Title: DEVELOPMENT OF A FARM MANAGEMENT TOOL FOR THE BRAZILIAN CONDITIONS

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ABSTRACT: *This paper presents results of a managerial information system prototype developed for modern agriculturalists in the Brazilian Cerrado´s Region. It follows a case study approach. One medium scale (422 hectares) of operation was envisioned, archetypical accounting framework was established, aiming to provide better data and information to support farm management decisions. The system has proved to be useful in examining decision making at farm level and in ex ante evaluations of changes in farm-level input use, output and profitability in response to price, policy, and/or technology changes. Data entry was done in ACCESS for user friendliness and global availability; presentational materials were prepared in ACCESS and in EXCEL.*

Key words: *Family farm system, Microsoft ACCESS application, managerial information, cost accounting.*

INTRODUCTION

This paper presents a discussion on how the needs, for primary data and information, of farm management decision makers, from the Brazilian Cerrados Region, can be met by using an appropriate computerised managerial tool.

Following the case study and systems approaches, first the problem statement is presented. After this, the source of data and the methodology are discussed, emphasising the characteristics of a medium scale farming system and the development of a managerial information system. This system is been tailored for the Brazilian Cerrado Region, to support the producer decisions and a mathematical modelling effort of the whole farming system.

Finally, some real time reports and other results generated by using such managerial system are presented and discussed. Such results are also crucial to ex-ante evaluation (in financial and economic terms) of new technologies viable under the agronomic view point.

PROBLEM STATEMENT

Some farmers and producers have required the development of computer tools for the generation, processing and analysis of their farm data, in order to carry out evaluations of R&D results or any technology proposed by Embrapa researchers to specific farming system. However, in Brazil, most of the available computerised farm management tools are oriented to the generation of various reports without considering the specification of the appropriate data base for farm management. Their development processes did not have included the effective participation of their users (farm management advisers, researchers and the producers and their families). As a result these data processing packages (developed from the data processing and accounting specialist view points) have not been adopted by the producers.

OBJECTIVES

The main objective is the development of a managerial information system at the farm level, as well as the generation of appropriated data and information to support a mathematical modelling effort oriented to carry out ex ante evaluations of new technologies recommended for the Cerrados farming systems.

Various farm managerial reports, specified by the producers and their families, are being designed, developed and displayed in real time by the system. At the same time, some graphics (such as the realised cash flow on a monthly basis and the realised maintenance costs of the dairy activity) are being conceptualised to be generated by the system.

SOURCE OF DATA AND METHODOLOGY

At the Embrapa Cerrados Research Center the implementation (in 1999) of a R&D project was oriented to carry out evaluations (in technical, economic and environmental terms) of mixed (integrate crop and dairy activities) farming systems. The evaluations include initial analysis of the whole farm systems followed by a synthesis using mathematical modelling.

This analysis include two case studies with the design and establishment of data base and managerial accounting procedures to support the farm management decisions. Thus, a decision support system is been developed and tested with the effective participation of the producers and their families as well as a multidisciplinary team of

researchers, faculty and university students. The main purposes are to offer the most friendly decision support system for the management of the two family agrobusinesses and to obtain useful data to evaluate some R&D results generated at the Embrapa Cerrados Research Center by using whole farm (mathematical) model.

First, the case study and systems approaches, discussed by Schinelle (1967) and Janssen & Goldsworthy (1996), were adopted to learn how is the dynamic of each farming system, its managerial and production processes. Hence, a financial control of the fund uses and sources of each one of the farm undertakings was implanted, after the establishment of basic managerial accounting plans. These plans as well as some reports, specified with effective participation of the producers and their families, were incorporated in the decision support system using the MS ACCESS software. Reports such as: financial fund uses and sources report, activity gross margin report, report of technical parameters and direct costs, indirect costs report, dairy production costs report, realised cash flow report and losses and profits demonstration report have being conceptualised according to some management procedures used in any small commercial business. Furthermore, by using queries, some tables have been generated and exported by the system to the EXCEL. Following this, specific technical analysis; such as what antibiotics, their quantities and for what disease or pest are been used in the dairy activity, are carried out.

RESULTS

The results presented in this section are related to a mixed (dairy and crop activities) medium farm denominated Fazenda Madeira. It is located in the Gameleira District at the South of the Goiás State and it presents over US$ 500,000. of assets, around US$ 200,000 of long term debt and no less than US$ 100,000 in short term debt related to the maintenance of the crop activities in the current year. It incorporates a dairy activity with 7 classes (involving around 240 animals) of animals. It uses 7 paddocks (sub-areas) involving a total of 65 hectares. In order to complement the animal nutrition requirements, more than 30 hectares of maize crop is used for silage every year. In 1999/00 there were 2 (46,5 hectares each) central pivots and in the beginning of 2001, a (third) 30 hectares central pivot was implanted where an industrial tomato crop has been already (in the first days of March 2001) planted. Part (around 10 hectares) of this third central pivot will be used to produce forage because it is located near to the dairy

facilities and the producer intends to expand the number of cows in lactation. For this, specific analysis (required by the producer) is being carry out by using the primary data base and participation of animal nutrition and forage production specialists.

The farming year period, for the purpose of cost accounting of the Madeira farm activities, has been set to start at 1st of June and to finalise on 31st of May of each year. This is crucial to specify the appropriation of the managerial and production indirect costs.

Tables 1 gives a general idea of the Madeira farm assets and the Table 2 presents a description of the Madeira farm sub-areas. The irrigated areas are cultivated twice a year and some neighbourhood land areas have been rented to be cultivated with upland crops during the rainy season. In the farming year 1999/00 many crops were developed and the total cultivated area was 629,18 hectares. For the farming year 2000/01 new rice crop areas were incorporated in the production process. These areas were rented, the Cerrado´s vegetation was cleared by using a bulldozer and then cultivated with a such risky crop because they are being cultivated for the first time and they presented low fertility and a high acidity. The following soybean crop will be developed after the incorporation of over 4 tones of lime, some phosphate and other nutrients required to correct the inappropriate fertility conditions for soybean and maize crops.

