented with information on quantities of manure applied, a minimum of information at least on the number of irrigations, and preferably the quantity of water applied per irrigation and some information on the relative ranking of the inherent fertility of the soils and their pH.

Yield Increase Required for Breakeven Return for Selected Crops as a Result of the Use of Limestone

Present Portuguese recommendations for limestone usage would result in the use of 7 tons of limestone over a 3-year period on one hectare. Current prices for limestone are 1,200 escudos per ton delivered to the farm gate. Therefore, 7 tons of limestone would cost 8,400 escudos and would result in an annual average limestone cost of 2,467 escudos per year per hectare. To compute a breakeven yield increase for limestone on this basis, prices reported by farmers in North Portugal were used for three crops--corn, potatoes, and rye. Farm gate prices of corn as reported by farmers averaged 15 escudos per kilo. Potatoes averaged 5-1/2 escudos per kilo and rye prices averaged 20 escudos per kilo. If the price received by farmers for each of these crops is divided into the average cost of limestone per year, that is 2,467 escudos per hectare, then indications are that it would take 167-1/2 kilos per hectare yield increase for corn to pay for the limestone. Potatoes would require a 328.9 kilo per hectare increase to pay for limestone, and rye would require an increase of 123.4 kilos per hectare to pay for limestone costs. This analysis assumes that there are no application costs associated with the limestone. In many cases in North Portugal there are no actual out of pocket costs incurred for the spreading of limestone as this work is done by hand by members of the farm family.

Similarly the percent yield increase for each of these three crops to recover limestone costs can be determined. The Portuguese national yield of corn is 1.3 tons per hectare, 9.5 tons for potatoes, and 0.72

tons for rye. 3/ Based on the above limestone cost, the percent yield increase required for corn would be 12.7 percent, 3.5 percent for potatoes, and 17.1 percent for rye.

If we assume that a tractor and fertilizer spreader and two hired laborers are used to apply the lime, this would add 328 escudos to the cost (variable and fixed costs) for the tractor and fertilizer spreader plus 126 escudos for the two hired laborers (see Table 1). Thus, a total of 2,917 escudos average annual cost for limestone and application was obtained. Dividing the appropriate price for corn, potatoes and rye into the 2,917 escudos indicates that it will take 194.5 kilos of corn or a 15 percent yield increase to pay for the cost of limestone and application. Potatoes would require a yield increase of 388.9 kilos or 4.1 percent increase over the national average yield. Rye would require 145.9 kilos yield increase per hectare or a 20.3 percent increase over the national average for rye.

Except for rye, the above numbers would indicate that the breakeven increase in yields for limestone with or without application costs are rather modest. In conversation with soil scientists on the Purdue University team at Vila Real and here in the United States, it would seem that limestone should be profitable for potatoes and corn. It likely will be a profitable input for most field crops produced in northern Portugal. Even rye may give a profitable yield response since the national yield of rye is only 720 kilograms per hectare, thus only a modest increase in yield in terms of kilograms would be required to pay for the limestone.

The Use of Budgets and Problems with Budgets

As mentioned previously in this report, these budgets can only be used for illustrative purposes. They in no way would reflect any usual or common situations in either Regions 1 or 2 of Portugal, but only reflect information provided in most cases by farmers for the individual farm or farmer interviewed. Clearly the budgets obtained from the dairy in Region 1 and the band of sheep in Region 2 are atypical of most farms in those regions. These budgets do reflect the kinds of information required for proper budget development and, as such, can be used as guides for those who feel a need to develop cost and returns information for various agricultural enterprises in Portugal.

Several aspects of these budgets need to be dealt with in somewhat more detail. The first of these is the unpaid labor, usually family labor. Under the apparent conditions of agriculture in North Portugal, unpaid

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3/ "World Bank Agricultural Sector Survey for Portugal, 1978 (1973-1975 Average)."

labor represents (in most cases) the largest single input into a crop. Within the farm itself it probably represents the most important limiting resource on the farm and therefore of necessity must have a significant influence on crop selection. This is simply to say that with a limited labor supply choices must be made between crops which require hand labor at the same time if sufficient labor is not available to work all the possible alternatives. There appears to be a feeling by many people in MACP that there is no reason to account for the hours or opportunity costs of unpaid farm labor. This is not the correct view. Any analysis of shifts from one crop to another must take into account the limited labor available on a given farm. A second aspect of labor both hired and unpaid, is that at least in Region 1 north of Porto labor is extremely scarce. There are several reasons for this. A significant portion of the family labor on many farms appears to be away from the farm working in other countries. Secondly, the level of economic activity in this region has provided greater income potential than would be obtained from farm work for people who might otherwise be hired farm laborers. In the three villages visited in this region, there was a great deal of idle land which appears to be directly related to the scarcity of labor. In an interview with an older farmer in this region, we found he had nine hectares of idle land because labor there was not sufficient to work these hectares.

