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A PROTOTYPE MODEL TO ESTIMATE
PROVINCIAL AND NATIONAL
PAKISTAN NET FARM INCOME

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EXECUTIVE SUMMARY

A model was developed for Sind which is designed to estimate Net Farm Income for the province. Net Farm Income is defined as the return to the farmers and their families for the resources they provide--Land, Labor, Capital, and Management. It can be looked upon as measure of health of the agricultural sector.

The province is divided into two zones: the cotton zone includes those districts where the hectares of cotton is greater than rice and the rice zone includes those districts where more hectares of rice are grown than cotton. In addition three farm sizes (small, medium, and large) are defined for each zone. Eleven Kharif crops are included in the analysis and 9 Rabi crops.

Two template models are developed. The first template distributes area and production by farm size. The second template uses the adjusted area and production data (two files) plus four additional data files (information on input prices, product prices, livestock, and credit and interest) and generates a summary report. LOTUS is used for the templates and the macro feature permits easy combining of the data into the template programs.

The input cost data is still being developed at this time thus analysis of the five years (1983-84 through 1987-88) is not possible. Example input data and the summary results generated by the program are presented in the appendix.

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INTRODUCTION

Knowledge and measurement of the health of the farming (production agriculture) sector is critical in a nation like Pakistan which has more than half of its workforce employed in the primary industries. One important measure which provides an indication of the health of the agricultural industry is National Net Farm Income. National Net Farm Income is defined as the return to the farmers and their families for the labor, capital, land, and management they provide. This is not an measurement of aggregate profits from agriculture because the costs of the farm provided resources are not estimated. However, given assumptions regarding the value of farm labor, an opportunity cost for equity capital, and a return to land a residual return to management and risk (profit) provided by the farmers could be developed.

This study develops a methodology for estimating Net Farm Income and uses data from Sind as an example. When parallel models for the other provinces are developed, the provincial data can be aggregated and an estimate of Pakistan Net Farm Income provided. Although beyond the time available and scope of this study, appropriate opportunity costs for farm labor, farm equity capital, and land would provide an estimate of return to management and risk in the agricultural industry.

The methodology developed used an electronic spreadsheet (LOTUS) which combines information of crop area, crop production, product prices, and input prices and quantities to estimate Net Farm Income. Once the model is developed, input data for any year can be used to calculate Net Farm Income. The models assume that an embodied technology (input-output relationships) remain constant (eg the quantities of seed and labor are unchanged and that technology has not changed). The model is developed for an ex post analysis--thus crop area, level of production, quantities of fertilizer, pesticides, credit, and input and product prices are known. The model can be used in a predictive mode if estimates of these variables are developed. This, for example, would permit an approximate evaluation of anticipated Net Farm Income for the coming year or an indication of a proposed policy alternative.

A section describing how to operate the models is included. The appendix tables show the input data, adjustment and computational LOTUS models, and the result summaries.

METHODOLOGY

The following sections will describe the methodology used in developing the LOTUS model for estimating Sind Net Farm Income. In general the quantities of the principal inputs and outputs for the important crops in two cropping regions for the Kharif and Rabi seasons have been specified. A given year's crop area, livestock numbers and production is allocated between regions and farm sizes. Gross farm income, costs, and net farm income are estimated by enterprise and aggregated for the province.

CROPPING ZONES

Two cropping zones are defined for Sind --a rice production zone and a cotton production zone. The zones are aggregates of provincial districts. Based on the 1980 Pakistan Census of Agriculture, those districts in Sind that showed a cropping pattern which included more rice than cotton during the Kharif season were included in the rice zone. Similarly, those districts with more acres of cotton than rice were included in the cotton zone. Table 1 shows the districts in Sind, their proportion of rice and cotton and their assigned zone. Figure 1 shows the location of the rice and cotton zones in Sind.

Table 1. Sind districts, their proportion of rice and cotton and their crop production zone.