Table 1 – The Madeira farm assets – safra 99/2000

Date	*Quant*	*Und*	*Description*	*Unit (R$)*	*Total (R$)*
27/12/00	64,65	ha	pasture area	1.000,00	64.650,00
27/12/00	315,94	ha	crop land area	1.000,00	315.940,00
27/12/00	36,76	ha	ecological reserve	600,00	22.056,00
27/12/00	4,65	ha	water reservoir	800,00	3.720,00
	422,00	**ha**	**total land value**		**406.366,00**
26/11/99			**machinery**		***294.370,00***
27/12/00	**235**	**heads**	**dairy animals**		***260.300,00***
26/11/99			**farm houses and other facilities**		**71.000,00**
			Total value of assets		**1.032.036,00**

Table 3 describe the Madeira farm assets. The infrastructure includes six old tractors, two old combines, one small covered area for machinery, one cereal and grain dryer and the basic facilities to manage the animals. The household facilities are reasonable.

Table 2 – Crop land sub-areas - (except the 65 ha of pasture) – Madeira farm

Cod	name	1999/01 area (ha)	2000/01 area (ha)	Description
1	Dogla	35,00	35,00	rented area Dogla
2	Joãozinho	7,26	7,26	rented área Joãozinho
3	Mauro	35,00	35,00	rented area Mauro
4	Osmar	9,68	9,68	rented area Osmar
5	Central pivot 01	46,50	46,50	pivot 01 – see the farm map
6	Central pivot 02	46,50	46,50	pivot 02 – see the farm map
7	Quadra01	47,55	47,55	rented area - div. Sinomar
8	Quadra02	12,00	17,52	rented area - div. Dogla
9	Central pivot 03	-	30,00	pivot 03 – near to the dairy facilities
10	Quadra04	17,00	17,00	see the farm map
11	Quadra05	42,18	42,18	div. Natório - see the farm map
14	Quadra06	39,15	39,15	no Alceu - terra velha - see the farm map
15	Quadra07	4,31	14,31	Div. Adail - see the farm map
16	Quadra08	38,50	38,50	ao lado Galpão - see the farm map
17	Sinomar	46,00	61,00	rented area Sinomar
18	Adail	3,00	3,00	rented area Adail
19	Alceu	-	10,00	no Alceu - terra nova
20	Calixto	-	74,16	rented area Calixto
21	Tamiro	-	40,83	rented area Tamiro
22	Coureiro	-	25,00	rented area Chico Coureiro

In anytime, it is possible to start a new irrigated crop (under a central pivot) in the Cerrados Region. Usually, the producers in this Region, use central pivots to irrigate Phaseolus beans (Brazilian staple food) and/or wheat crops in the dry season (from May to the end of September) and maize and/or soybean crops in the rainy season. Industrial tomato and barley crops have been also recommended to be cultivated in the dry season but they depend on the distance of the processing industries from the irrigated area. In the case of the Fazenda Madeira, it is 85 km from planted tomatos to the processing plant. Tomato crop was developed in the dry season of 2000 but barley crop is another technically viable activity that is being considered, to be incorporated in the production process, by the producer. Therefore, the producer decision to implement a such activity depends on a specific gross margin analysis, in progress, and a specific contract with the beer industry.

Table 3 – The Madeira farm assets (in R$)

Data Avaliaçao	Quant.	Und	Descriçao	Classificaçao	Marca Modelo	Ano	Potencia	Valor	Vida Util
02/02/2000	1	ud	Aparador de gramas	utilitário	Still	2000		1.220,00	5
26/11/1999	1	ud	Caminhoneta S 10	utilitário	Chevrolet	1997		13.000,00	12
26/11/1999	1	ud	Caminhoneta Ford Willis	utilitário	Ford	1970		5.000,00	15
26/11/1999	167,4	m2	Casa sede (Darcy)	benfeitoria	alvenaria	0		20.000,00	40
26/11/1999	224	m2	Casa sede (Fernando)	benfeitoria	alvenaria	0		15.000,00	40
26/11/1999	58,1	m2	Cozinha	benfeitoria	alvenaria	0		3.000,00	40
26/11/2009	127,4	m2	Casa de colono	benfeitoria	alvenaria	0		3.000,00	40
26/11/1999	223,3	m2	Casa de colono	benfeitoria	alvenaria	0		3.000,00	40
26/11/2009	160	m2	Casa de colono	benfeitoria	alvenaria	0		3.000,00	40
26/11/2009	462,5	m2	Galpão (antiga granja)	benfeitoria	alvenaria	0		3.000,00	25
26/11/1999	37,5	kwa	energia	benfeitoria		0		2.000,00	100
26/11/2009	4,6	há	represa	benfeitoria		0		15.000,00	100
26/11/1999	1	ud	secador de grãos	equipamento	Pampeiro	0		15.000,00	20
26/11/1999	1	ud	Conjunto de irrigação 94 há	máquina	Asbrasil	1994		100.000,00	20
26/11/1999	1	ud	Batedeira de feijão	máquina	Miak	1994		7.000,00	10
26/11/2009	1	ud	Carreta 4 rodas (4 ton)	equipamento		1998		2.000,00	4
26/11/1999	1	ud	Carreta 4 rodas (4 ton)	equipamento		2000		2.000,00	4
31/05/2000	1	ud	Carreta 4 rodas (4 ton)	equipamento		2000		1.700,00	4
26/11/1999	1	ud	Colhedeira	máquina	MF 310	1975	110 hp	7.000,00	10
26/11/1999	1	ud	Colhedeira	máquina	MF 3640	0		15.000,00	10
26/11/1999	1	ud	Grade aradora			1985		4.000,00	12
26/11/1999	1	ud	Plantadeira	equipamento	Jumil 2.800	0		5.000,00	10
26/11/1999	1	ud	Plantadeira	equipamento	Semeato	0		3.000,00	10
26/11/1999	1	ud	Pulverizador 2.000 l	equipamento	Jacto	198		4.000,00	10
26/11/1999	1	ud	Raspadeira	equipamento		0		4.000,00	12
23/02/2000	1	ud	Roçadeira	equipamento		0		800,00	12
26/11/1999	1	ud	Trator	máquina	MF 55 x	1973	55 hp	5.000,00	20
26/11/1999	1	ud	Trator	máquina	MF 55 x	1973	55 hp	5.000,00	20
26/11/1999	1	ud	Trator	máquina	MF 65 x	1974	65 hp	6.000,00	20
26/11/1999	1	ud	Trator	máquina	MF 262	1989	90 hp	18.000,00	20
26/11/1999	1	ud	Trator	máquina	MF 650	1994	143 hp	30.000,00	20
26/11/1999	1	ud	Trator	máquina	Valmet 118	1985	120 hp	12.000,00	20
26/11/1999	138,6	m2	Galpão para máquinas	benfeitoria	alvenaria	0		10.000,00	40
26/11/2009	1	ud	Ducha	equipamento		1998		3.000,00	10
26/11/1999	1	ud	Botijão para sêmen	equipamento		1998		500,00	7
26/11/1999	1	ud	Ordenhadeira	equipamento	Fokink	1998		12.000,00	15
26/11/1999	1	ud	Ensiladeira	equipamento	JF 90	1999		4.500,00	10
26/11/1999	1	ud	Ensiladeira	equipamento	ZF 90	1999		4.120,00	10
26/11/1999	1	ud	Tanque de resfriamento	equipamento	Echad TKT 3000	1998		10.000,00	20
26/11/1999	1	ud	Tronco	equipamento		1999		2.450,00	10
26/11/1999	7	km	Cerca elétrica	benfeitoria		0		1.000,00	5
26/11/1999	11	km	Cerca convencional			0		10.000,00	10
26/11/1999	144	m2	Galpão para leite	benfeitoria	alvenaria			20.000,00	20
			total					**410.290,00**	