A second item in these budgets that is of some concern to the author is the use of manure. Manure is obviously a very important input in crop production where fertilizer is not used. Because of the nature of the soils, manure is deemed to be highly desirable even where fertilizer is used. In most instances farmers reported that manure was not a purchased input, yet in the budgets presented in this report I have treated manure as a purchased input for the following reasons. The first would be that although most farmers reported that they use their own manure to fertilize the crops, they were able to very quickly put a value on this manure. There was an established price for manure in each village indicating that manure was regularly bought and sold. Thus, supply of manure is probably limited in most villages. Some people in the villages in the north own very little livestock, and even where a farmer owns several teams of cows and other livestock the question has to be raised as to whether there is sufficient manure available for all of the crops produced on the farm. The manure item listed under materials can be easily removed from direct or variable costs if so desired and put under noncash costs with unpaid labor. To sum up, I would say that the purpose for which the budget is to be used would determine whether manure should be treated as a cash or noncash item.

RECOMMENDATIONS

The immediate need in PROCALFER is to develop information on costs and returns associated with the use of limestone on crops in Portugal. The question becomes how do we effectively accomplish this in the least

possible time. A decision was made to use demonstration plots to develop such information, yet the data which I received in early March does not seem to indicate that this data will be of great use in determining costs and returns associated with limestone and fertilizer use. A further study of this document will be made shortly. This judgment is reinforced by statements made at my first meeting with members of the Extension Farm Management Group. There are clearly problems with supervision of the demonstration plots and data collection associated with these plots. In all fairness, I must say that despite repeatedly asking for permission to see some demonstration plots, while I was in North Portugal, for one reason or another I was not shown any. Possibly a large portion of these plots may have been harvested at the time I was in North Portugal, but I saw a sufficient number of unharvested crops to make me wonder if this was entirely accurate. I must suggest that the feasibility of properly designed limestone and fertilizer research plots be again considered as data generated from such plots would provide the necessary data to make a full economic evaluation of crop response to fertilizer and limestone. I realize that the location of experiment stations in Portugal, particularly in North Portugal, would mean that the results from these plots would not be representative of a wide range of the soil types and microclimates found in North Portugal. However, one or more such research activities could quickly strengthen the position of PROCALFER in terms of providing data to farmers so that they might make a decision as to use of limestone.

To return to the question of the demonstration plots, I would suggest that the number of demonstration plots be reduced to a level where there is sufficient manpower to see that these demonstration plots are properly supervised throughout the growing season. It would seem that data from a limited number of plots would be more useful than unreliable data from a number of large plots. Individuals responsible for the demonstration plots should have no other duties during the growing season other than to supervise and collect data from these plots. I make this point because it was often mentioned that the multiple number of duties required of regional extension people precluded them from having sufficient time to oversee these plots.

It would seem to the author that the planning, development, supervision, and data collection from this proposed limited number of demonstration plots be put in the hands of PROCALFER itself. It is clear that many of the people in the regional extension service are occupied with other tasks directed by the Ministry of Agriculture which take priority over the proper conduct of demonstration plots.

To be specific I will make two recommendations. First, demonstration plots should have the highest priority if reliable budgets are to be developed rapidly. Secondly, the number of demonstration plots should be reduced to the number that can be effectively supervised and serviced, and that this supervision and data collection become the responsibility

of PROCALFER rather than MACP in the regions. In addition, if funds are available, it may be appropriate to bring in someone to discuss with the people directly responsible for the demonstration plots the purpose of these plots, how they will be used, how they should be set up, data requirements, and how the data will be used. It is not reasonable to expect people who are going to do the actual supervision and data collection from the plots to do a good job if they do not have a thorough understanding of that job.