District	% Cropped Area in		Cropping Zone
	Rice	Cotton	
Badin	73	16	Rice
Thatta	88	1	Rice
Karachi	9	7	Rice
Dadu	64	5	Rice
Larkana	99	0	Rice
Shikarpur	99	0	Rice
Jacobabad	99	0	Rice
Tharparkar	1	16	Cotton
Hyderabad	27	57	Cotton
Sanghar	1	85	Cotton
Nawabshah	2	70	Cotton
Khairpur	2	74	Cotton
Sukkur	7	68	Cotton

Source: Census of Agriculture 1980: Sind

REFERENCES		
BOUNDARY	INTERNATIONAL	-----
"	PROVINCE	-----
"	DISTRICT	-----

$\frac{\% \text{ Rice}}{\% \text{ Cotton}}$



Figure 1. The cotton and rice cropping zones of Sind.

CROPS

The crops included in the analysis are the principal crops produced in the cropping zones. Only those crops which contributed at least one percent of the seasonal (Kharif or Rabi) cropped acre are included. The Kharif crops are: rice, cotton, sugarcane, oilseeds, pulses, fodders, vegetables, and rough grains (maize, jawar, and bajra). The Rabi crops are: wheat, barley, oilseeds, gram, other pulses, fodders, and vegetables. Tobacco was combined with "other crops". For both seasons, "other crops" are proportionately combined (on the basis of area) with the crops included.

The Kharif fruits were defined as mangoes, bananas, and dates. All others were considered Rabi fruits. Kharif oilseeds include groundnut, sesamum, linseed, castorseed, rapeseed and mustard. Kharif pulses include mung, mash, and other Kharif pulses. Kharif vegetables include coriander, chilies, and turmeric. Rabi pulses include nasoor and other Rabi pulses. Rabi vegetables include sugarbeet, onion, potato, peas, and garlic.

FARM SIZE CATEGORIES AND THEIR DISTRIBUTION

The study was specified to include small, medium, and large farms. Small farms operated less than 5 hectares; medium farm from 5 to 10 hectares; and large farms are greater than 10 hectares. These size categories conform with those used in the Census of Agriculture (18), Agricultural Statistics (21), and several other data sources.

The area of crop production in each of the crop size categories was computed from the 1980 Census of Agriculture (18). It is assumed that the same proportional distribution of cropped area is maintained for each crop year analyzed. Table 2 shows the distribution of the Kharif season cropped area by farm size and cropping zone.

STUDY YEARS

The years 1983-84 through 1987-88 are to be considered in the study. Data is being collected for these years but due to time constraints and incomplete data collection only an example of the model for the year 1983-84 is included. When the data is complete and verified, a detailed analysis can be undertaken.

CROPPING PATTERN CHANGES

The cropping pattern of 1980 by farm size and cropping season is shown in Table 3. Because the cropping pattern is different for the small, medium, and large farms the analysis was undertaken to limit the deviations from these cropping patterns.

Table 2. Hectares and percentage of Kharif and Rabi season area cropped by small, medium and large farms.

	RICE ZONE			COTTON ZONE		
	Farm Size			Farm Size		
	Small	Medium	Large	Small	Medium	Large
<u>Kharif Season</u>						
(1000 Ha)	1,307	587	505	1,461	853	1,079
%	54.5	24.5	21.0	43.1	25.2	31.8
<u>Rabi Season</u>						
(1000 Ha)	1,053	408	319	1,365	554	529
%	59.2	22.9	17.9	55.8	22.6	21.6

Source: Census of Agriculture 1980: Sind

However, over time the cropping pattern will change but the data does not reflect the changes by farm size. The study adjusted the cropping pattern so that the total area of a given crop is maintained (because this is known each year) and the distribution between farm size categories is based upon the base information from 1980. Appendix A shows the LOTUS program developed to maintain this balance.