Source: Computer print from the managerial information system.

The main results, in terms of farm management data and information, are some reports on the performance of each crop, the dairy production activity and a summary of the

cost accounts on a monthly basis. Given that in Brazil, for a long time, inflation has been an important issue, the system has incorporated a table of US$ / R$ exchange rates, in a monthly basis, because in medium and long terms such reports must be also presented in current R$ and US$. On 29th of March 2001 1 (one) US$ is equal 2,12 (two point twelve cents) R$ and the inflation rate is less than 1% per month.

The Figures 1, 2, 3 and 4 show the first screen, a data input form and two output reports of the managerial information system.

Figure 1, it is the system principal menu which describes the reports already incorporated in the system.

Figure 1 The principal menu of the system

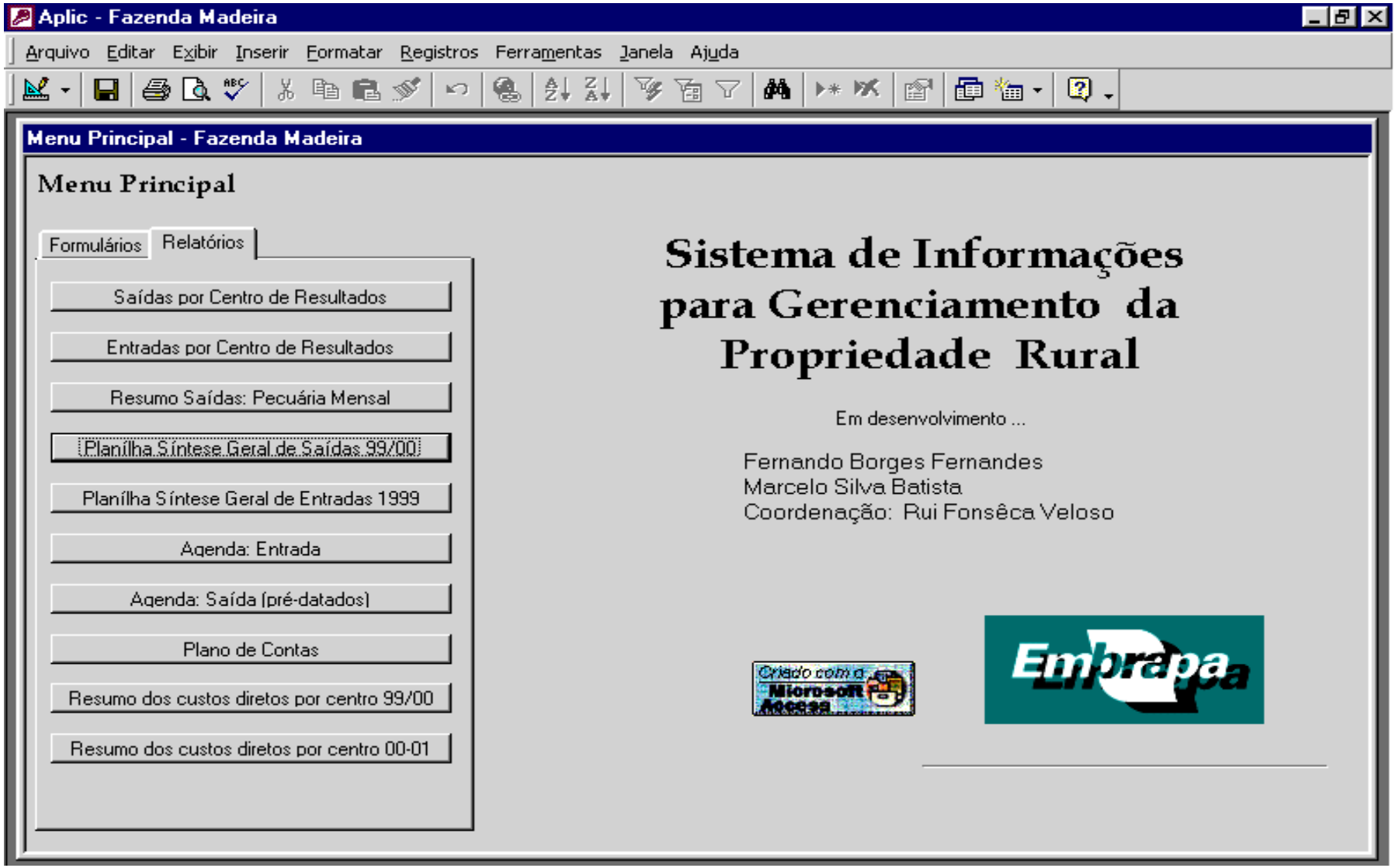

Figure 2 shows how a financial withdrawal is registered in the system data base.