Most of the limestone use that I found in North Portugal was applied at some rate less than currently being recommended by MACP. Yet, in almost all cases farmers reported that they could see increased yield as a result of these limited quantities of limestone. As limestone not only affects pH but aluminum toxicity, it would seem that the encouragement of the use of lesser rates would be appropriate on many farms in Northern Portugal due to limited capital. It would seem to me that if quantities less than those currently recommended did in fact increase yield these yield increases would provide additional income to purchase additional lime in succeeding years. Another approach which seems logical to me would be to encourage farmers to treat a small portion of a field so they can observe for themselves the effects of limestone on yield. It must be remembered that these small farmers have obviously very limited capital resources. The Ministry of Agriculture has loans available for the purchase of limestone yet most farmers did not feel confident to fill out the loan papers and when they were assisted by regional extension service workers the time was viewed as prohibitive by many farmers. In many cases, they were reluctant to use this credit source. Such a program of recommending a lesser rate or allowing the farmer to purchase small quantities of lime to be used on a small part of a given field are accepted and widely used extension practices throughout the world.

While the budgeting process, given an adequate number of observations, could provide insights as to the profitability of limestone use it appears to me that the impact of this use could still be limited. Budgets are applied to individual enterprises or crops, yet we are dealing with an individual farm firm producing a multiple number of crops with many goals to meet. It is clear that on most farms in North Portugal the first goal to be met is to provide food for the farmer and his family. Secondly, he desires to produce products that can be sold for money to purchase those things which he cannot grow. What is not understood by the author is the nature and structure of the whole farm in North Portugal. Obviously the nature and structure is somewhat different in Region 1 than in Region 2. It may even be different between villages, but until we understand the nature and structure of these farms we will probably have only limited use of limestone.

Due to the smallness of these farms, and based on a fairly universal feeling among farmers interviewed, it is not likely that increased production of corn or other grain is going to be moved into grain market

channels. Most farmers indicated that if they could increase production through the use of limestone and fertilizer that they would utilize the increased output for livestock production. Again it was a consensus of opinion that, considering the small quantities of grain which they might produce, the value of this grain could be greatly enhanced by feeding livestock for sale. It is my understanding that to some extent this is compatible with the finding of the study on the comparative advantage of Portuguese agriculture with other common market nations affected by a Mediterranean climate. We are confronted here with a question of priority. It is clear that the priority of most of the farmers in North Portugal is to first produce sufficient food to feed their family. Production above this level is used to earn cash to purchase other goods which are needed or desired.

It appears that most of the farms in North Portugal would best be described as self sufficient farms. By self sufficient I mean that the goal of the farmer is to make that farm provide for the basic wants of the family through the production of food and income sufficient to buy needs and wants. This kind of farm is considerably different than that which is commonly referred to as a subsistence farm. A subsistence farm is one in which there are few alternatives for the people working the land and may not supply the basic requirements for food.

The farms of North Portugal certainly are considerably smaller than the farms of the 1930's in the United States but appear to be similar in their function. That is, cash is limited but the farm has a capacity to provide not only the basic wants but also some goods and services beyond those items considered as basic wants.

The increased use of limestone and fertilizer obviously offers a tremendous potential for raising the living standards of farmers in North Portugal. Yet, one must question whether it is reasonable to expect that increased productivity would do much more than enhance the standard of living of the people in regions 1 and 2. This is not a fault of what limestone and fertilizer might do toward increasing productivity but rather due to the size and structure of the farms. Certainly farmers expressed little interest in selling grain off the farm. Increased livestock production on the other hand was viewed as being a more profitable alternative use for increased production thus raising their living and nutritional standards. Certainly some portion of that increased livestock productivity would result in increased supplies of livestock products in Portugal. It is very difficult at this time, however, to envision that increased productivity of grains would have any significant impact on the ability to supply other parts of Portugal with significant quantities of grain. Certainly there are some farms in North Portugal which are large enough to have an impact on the supply of agricultural products for all of Portugal. Statistics concerning North Portugal would indicate that the number of these farms is limited, however.

It is recommended that one or more consultants with experience in farm structure and organization be brought in to study as many individual farms as possible given budget constraints, but in any case at least two farms in each village involved in the study. Thus, a better understanding of labor availability, labor requirements, requirements for food production, requirements for production for cash sales could be obtained. Furthermore, the general nature of farms in North Portugal could be identified from such a study.