YIELD CHANGES

Yield changes are handled in a manner parallel to that for changes in the cropping pattern. The total production (known information) is maintained but this production is distributed between the farm sizes in a manner that is consistent with the area and a basic yield distribution. Based on a study of cotton (20) and rapeseed and mustard (3) it was assumed that all crops would show relative yields of 90% for small farms, 100% for medium farms and 120% for large farms. The LOTUS template developed to make the production (yield) distributions between the different farm sizes is designed to accommodate differences by crop rather all the crops being subject to the same yield distribution. When additional information is available regarding crop yields by farm size, it can easily be included.

Table 3. Cropping patterns in Sind by cropping zones, farm size, and season.

	RICE ZONE			COTTON ZONE		
	Farm Size			Farm Size		
	Small	Medium	Large	Small	Medium	Large
KHARIF	----- % -----			----- % -----		
Rice	90.7%	85.8%	75.1%	6.3%	4.8%	2.9%
Maize	0.1%	0.0%	0.3%	0.3%	0.7%	0.4%
Jawar	2.3%	3.2%	4.6%	14.2%	29.0%	33.1%
Cotton	2.2%	2.8%	3.5%	61.5%	41.4%	31.5%
Sugarcane	2.7%	4.9%	10.4%	5.1%	4.8%	4.7%
Oilseeds	0.2%	0.2%	0.7%	0.2%	2.8%	7.7%
Pulses	0.0%	0.1%	0.3%	0.8%	1.5%	2.1%
Fodders	0.8%	1.9%	2.9%	7.9%	13.6%	15.1%
Vegetables	0.4%	0.8%	0.8%	3.1%	1.3%	1.7%
Others	0.0%	0.0%	0.2%	0.0%	0.5%	0.4%
RABI	----- % -----			----- % -----		
Wheat	42.4%	43.0%	47.7%	81.0%	77.1%	76.7%
Barley	4.0%	4.1%	4.8%	0.2%	0.2%	0.8%
Tobacco	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Oilseeds	7.8%	7.9%	6.9%	2.8%	5.3%	6.5%
Gram	7.3%	6.1%	6.5%	1.6%	2.0%	1.4%
Other Pulses	23.0%	23.1%	16.8%	2.3%	1.8%	1.7%
Fodders	10.8%	10.5%	10.1%	10.2%	11.3%	10.3%
Vegetables	1.9%	2.2%	4.4%	1.5%	2.0%	2.4%
Other	2.7%	3.0%	2.1%	0.0%	0.2%	0.0%

Source: Census of Agriculture 1980: Sind

INTERMEDIATE PRODUCTS

Because the crop by products are typically livestock feed, they are not valued. Instead, it is assumed that they are an intermediate product and fed to livestock and poultry. Thus rather than value by products and then charge them as a livestock feed, they are assumed to be feed to livestock. However, grains which may be fed to livestock or used for human consumption are fully valued and that portion which is fed is valued at the farmgate price.

FERTILIZER AND MANURE

The total quantity of fertilizer applied in the province is known thus the problem is that of allocation between crops and farm sizes. Fertilizer quantities were allocated between crops based upon their reported use (18). Table 4 shows the kg/ha of nitrogen fertilizer applied and the relative quantity (wheat is given an index of 100). For a given crop, the same quantity of fertilizer was used regardless of farm size. Crops not explicitly listed below were considered to have the same level of fertilizer as wheat. For simplicity, phosphorus and potash are allocated in the same proportions as nitrogen. Manure is not included as a cost in estimating aggregate provincial or nation income because it is an intermediate input--that is, manure is farm produced and farm consumed. It is recognized that small quantities of manure may be generated off the farm (in the large cities) but these small quantities are ignored.

The prices used for nitrogen was the weighted average (by tons applied) of urea, ammonium nitrate, and ammonium sulphate. There is some variation by year but about 88% of the single nutrient nitrogen fertilizer applied is urea, about 10% ammonium nitrate, and the residual ammonium sulphate. Sulphate of potash was the only source of potash considered. Phosphate price was derived by pricing the nitrogen at its single nutrient price and using the residual value as the cost of phosphate in nitrophos (23% N and 23% P). Single super phosphate was the second source considered. On average about 80% of the phosphate was from nitrophos and 20% from single super phosphate.