Figure 2 The form to register Madeira farm expenses

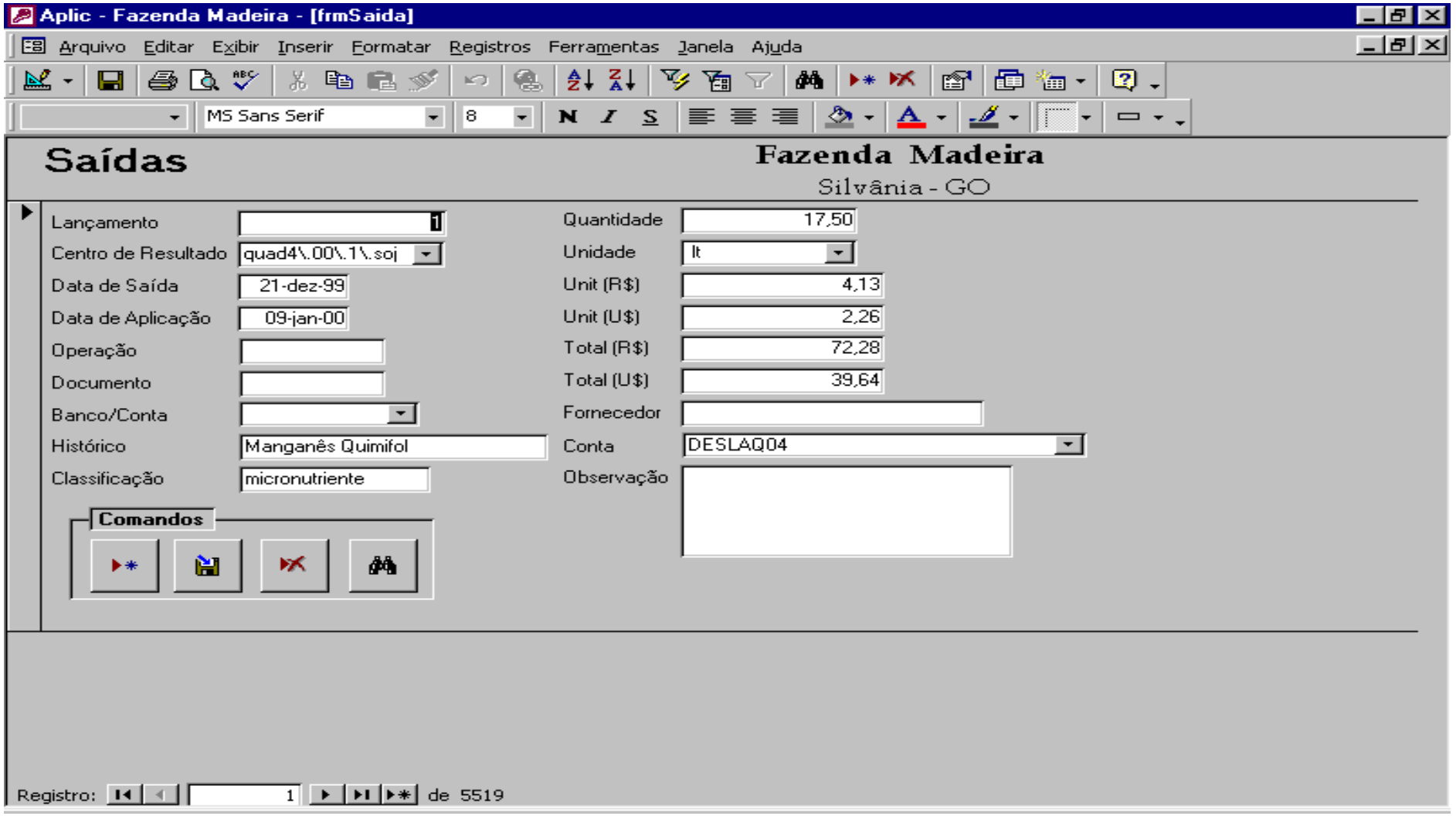

Figure 3 presents part of the direct cost report of the first tomato crop developed in the Madeira farm, in the dry season of the 2000 year.