One of the problems that we are concerned with is the lack of understanding of the contribution that firm level economics might have not only on individual farmers and farmers in various regions but on policymakers. The author strongly feels that there is a great need to bring in consultants, one or two at least, not only with theoretical knowledge of firm level analysis but considerable experience in the development of data, the analysis of data and the use of such data in the decision-making process. These people should be providing instructions to mid- and high-level management personnel in MACP and PROCALFER as to the worth of such activities. It seems to me that in many instances even where knowledge of farm management or microeconomics was found in almost no case is such knowledge being put to practical use. Such a training program for middle and upper level management people would seem consistent with the training programs now being carried out on management techniques by PROCALFER.

ATTACHMENTS

The farm management extension group in Lisbon asked for a set of forms to be used in taking data for budget development. Enclosed are three forms that are used for such purposes in the United States and have been slightly modified to fit Portuguese conditions.

The first of these forms is entitled "Operations Data." Note that where hired labor is used a wage rate per hour should be obtained. Description of operation would simply mean such things as apply manure, plow, moldboard, plant, apply herbicides, harvest, irrigate or whatever. It is desirable to obtain the approximate date in a given month for each operation so that competition for labor or equipment can be noted. Under the general heading of equipment we have power source. This should be tractor and horsepower or pair of cows or whatever. The hours required to do the operation on one hectare and the size or description of the equipment such as one-bottom rollover moldboard, small animal powered plow, hand planter, or whatever should be entered in the column under hours. Number of laborers and hours worked, paid laborers and unpaid laborers will complete this section.

A second form entitled "Materials" is be used to obtain the quantity and cost of materials used to produce a given crop. Obviously only the lines where material inputs are used would be filled out on this form, but for proper understanding of the budget the description of operation should be repeated where appropriate. The kind of material might be manure, fertilizer or the name or formulation of the fertilizer, seed or whatever. The unit should be expressed as so much per kilo or ton and the price for that unit and quantity per hectare. Where the quantity used was on less than one hectare, a factor should be used to expand the quantity to that appropriate for one hectare.

The third form is concerned with collection of data to determine power and machinery costs. Under item we should list such things as the make and model of each item so the entry is readily understood. Under size and description number of plows or width should be listed. You would enter no data under performance rate per hectare for tractors or cows. Include the useful length of life and the purchase price of these items. For a particular piece of equipment such as a moldboard plow or planter, you would list that item in such a way that it can be understood what it is. Performance rates are obtained for each tool, i.e. how long it takes to do one hectare. Again, length of life and purchase price should be obtained.

These data would provide all the information needed to develop a budget for a given crop if the procedure outlined in the report were followed. Ideally, over time a large amount of such data could be collected. At this point in time, a mini computer could be used in conjunction with a budget generator to speed up the budget development process and eliminate many of the hand calculation errors inherent in such work. A budget generator also makes it possible for the development of budgets by someone with little expertise in budgeting.

OPERATIONS DATA

Wage rate per hour _____

Description of operation	Approximate date	Equipment			Labor			
		Power source	Hours	Size or description	Number paid laborers	Hours	Number unpaid laborers	Hours

MATERIALS DATA

Description of operation	Kind of material	Unit	Price per unit	Quantity per hectare

POWER AND MACHINERY DATA

Item	Size or description	Performance rate per hectare	Length of life	Purchase price

Appendix table 2A. Estimated power and equipment costs by operation, one hectare of rye for grain, regions 1 and 2 of Portugal, 1982.

Operation/description	Performance rate	Times over	Power			Equipment		
			Hours	Direct costs	Fixed costs	Hours	Direct costs	Fixed costs
	Hours			- - Escudos - -			- - Escudos - -	
Apply manure (hand)	--	-	--	--	--	--	--	--
Plow	16	1	16	459	309	16	64	301
Plant (hand)	--	-	--	--	--	--	--	--
Small plow	5	1	5	143	94	5	3	16
Harvest (hand)	--	-	--	--	--	--	--	--
Thrash 1/	--	-	--	--	--	--	2,800	--
Totals	--	-	--	602	395	--	2,867	317

1/ Custom thrasher.

Appendix table 2B. Estimated labor and materials costs by operation, one hectare of rye for grain, labor at 50$00 escudos per hour, regions 1 and 2 of Portugal, 1982.

Operation/description	Labor				Material			
	Hired		Unpaid					
	Hours	Cost	Hours	Cost	Quantity	Unit	Cost per unit	Cost per hectare
		Esc.		Esc.			Esc.	Esc.
Apply manure (hand)	--	--	8	400	8.0	ton	2,000	16,000
Plow	--	--	16	800	--	--	--	--
Plant (hand)	--	--	4	200	156.0	kg	20	3,120
Small plow	--	--	5	250	--	--	--	--
Harvest (hand)	--	--	144	7,200	--	--	--	--
Thrash (custom)	--	--	4	200	--	--	--	--
Totals	--	--	181	9,050	--	--	--	19,120

Appendix table 3A . Estimated power and equipment costs by operation, one hectare of rye for grain, regions 1 and 2 of Portugal, 1982.