SEEDS

The quantities of seeds used in the analysis are based on those reported in the United Consultants report on the impact of mechanization on productivity and employment (11). In addition it was assumed that the seed requirements (kg/ha) for barley were equivalent to wheat; oilseeds in Rabi were equivalent to Kharif; jawar and bajra are similar to maize; and that all pulses have the same seed requirements. Although it is appreciated that

Table 4. Reported applications of fertilizer to principal crops in Pakistan.

Crop	Kg N/ha	% of Wheat
Wheat	74.4	100
Rice	41.7	56
Cotton	92.4	124
Sugarcane	107.3	144
Maize	74.2	100
Fruit	74.1	100

Source: Agricultural Census 1980: Sind

important differences exist between traditional vs improved varieties both with respect to cost and potential yield, simplicity required so such distinctions in this study.

PESTICIDES

Little information regarding pesticide use in a desirable format was located. The Agriculture Statistics of Sind (21, 22) provides information on the number of hectares by crop that receive either preventative or curative. The proportion of cropped hectares treated by pesticides multiplied by the average cost of a pesticide treatment is used to estimate the cost per hectare for pesticides for the included crops. The treated area noted as "other crops" or "misc" is combined and allocated to the maize-jawar enterprise. The average cost per hectare treated is computed by dividing the national cost of imported pesticides by the hectares treated. In 1986-87 and 1987-88 when data was missing, the previous years growth rate was assumed for hectares sprayed and imported cost of pesticides. The hectares of wheat treated beyond 1984-85 was assumed to be the same as the average percent for the first two years times the hectares of wheat grown. The last three years of pesticide treated crops is the ground applied hectares plus 3%, 13.3% and .08% of the hectares grown of rice, sugarcane, and fruits and vegetables, respectfully. Twenty percent of the fruit and vegetable pesticide treated hectares are assumed to be fruit and 80% vegetables. It is assumed that the pesticide costs/hectare are the same for all crops. Also, the same percent of crop hectares are treated by farm size are the same for all farm sizes.

LABOR

Total labor requirements (family plus hired) are reported by crop in Table 5. The labor requirements are the same for all farm sizes except for cotton where 90% and 120% of the stated hours were used for the small and large farms respectively. The hours of labor are based on information from the Mechanization Study (11). Pakistan Census of Agriculture (18) provided information regarding the number of permanent hired workers by farm size. Hired labor was 5.7%, 15.6%, and 62.7% of the total hours/hectare for the small, medium, and large farms, respectively. The percent of hired labor for a given farm size was assumed to be the same for all crops. The hours worked per year by agricultural workers was estimated at 2300 using information on the percentage of workers working a given number of hours in the surveyed week (9). Parttime family members were assumed to work half the hours of full time family workers. Hired workers and fully time family workers were both assumed to work 2300 per year. A single wage rate is used in the model with the exception of adjusting the cotton wage as a percent of the hired labor wage.

Table 5. Total hours of labor required by crop and farm size.

<u>Crop</u>	<u>Farm Size</u>	<u>Hours/Hectare</u>
Cotton	Small (S)	694
Cotton	Medium (M)	771
Cotton	Large (L)	925
Rice	S M L	430
Sugarcane	S M L	1171
Wheat	S M L	412
Vegetables	S M L	489
Fruit	S M L	514
Barley	S M L	412
Oilseeds	S M L	148
Pulses	S M L	161
Maize	S M L	380
Fodder-Rabi	S M L	489
Fodder-Kharif	S M L	385

POWER AND MACHINERY

The Mechanization Study (11) was the source for data on power and machinery requirements. Power requirements are met either by bullocks or by tractors. It is assumed that bullocks are provided by the farmer, thus the cost will be reflected in the livestock cost section. Tractors and machinery (primarily plow, harrows and combines) may or may not be owned by the farmer, but the charge will reflect both the variable costs (fuel, oil,

and repairs) as well as the fixed costs. Because a larger proportion of the small farmers would rent tractors and other machinery (and the driver/operator) the costs to them is 10% higher than the medium farms and the large farms cost is 10% lower.