Figure 3 The direct cost report of the first tomato crop in 2000

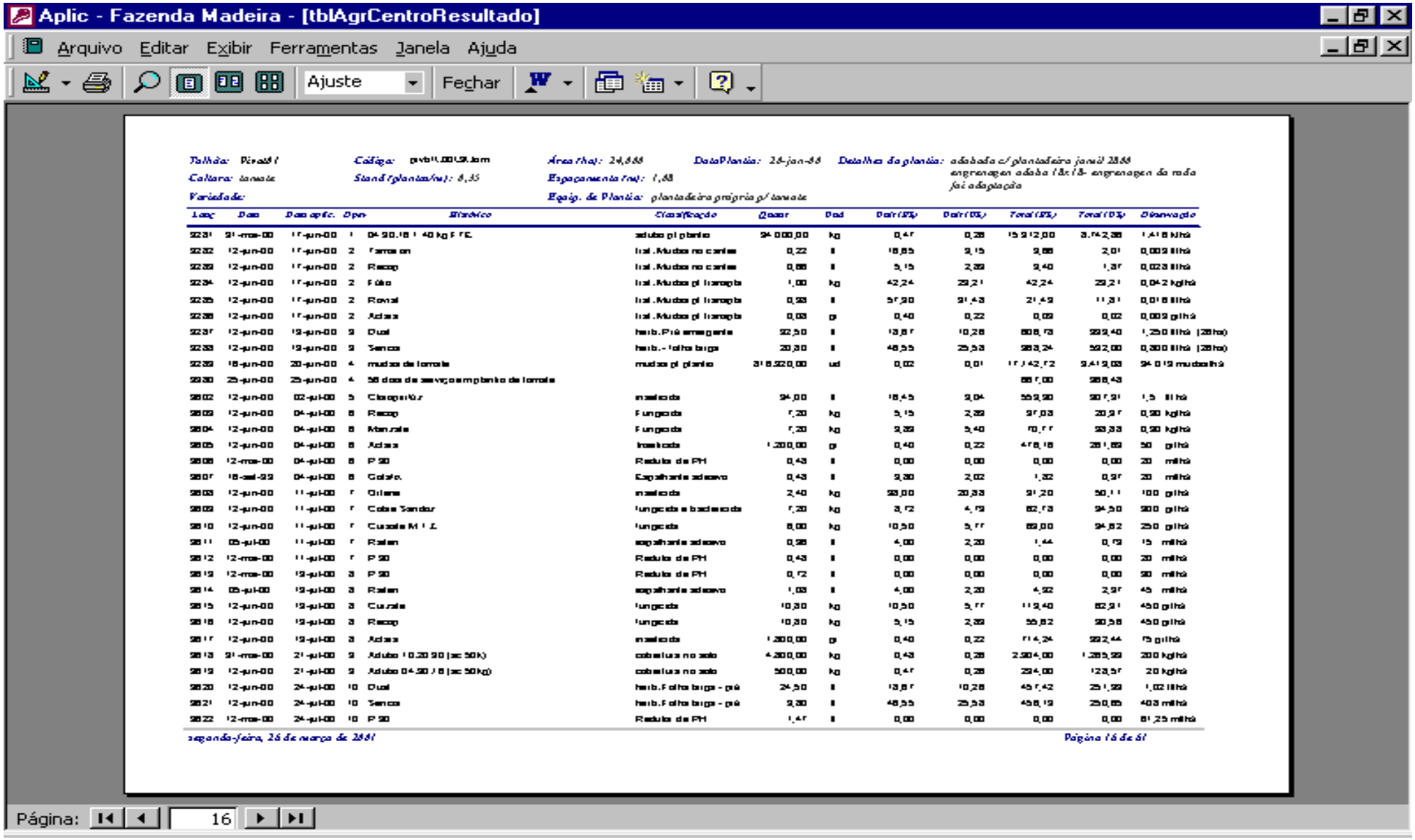

Figure 4 presents expenses by each account in a monthly basis.

Figure 4 The report of expenses in a monthly basis – farming year 1999/00

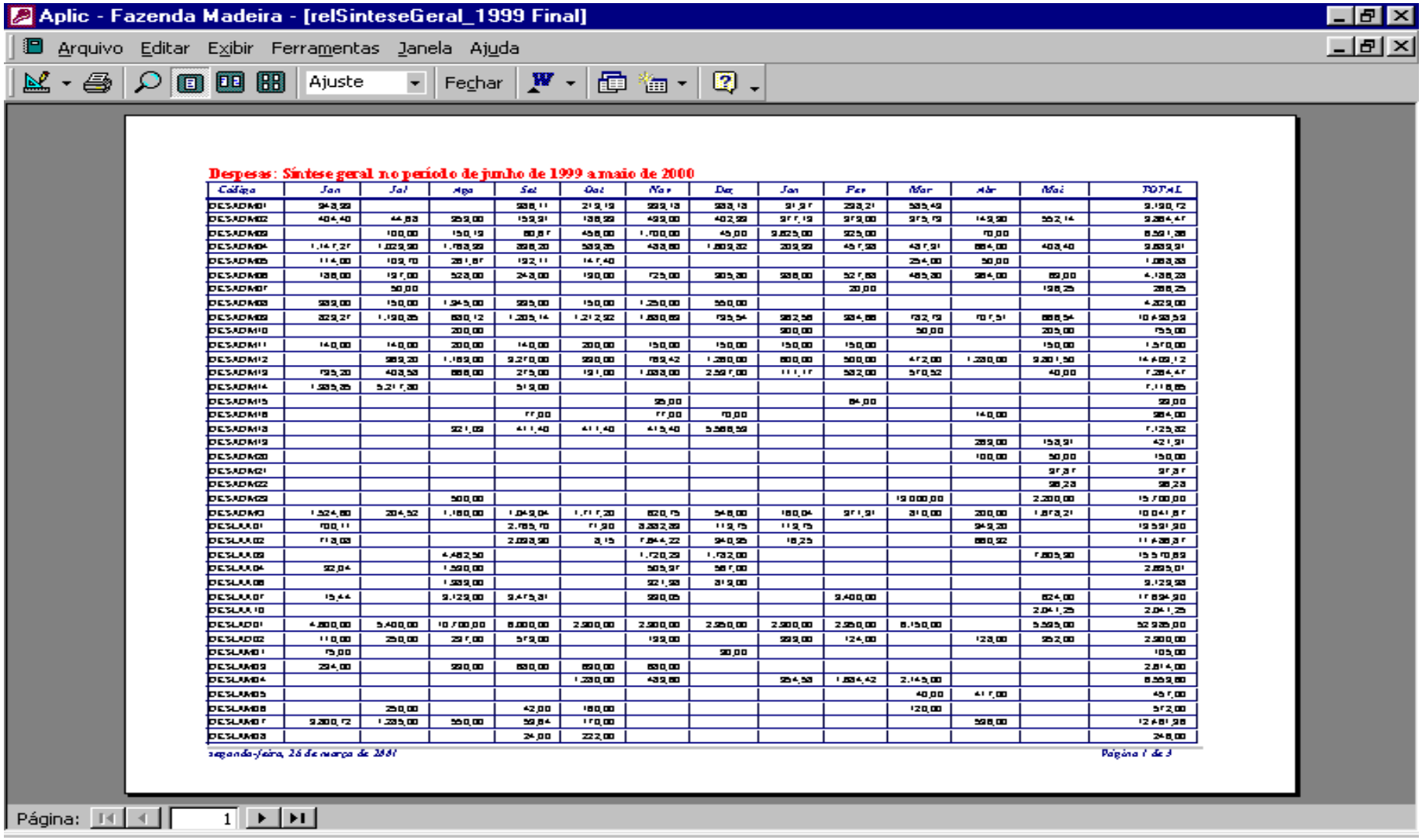

Table 4 presents the appropriation of indirect costs for the farming and dairy activities in 1999/00. The indirect costs (R$ 193.370,62) of farming activities represent over 30 % of the total cost (R$ 614.616,20) presented in the Table 5.