Operation/description	Performance rate	Times over	Power			Equipment		
			Hours	Direct costs	Fixed costs	Hours	Direct costs	Fixed costs
	Hours			- - Escudos - -			- - Escudos - -	
Apply manure (hand)	--	--	--	--	--	--	--	--
Plow	16	1	16	459	301	16	64	301
Plant (hand)	--	--	--	--	--	--	--	--
Little plow	5	1	5	143	94	5	3	16
Harvest (hand)	--	--	--	--	--	--	--	--
Thrash (hand)	--	--	--	--	--	--	--	--
Totals	--	--	--	602	395	--	67	317

Appendix table 3B . Estimated labor and materials costs by operation, one hectare of rye for grain, labor at 50$00 escudos per hour, regions 1 and 2 of Portugal, 1982.

Operation/description	Labor				Material			
	Hired		Unpaid					
	Hours	Cost	Hours	Cost	Quantity	Unit	Cost per unit	Cost per hectare
		Esc.		Esc.			Esc.	Esc.
Apply manure	--	--	36	1,800	1	ton	2,000	2,000
Plow	--	--	32	1,600	--	--	--	--
Plant (hand)	--	--	4	200	300	kg	20	6,000
Little plow	--	--	5	250	--	--	--	--
Harvest	--	--	960	48,000	--	--	--	--
Thrash	--	--	960	48,000	--	--	--	--
Totals	--	--	1,997	99,850	--	--	--	8,000

Appendix table 4A. Estimated power and equipment costs by operation, one hectare of corn for grain, regions 1 and 2 of Portugal, 1982.

Operation/description	Performance rate	Times over	Power			Equipment		
			Hours	Direct costs	Fixed costs	Hours	Direct costs	Fixed costs
	Hours			- - Escudos - -			- - Escudos - -	
Apply manure (hand)	--	--	--	--	--	--	--	--
Mold board	7	1	7	4,956	2,742	7	224	439
Small plow (cows)	5	1	5	143	94	5	3	16
Plant (hand)	--	--	--	--	--	--	--	--
Weed and thin (hand)	--	--	--	--	--	--	--	--
Apply fertilizer (hand)	--	--	--	--	--	--	--	--
Hoe x 2 (hand)	--	--	--	--	--	--	--	--
Irrigate x 6 1/	--	--	--	--	--	--	--	--
Cut (hand)	--	--	--	--	--	--	--	--
Pull (hand)	--	--	--	--	--	--	--	--
Totals	--	--	--	5,099	2,836	--	227	455

1/ Inadequate data for calculation

Appendix table 4B. Estimated labor and materials costs by operation, one hectare of corn for grain, labor at 50$00 escudos per hour, regions 1 and 2 of Portugal, 1982.

Operation/description	Labor				Material			
	Hired		Unpaid					
	Hours	Cost	Hours	Cost	Quantity	Unit	Cost per unit	Cost per hectare
		Esc.		Esc.			Esc.	Esc.
Apply manure (hand)	--	--	15	750	25	ton	1,000.00	25,000
Mold board	--	--	7	350	--	--	--	--
Small plow (cows)	--	--	5	250	--	--	--	--
Plant (hand)	--	--	4	200	25	kg	65.00	1,625
Weed and thin (hand)	--	--	180	9,000	--	--	--	--
Apply fertilizer (hand)	--	--	16	800	400	kg	7.95	3,180
Hoe x 2 (hand)	--	--	120	6,000	--	--	--	--
Irrigate x 6	--	--	180	9,000	--	--	--	--
Cut (hand)	--	--	24	1,200	--	--	--	--
Pull (social affair)	--	--	--	--	--	--	--	--
Totals	--	--	551	27,550	--	--	--	29,805

Appendix table 5A. Estimated power and equipment costs by operation, one hectare of corn for grain, regions 1 and 2 of Portugal, 1982.