PAYMENTS TO ARTISANS

Data from the Mechanization Study (11) is the basis for the coefficients for payments to artisans. The average of the Zone 5 and 6 All Technology is used for all reported crops. For the crops not reporting a payment to artisans, the average of the All Technology for the other zones is used. Barley is assumed to have the same value as wheat. An index (1986-87 = 100) is provided to allow proportionate changing of the expenses between years.

LAND TAXES

Data from the mechanization Study (11) was the basis for the coefficients for land taxes. The average of the Zones 5 and 6 for the All Technology is used for all reported crops. For the crops not reporting a "land revenue" the average of the All Technology for the other zones is used. Barley is assumed to have the same coefficient as wheat; no data was available for pulses, thus the same value as for oilseeds is used. An index (1986-87 = 100) is provided to allow proportionate changes between years.

INTEREST AND CREDIT

Credit is provided to farms from a number of institutional and private sources. Pakistan Agricultural Statistics (7) reports credit transactions (quantities) for the Agricultural Development Bank of Pakistan (ADBP), Commercial Banks, Taccavi Loans, and Cooperative Loans Advanced. For ADBP and Commercial Bank loans information on loan terms and farm size distributions are shown. Medium and long term loans were combined so that loans could be classified as either short term or long term loans. Loans to landless tenant and farms with less than 5 hectares were considered small farms. One third of the loan volume of the farm size classification 5 to 20 hectares is used as medium sized farms (farms from 5 to 10 hectares). The residual loans are classified as loans to large farms. Commercial Bank loans are classified as farm (really crop loans) and non-farm loans--those for poultry and livestock. Commercial Bank poultry loans are considered short term and livestock loans are classified as long term loans. The non-farm loans used the same farm size distribution as for farm loans. Taccavi Loans were distributed by farm size and loan type the same as ADBP loans. Cooperative loans were distributed by farm size and loan type the same as Commercial Bank loans.

The Cooperatives and Commercial Banks provide some Mark-up Free (no interest) loans. Data is reported on the total Rs and Rs of Mark-up Free loans (10). This proportion varies by year and is assumed to be the same for both short and long term loans. It is assumed that Traccavi Loans are at the same interest rates as ADBP loans. Also, that the interest rate for Mark-up loans by the Commercial Banks was 10% for short term loans (the minimum they can charge) and 13% for the long term loans (the maximum they can charge). Interest rates used are those reported in the Annual Report of the State Bank of Pakistan and shown in (10).

Interest rates and quantities from non-institutional sources is elusive. It is assumed that private lenders will charge the same rate as Mark-up loans by Commercial Banks. Also, that the percent of capital borrowed from institutions is 14%, 34%, and 57% for small, medium, and large farms respectfully (10, page II-9).

DEPRECIATION

A charge must be included for depreciation of capital assets--breeding and power livestock, machinery, and equipment. However, information on the value of the capital stock and its rate of depreciation is not available. Thus, the approach was adopted that depreciation is associated with long term loans. A factor of 20%, 35% and 25% of the total Rs of long term loans is used to reflect the consumption of capital resources by small, medium and large farms respectfully. Total depreciation for a given farm size is divided equally between all cultivated hectares in both the Rabi and Kharif seasons. This approach allows depreciation to vary with long term loans (which are investments in capital stock). The capital consumption factors are arbitrary, however, they appear to reflect relatively correct values--increases in depreciation as farm size increases indicating a substitution of capital for human and animal power.

LAND RENT

A charge is made for land rent which tenant will have to pay. Based on the 1980 Census of Agriculture it was calculated that 64.6%, 46.4%, and 24.7% of the cultivable land is rented/leased to tenant by small, medium, and large farms respectfully. It is assumed that large farmers will pay 15% more rent than small and medium farmers (20).