Table 5 presents a synthesis of the farming activities in 1999/00. The irrigated activities were more intensive in capital but they resulted in R$. 34.222,30 of profit. The rented areas presented in the same year, resulted R$ 2.571,39 of losses.

Tables 6 and 7 present the financial results of the dairy activity in 1999/00, when the production cost of 1 (one) litter of milk was calculated in R$ 0,31 and the received average price per litter was calculated in R$ 0,337. It assumed that the milk production represented (in 1999/00) 82.58 % of the total costs appropriated to the whole dairy production activity. This is shown at the Table 6 where the sale of 33 cows represented 13.42% of the total dairy activity revenue. In 1999/00, at Madeira farm, the average yield of milk per cow / day was around 20 kg and the total average production of milk per day was 1246.7 kg.

Linked to the Table 6 the Figure 5 shows graphically the appropriation of the direct costs of the dairy activity. Moreover, Figure 6 shows a specific analysis carried out on the costs involved with the veterinary medical supplies for the Madeira farm dairy activity in 1999/00.

Table 7 presents the financial results of the Madeira farm in the financial year 1999/00. The outcome of the whole farm production system, in 1999/00, was calculated in R$ 45.594,23 which correspond to approximately US$ 23000.00.

To conclude this preliminary analysis showing the financial situation resulted in further demand including alternative farm production system cenario.

Table 4 – appropriation of Indirect costs – Madeira Farm from 1/06/99 to 31/05/00

	Total value (R$)	*Dairy activity* (R$) 20%	*Farming activity* (R$) 80%
Familiar expenses	27.097,54	5.419,51	21.678,03
Administrative expenses			
electric power	3.043,72	608,74	2.434,98
Telephone	3.864,47	772,89	3.091,58
Office maintenance	6.531,86	1.306,37	5.225,49
Food	9.689,91	1.937,98	7.751,93
automobile	5.943,32	1.188,66	4.754,66
interests and other bank costs	10.438,53	2.087,71	8.350,82
accountant	755,00	151,00	604,00
labour	463,00	92,60	370,40
mortgage of investments	7.125,82	1.425,16	5.700,66
Inss/Fgts taxes	74,15	14,83	59,32
other financial costs	23.167,77	4.633,55	18.534,22
other costs	10.128,67	2.025,73	8.102,94
Fixed costs			
Depreciation of pick-up	1.660,67	332,13	1.328,53
Depreciation of houses and other facilities	1.505,00	301,00	1.204,00
sub-total	***84.391,89***	***16.878,38***	***67.513,51***
Dairy activity			
Fixed costs			
Depreciation of machinery	2.478,43	2.478,43	0,00
Depreciation of local facilities	2.200,00	2.200,00	0,00
sub-total	***4.678,43***	***4.678,43***	***0,00***
Farming crops			
Variable costs			
Fuel (diesel,	12.345,00	0,00	12.345,00
Machinery	34.339,02	0,00	34.339,02
Irrigation sets*	12.581,36	0,00	12.581,36
Labour	11.791,95	0,00	11.791,95
other costs	16.763,42	0,00	16.763,42
Custos fixos			
Depreciation of machinery	16.108,33	0,00	16.108,33
Depreciation of local facilities	250,00	0,00	250,00
sub-total	***104.179,08***	***0,00***	***104.179,08***
Total	***220.346,94***	***26.976,31***	***193.370,62***

* Indirect costs of the implanted irrigation systems.

Table 5 – Madeira farm financial results – grain and cereal crop activities in 1999/00

crop	area (ha)	% of total area	direct costs (R$)	indirect costs (R$)	total costs (R$)	revenue (R$)	financ. result (R$)	yield (60 kg bag/ha)	revenue (R$/60 kg)	costs (R$/60 kg)
Upland crops – own land										
Phaseolus beans	47,55	7,56	43.026,23	13.662,98	56.689,21	55.648,87	1.040,34	42,65	27,44	27,96
green maize	47,55	7,56	19.185,49	13.662,98	32.848,47	30.379,23	2.469,24			
Rice	1,00	0,16	337,00	287,34	624,34	556,53	67,81	41,29	13,48	15,12
Phaseolus beans	4,00	0,64	5.329,04	1.149,36	6.478,40	8.310,00	1.831,60	33,38	62,25	48,53
Maize	8,00	1,27	3.037,95	2.298,71	5.336,66	8.243,76	2.907,10	82,77	12,45	8,06
Soybean	17,00	2,70	8.027,27	4.884,77	12.912,04	13.255,40	343,36	50,44	15,46	15,06
Rice	4,84	0,77	1.598,07	1.390,72	2.988,79	2.997,60	8,81	41,29	15,00	14,96
Maize	4,84	0,77	2.070,29	1.390,72	3.461,01	4.730,00	1.268,99	88,84	11,00	8,05
Soybean	32,50	5,17	16.951,49	9.338,53	26.290,02	25.242,83	1.047,19	50,24	15,46	16,10
Soybean	39,15	6,22	20.355,80	11.249,62	31.605,42	32.361,13	755,71	53,47	15,46	15,10
Soybean	14,31	2,27	6.203,95	4.112,69	10.316,63	12.797,05	2.480,42	57,83	15,46	12,46
Soybean	38,50	6,12	20.063,62	11.062,56	31.126,18	31.761,97	635,79	53,36	15,46	15,15
Upland crops – rented land										
Rice	3,00	0,48	873,00	862,02	1.735,02	1.563,45	171,57	41,41	12,59	13,97
Soybean	35,00	5,56	13.591,30	10.056,87	23.648,17	29.163,74	5.515,57	53,90	15,46	12,54
Rice	7,26	1,15	2.602,97	2.086,08	4.689,05	3.896,88	792,17	41,29	13,00	15,64
Maize	35,00	5,56	15.986,70	10.056,87	26.043,57	14.840,76	11.202,81	38,55	11,00	19,30
Rice	9,68	1,54	2.256,98	2.781,44	5.038,42	5.195,84	157,42	41,29	13,00	12,61
Rice	20,00	3,18	7.964,79	5.746,79	13.711,58	10.735,00	2.976,58	41,29	13,00	16,60
Soybean	26,00	4,13	11.486,87	7.470,82	18.957,69	20.249,25	1.291,56	50,38	15,46	14,47
sub-total	**395,18**	**62,81**	**200.948,81**	**113.551,88**	**314.500,68**	**311.929,29**	**2.571,39**			
irrigated crops – own land										
green maize	24,00	3,81	13.476,75	8.186,54	21.663,29	28.700,00	7.036,71			
green maize	24,00	3,81	20.652,98	8.186,54	28.839,52	37.215,65	8.376,13			
Maize	46,50	7,39	33.340,75	15.861,42	49.202,17	64.359,85	15.157,68	67,74	20,43	15,62
Phaseolus beans	46,50	7,39	56.878,71	15.861,42	72.740,13	74.658,43	1.918,30	39,43	40,72	39,67
Maize	46,50	7,39	33.323,04	15.861,42	49.184,46	51.240,75	2.056,29	100,18	11,00	10,56
Phaseolus beans	46,50	7,39	62.624,54	15.861,42	78.485,96	78.163,14	322,82	38,68	43,45	43,63
sub-total	**234,00**	**37,19**	**220.296,77**	**79.818,75**	**300.115,52**	**334.337,82**	**34.222,30**			
total	**629,18**	**100,00**	**421.245,58**	**193.370,62**	**614.616,20**	**646.267,11**	**31.650,91**			