Operation/description	Performance rate	Times over	Power			Equipment		
			Hours	Direct costs	Fixed costs	Hours	Direct costs	Fixed costs
	Hours			- - Escudos - -			- - Escudos - -	
Apply manure (hand)	--	--	--	--	--	--	--	--
Plow (cows)	16	1	16	459	301	16	64	301
Small plow (cows)	5	1	5	143	94	5	3	16
Plant (hand)	--	--	--	--	--	--	--	--
Thin and weed (hand)	--	--	--	--	--	--	--	--
Apply fertilizer (hand)	--	--	--	--	--	--	--	--
Irrigate x 5 1/	--	--	--	--	--	--	--	--
Cut (hand)	--	--	--	--	--	--	--	--
Pull (social affair)	--	--	--	--	--	--	--	--
Totals	--	--	--	602	395	--	67	317

1/ Inadequate data for calculation.

Appendix table 5B. Estimated labor and materials costs by operation, one hectare of corn for grain, labor at 63$00 escudos per hour, regions 1 and 2 of Portugal, 1982.

Operation/description	Labor				Material			
	Hired		Unpaid					
	Hours	Cost	Hours	Cost	Quantity	Unit	Cost per unit	Cost per hectare
		Esc.		Esc.			Esc.	Esc.
Apply manure (hand)	--	--	12	756	2	ton	2,000.00	4,000
Plow (cows)	--	--	16	1,008	--	--	--	--
Small plow (cows)	--	--	5	315	--	--	--	--
Plant (hand)	--	--	2	126	15	kg	28.67	430
Weed and thin (hand)	--	--	60	3,780	--	--	--	--
Apply fertilizer (hand)	--	--	8	504	35	kg	11.00	385
Irrigate x 5	--	--	60	3,780	--	--	--	--
Cut (hand)	--	--	12	756	--	--	--	--
Pull (social affair)	--	--	--	--	-	--	--	--
Totals	--	--	175	11,025	--	--	--	4,815

Appendix table 6A. Estimated power and equipment costs by operation, one hectare of corn for grain, regions 1 and 2 of Portugal, 1982.

Operation/description	Performance rate	Times over	Power			Equipment		
			Hours	Direct costs	Fixed costs	Hours	Direct costs	Fixed costs
	Hours			- - Escudos - -			- - Escudos - -	
Apply manure	6	1	6	4,248	2,350	6	1,728	4,104
Mold board	3.5	1	3.5	2,478	1,371	3.5	73	219
Disk	1	1	1	708	392	1	48	114
Apply fertilizer	1	1	1	708	392	1	98	226
Apply limestone	1	1	1	708	392	1	98	226
Disk	1	1	1	708	392	1	48	114
Plant	1	1	1	708	392	1	616	1,672
Roll	1	1	1	708	392	1	20	78
Apply herbicide	1	1	1	708	392	1	469	806
Thin (hand)	--	--	--	--	--	--	--	--
Apply fertilizer (hand)	--	--	--	--	--	--	--	--
Irrigate x 2 1/	--	--	--	--	--	--	--	--
Top (hand)	--	--	--	--	--	--	--	--
Cut (hand)	--	--	--	--	--	--	--	--
Pull (hand)	--	--	--	--	--	--	--	--
Totals	--	--	--	11,682	6,465	--	3,198	7,559

1/ Inadequate data for calculation.

Appendix table 6B. Estimated labor and materials costs by operation, one hectare of corn for grain, labor at 63$00 escudos per hour, regions 1 and 2 of Portugal, 1982.

Operation/description	Labor				Material			
	Hired		Unpaid					
	Hours	Cost	Hours	Cost	Quantity	Unit	Cost per unit	Cost per hectare
		Esc.		Esc.			Esc.	Esc.
Apply manure	2	126	4.0	252	20	ton	1,000.00	20,000
Mold board	--	--	3.5	220	--	--	--	--
Disk	--	--	1.0	63	--	--	--	--
Apply fertilizer	--	--	1.0	63	1	ton	8,600.00	8,600
Apply limestone	--	--	2.0	126	3	ton	1,200.00	3,600
Disk	--	--	1.0	63	--	--	--	--
Plant	--	--	1.0	63	30	kg	40.00	1,200
Roll	--	--	1.0	63	--	--	--	--
Apply herbicide	--	--	1.0	63	8.5	liter	647.00	5,500
Thin	4	252	8.0	504	--	--	--	--
Apply fertilizer	2	126	4.0	252	800.0	kg	7.95	6,360
Irrigate x 2	8	504	16.0	1,008	--	--	--	--
Top	20	1,260	40.0	2,520	--	--	--	--
Cut	20	1,260	40.0	2,520	--	--	--	--
Pull	60	3,780	120.0	7,560	--	--	--	--
Totals	116	7,308	243.5	15,340	--	--	--	45,260

Appendix table 7A. Estimated power and equipment costs by operation, one hectare of green chop forage and hay behind corn, regions 1 and 2 of Portugal, 1982.