SUPPLEMENTAL WATER

The hours of additional water (tube wells) was based on data presented in the Mechanization Study (11). The cost of the supplemental water was based on a cost of Rs/hr 20 for 1987-88 and the other years are indexed based upon the cost of diesel and

electricity weighted by the number of tube wells using each power source.

LIVESTOCK

The livestock budgets were based upon those presented in the Pakistan Livestock Sector Study (16). Livestock was classified into buffalo, cattle, and sheep and goats. The unit of buffalo is the market integrated shallholder (Annex 10, Table 3), the cattle unit is a weighted average of shallholder on irrigated [85%] and Barani lands [15%] (Annex 10, Table 4), and the sedentary sheep and goat enterprise (Annex 10 Table 6). The number of animals in Pakistan (7) and allocating 19%, 17%, and 19% of buffalo, cattle, and sheep and goats respectively, to Sind. These percentages are based upon the percentages by province for 1976 (the latest year for which the provincial distribution was reported). The livestock budgets are for 1985-86. Product prices and costs are indexed using 1985-86 = 100. These budgets do not include forages as an expense, this is because the cost of forage production is reflected in the crop production sector and not valued and then repurchased in the livestock sector of the model.

PRODUCT PRICES

The product prices developed are the average of the principal marketing season price. Where crops are aggregated (eg oilseeds or pulses) a weighted average based on production of the various crops is used. Kharif vegetables used the weighted average of chillies, coriander, and turmeric. Rabi vegetables used the weighted average of potatoes, onions, sugarbeets and peas. Kharif fruit (major fruit) is the weighted average price of mango, banana, and dates. Product price for the Rabi (minor) fruit has not been computed at the time of this report.

CONCERNS AND LIMITATIONS

A number of concerns and limitations are apparent in the methodology. Time limitations preclude efforts to resolve them but they are noted for the concerned reader.

1. The input-output coefficients need to be reviewed. They were developed using the best known sources, however, review, modification and updating should not be overlooked.
2. Aggregate data (eg total production in Sind) has been distributed based upon relationships that are reported in the 1980 Census of Agriculture. It is assumed that these relationships continue.

3. Some data was aggregated (eg vegetable and fruit production). Review of the aggregation procedure including the weights used may be a useful refinement.
4. The importance of non-institutional (private) credit is not well understood or documented. Given the importance of this relationship and the apparent limited information it may be useful to devote research resources to better understand it.
5. Farm income is understated in that non cultivated land is excluded as a source of revenue and expense.
6. Two cropping zones, three farm sizes, and 23 crop enterprises require the development of 138 crop budgets for Sind. The lack of disaggregated data results in an illusion of greater information than is justified. In developing the models for the other provinces, it may be desirable to include fewer enterprise divisions.
7. Consider pricing seed as a percentage of the previous years price.
8. Add a value and production for cotton stalks--since they are not used for animal feed, but rather for fuel their value should be reflected in Net Farm Income.
9. All the data input range names are the year of production, eg 1983-84 or 1987-88.
10. Lack of data limited the detail that would be desirable in the livestock sector of the model.
11. Lack of information by farm size required assumptions to provide differential input-output coefficients. Frequently no farm size differentials were used (eg fertilizer use rates by farm size). When this data become available the model will accommodate this refinement.
12. The greatest reliability should be accorded the provincial estimates. Reliability decreases if aggregation by season, crop, and farm size are undertaken.

MODEL OPERATION AND ORGANIZATION

The Farm Income Model is a series of two templates (in LOTUS) with six data files which provide the yearly coefficients. The first template (Filename = FIN-1) adjusts and distributes

provincial area (Filename = AREAX) and production (Filename = PRODUCTX) information between the small, medium and large farm sizes. The distributions are based on the farm size distributions which existed in the 1980 Census of Agriculture (22). The second template (Filename = FIM-2) combines the information about area and production by farm size generated by FIM-1 and combines it with information about input prices (Filename = PRICEI), product prices (Filename = PRICEP), credit and interest data (Filename = CREDIT), and livestock data (Filename = LSDATA). Figure 2 shows the organization of the data files and the two templates.