Table 6- Dairy activity costs - Madeira farm – farming year from 1/06/99 to 31/05/00

Description	*Value* (R$)	subtotal *(%)*	total *(%)*
Direct costs			
Concentrate feeds	70.460,74	48,73	41,06
Roughage (silage)	14.400,00	9,96	8,39
Salt	3.701,90	2,56	2,16
Medical supplies	23.316,00	16,12	13,59
Cleaning materials	1.377,70	0,95	0,80
Taxes - Inss/Senar (2,2%)	3.470,66	2,40	2,02
Milk transport costs	7.583,29	5,24	4,42
Bull	1.286,28	0,89	0,75
Artificial Insemination	1.362,00	0,94	0,79
Milking machine	1.104,40	0,76	0,64
Bulk tank	351,00	0,24	0,20
Labour	9.322,80	6,45	5,43
Other costs	6.871,29	4,75	4,00
sub-total	***144,608,06***	***100,00***	***84,28***
Indirect costs			
Family maintenance	5.419,51	24,31	3,16
Management expenses	16.878,38	75,69	9,84
sub-total	***22,297,89***	***100,00***	***13,00***
Fixed costs			
Machinery depreciation	2.478,43	52,98	1,44
Depreciation of administrative facilities	2.200,00	47,02	1,28
sub-total	***4,678.43***	***100,00***	***2,73***
Total	***171,584.37***		***100,00***

Revenue		
Sale of 455.069 litres of milk	153.205,70	82,58
Sale of animals	32.322,00	17,42
Total	***185,527.70***	***100,00***
Result	***13,943.33***	

Table 7 – Calculated net revenue per litter of milk in the farming year 1999/00

Price of milk in R$ / per litter	0,337
Calculated production cost of milk in R$ / per litter	0,311
Net revenue (R$ / l)	0,025

Figure 5 - Direct costs of the dairy production activity in the farming year 1999/00 - Madeira farm

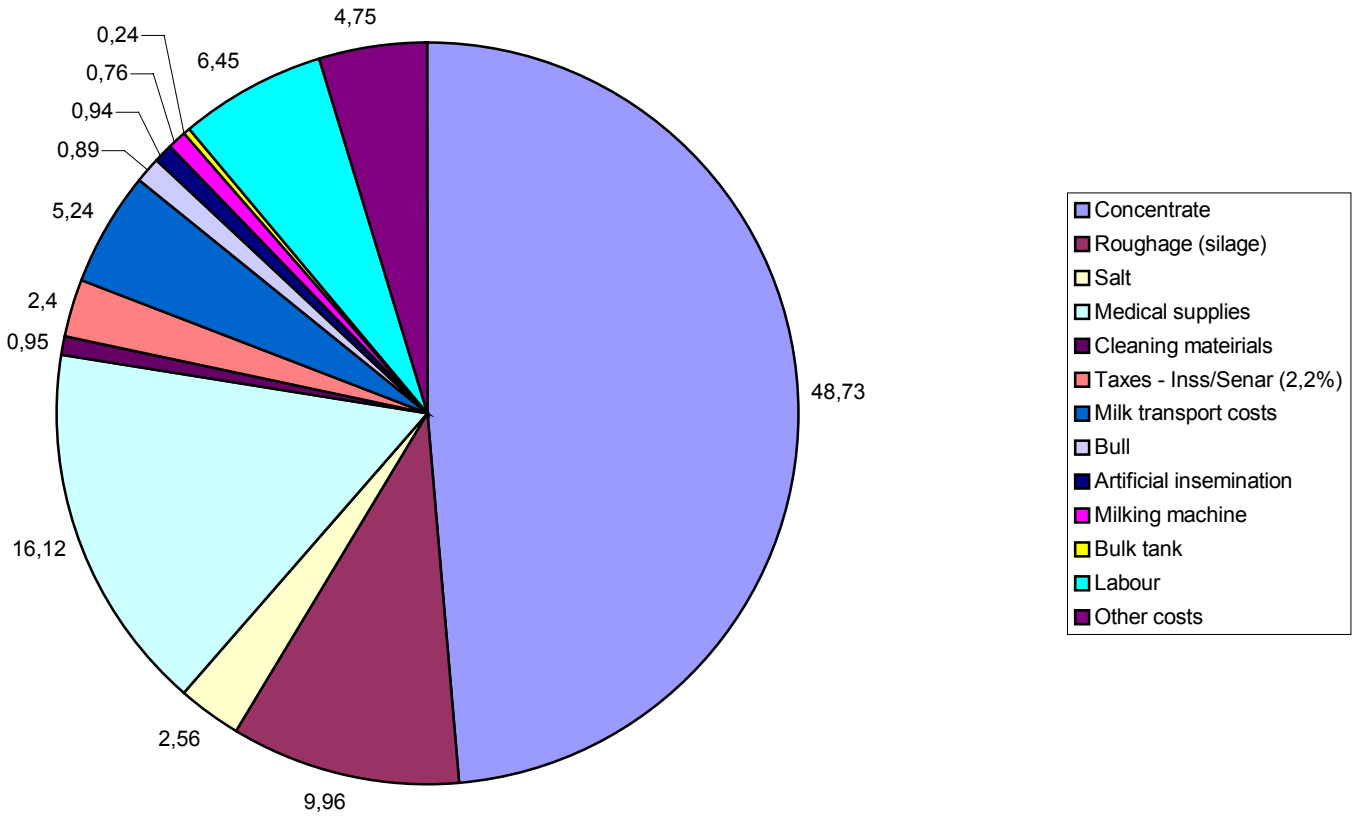

Figure 6 - Veterinary medical supplies - Madeira farm 1999/00
Gameleira - GO, BRASIL