Operation/description	Performance rate	Times over	Power			Equipment		
			Hours	Direct costs	Fixed costs	Hours	Direct costs	Fixed costs
	Hours			- - Escudos - -			- - Escudos - -	
Apply manure	6	1	6	4,248	2,350	6	1,725	4,104
Apply fertilizer	1	1	1	708	392	1	98	226
Small plow	5	2	10	286	188	10	6	32
Grain drill, 6 ft.	1	1	1	708	392	1	175	700
Apply fertilizer	1	1	1	708	392	1	98	226
Cut green chop	3	2	6	4,248	2,350	6	1,012	1,539
Haul green chop	3	2	6	4,248	2,350	6	1,728	4,104
Apply fertilizer	1	1	1	708	392	1	98	226
Irrigation x 3 1/								
Cut hay	3	1	3	2,124	1,175	3	1,012	1,539
Bale hay 1/								
Haul hay	3	1	3	2,124	1,175	1/	1/	1/
Totals	--	--	--	20,110	11,156	--	5,955	12,696

1/ Inadequate data for calculation.

Appendix table 7B. Estimated labor and materials costs by operation, one hectare of green chop forage and hay behind corn, labor at 63$00 escudos per hour, regions 1 and 2 of Portugal, 1982.

Operation/description	Labor				Material			
	Hired		Unpaid					
	Hours	Cost	Hours	Cost	Quantity	Unit	Cost per unit	Cost per hectare
		Esc.		Esc.			Esc.	Esc.
Apply manure	2	126	4	252	3	ton	1,000.00	3,000
Apply fertilizer	0	0	1	63	250	kg	6.62	1,654
Small plow	0	0	10	630	--	--	--	--
Grain drill, 6 ft.	0	0	1	63	--	--	--	--
Apply fertilizer	0	0	1	63	250	kg	6.62	1,654
Cut green chop	2	126	4	252	--	--	--	--
Haul green chop	2	126	4	252	--	--	--	--
Apply fertilizer	0	0	1	63	250	kg	6.62	1,654
Irrigate x 3	4	252	12	756	--	--	--	--
Cut hay	0	0	3	189	--	--	--	--
Bale hay	3	189	3	189	--	--	--	--
Haul hay	3	189	6	378	--	--	--	--
Totals	16	1,008	50	3,150	--	--	--	7,962

Appendix table 8A. Estimated power and equipment costs by operation, one hectare of corn for silage, regions 1 and 2 of Portugal, 1982.

Operation/description	Performance rate	Times over	Power			Equipment		
			Hours	Direct costs	Fixed costs	Hours	Direct costs	Fixed costs
	Hours			- - Escudos - -			- - Escudos - -	
Apply manure	6	1	6	4,248	2,350	6	1,728	4,104
Apply limestone	1	1	1	708	392	1	98	226
Apply fertilizer	1	1	1	708	392	1	98	226
Mold board	3.5	1	3.5	2,478	1,371	3.5	73	219
Small plow	5	1	5	143	94	5	3	16
Plant (4 row)	1	1	1	708	392	1	616	1,672
Roll	1	1	1	708	392	1	20	78
Apply herbicide	1	1	1	708	392	1	469	806
Apply herbicide	1	1	1	708	392	1	469	806
Apply fertilizer	1	1	1	708	392	1	98	226
Irrigate x 3 1/	--	--	--	--	--	--	--	--
Harvest (row)	5	1	5	3,540	1,958	5	743	823
Haul	5	1	5	3,540	1,958	5	1/	1/
Totals	--	--	--	18,905	10,475	--	4,415	9,202

1/ Inadequate data for calculation.

Appendix table 8B. Estimated labor and materials costs by operation, one hectare of corn for silage, labor at 63$00 escudos per hour, regions 1 and 2 of Portugal, 1982.

Operation/description	Labor				Material			
	Hired		Unpaid					
	Hours	Cost	Hours	Cost	Quantity	Unit	Cost per unit	Cost per hectare
		Esc.		Esc.			Esc.	Esc.
Apply manure	2	126	4.00	252	350	ton	8.57	3,000
Apply limestone	--	--	1.00	63	3	ton	1,200.00	3,600
Apply fertilizer	--	--	1.00	63	750	kg	7.95	5,963
Moldboard	--	--	3.50	220	--	--	--	--
Small plow	--	--	5.00	315	--	--	--	--
Plant (4-row)	--	--	1.00	63	40	kg	33.75	1,350
Roll	--	--	1.00	63	--	--	--	--
Apply herbicide	--	--	1.00	63	6	liter	--	5,550
Apply herbicide	--	--	1.00	63	1	liter	--	--
Apply fertilizer	--	--	1.00	63	400	kg	--	3,180
Irrigate x 3	4	252	12.00	756	--	--	--	--
Harvest (row)	5	315	14.00	882	--	--	--	--
Haul	--	--	10.00	630	--	--	--	--
Totals	11	693	55.50	3,496	--	--	--	22,643

Appendix table 9A. Estimated power and equipment costs by operation, one hectare of permanent pasture for green chop, 3 years, regions 1 and 2 of Portugal, 1982.

Operation/description	Performance rate	Times over	Power			Equipment		
			Hours	Direct costs	Fixed costs	Hours	Direct costs	Fixed costs
	Hours			- - Escudos - -			- - Escudos - -	
Apply fertilizer 1/	1	1	1	236	131	1	33	75
Small plow 1/	5	2	10	2,360	1,307	10	327	753
Grain drill 1/	1	1	1	236	131	1	58	233
Apply fertilizer	1	1	1	708	392	1	98	226
Cut and haul 2/	3	1	6	4,248	2,350	3	3,072	7,196
Cut and haul 2/	3	1	6	4,248	2,350	3	3,072	7,196
Apply fertilizer	1	1	1	708	392	1	98	226
Cut	3	1	6	4,248	2,350	3	3,072	7,196
Totals	--	--	--	16,992	9,403	--	9,830	23,101

1/ One-third of cost.
2/ Two tractors, 1 cutter, 1 green chop wagon.

Appendix table 9B. Estimated labor and materials costs by operation, one hectare of permanent pasture for green chop, labor at 63$00 escudos per hour, regions 1 and 2 of Portugal, 1982.

Operation/description	Labor				Material			
	Hired		Unpaid					
	Hours	Cost	Hours	Cost	Quantity	Unit	Cost per unit	Cost per hectare
		Esc.		Esc.			Esc.	Esc.
Apply fertilizer 1/	--	--	0.33	21	83	kg	6.64	551
Small plow 1/	--	--	3.33	210	--	--	--	--
Grain drill 1/	--	--	0.33	21	--	--	--	2/
Apply fertilizer	--	--	1.00	63	250	kg	6.62	1,654
Cut and haul	2	126	4.00	252	--	--	--	--
Cut and haul	2	126	4.00	252	--	--	--	--
Apply fertilizer	--	--	1.00	63	250	kg	6.62	1,654
Cut	2	126	4.00	252	--	--	--	--
Totals	6	378	17.99	1,133	--	--	19.88	3,859

1/ One-third of cost.
2/ No cost. Farmer saved own seed.

Appendix table 13A. Estimated power and equipment costs by operation, one hectare of rye for grazing sheep, regions 1 and 2 of Portugal, 1982.

Operation/description	Performance rate	Times over	Power			Equipment		
			Hours	Direct costs	Fixed costs	Hours	Direct costs	Fixed costs
	Hours			- - Escudos - -			- - Escudos - -	
Mold board	7	1	7	4,956	2,742	7	224	439
Plant (hand)	--	--	--	--	--	--	--	--
Small plow	5	1	5	143	94	5	3	16
Totals	--	--	--	5,099	2,836	--	227	455

Appendix table 13B. Estimated labor and materials costs by operation, one hectare of rye for grazing sheep, labor at 50$00 escudos per hour, regions 1 and 2 of Portugal, 1982.

Operation/description	Labor				Material			
	Hired		Unpaid					
	Hours	Cost	Hours	Cost	Quantity	Unit	Cost per unit	Cost per hectare
		Esc.		Esc.			Esc.	Esc.
Mold board	7	350	--	--	--	--	--	--
Plant (hand)	8	400	--	--	300	kg	16	4,800
Small plow	5	250	--	--	--	--	--	--
Totals	20	1,000	--	--	--	--	--	4,800

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