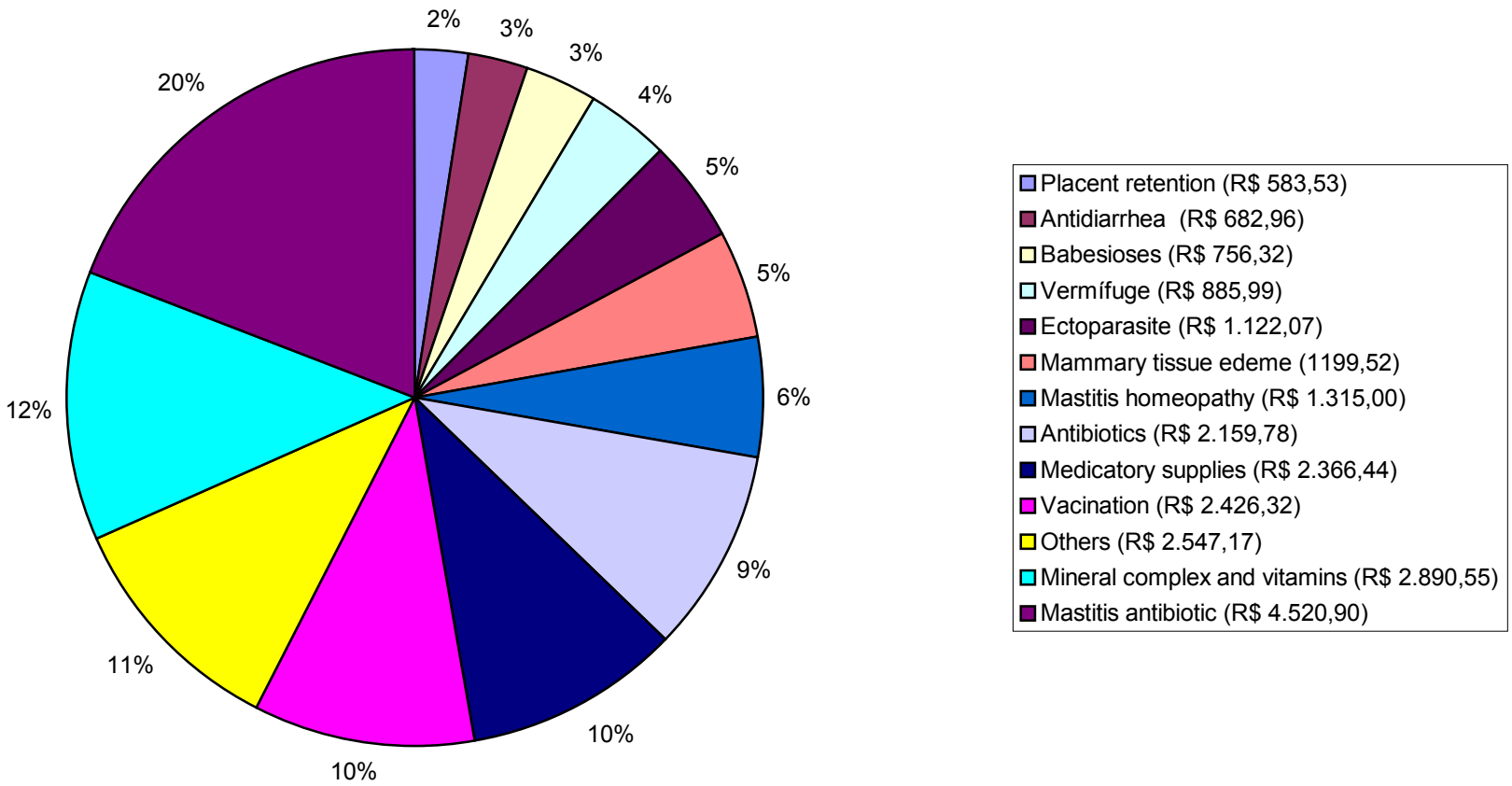

Table 7 – Final financial results of the Madeira farm – farming year 1999/00

description	result (R$)
crop activities	
upland crops in the own land – rainy season from October to May	5.607,19
upland crops in the rented land – rainy season from October to May	8.178,59
sub-total	**2.571,39**
Irrigated crops in the own land	34.222,30
total	**31.650,91**
animal production activity	**13.943,33**
whole farm production result in 1999/00	**45.594,23**
Investments	**2.500,00**
Input of own capital	**15.181,50**
withdraw of capital	**29.004,77**
other receipts from contract services (cereal and grain dryer)	**1.636,00**
Final financial result in 31/05/00	**30.906,96**

REFERENCE

- Janssen, W. and Goldsworthy (1996) Multidisciplinary research for natural resource management: conceptual and practical implications, in**: Agricultural Systems**, 51 p 259-279.
- Schnelle, K.E. (1967) **Case analysis and business problem solving**. New York: McGraw-Hill, p.149-151.

BIOGRAPHICAL SKETCH

Rui F. Veloso: Agronomist, rural resource management specialist, since 1978 with Brazilian Agricultural Research Corporation, EMBRAPA in Brasília, Brazil. Responsible for a farming systems research project dealing with Cerrados whole farm management problems related to the introduction of new technologies using the case study and mathematical modelling approaches. Also responsible for collaborative efforts with two Universities: Universidade de Brasília – UnB, and UPIS. Rui holds a PhD from Edinburgh University oriented (from 1987-1990) by Professor J. B. Dent.