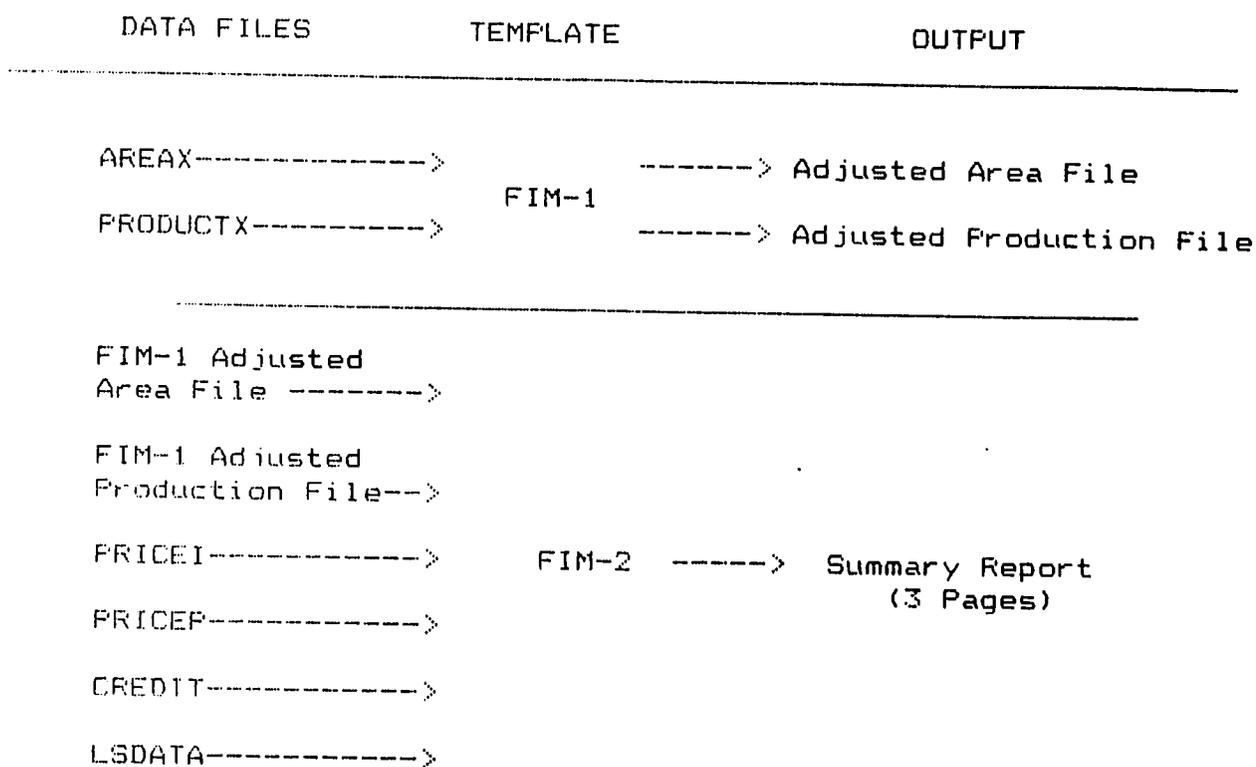


Figure 2. Organization of the data files, model templates, and associated outputs.

The two template models are run with macros. The user of needs only to select the year for which he want to make the analysis (for example 1983-84) and use "1983-84" as the range name when importing the data for the analysis from the data files. The data files have range name for five years 1983-84 through 1987-88. Data for additional years can be easily added but must be in the same format. The new data will also have to be given a range name corresponding to the appropriate added year.

The two templates are built with blocks of data/program on a diagonal. This allows for easily adding new rows or columns. In FIM-2 the Season (K,R) Zone (C,R), and Farm Size (S,M,L) aggregate budgets are identified by the three letter range names, eg KCS for Kharif-Cotton-Small. Data and calculations for one unit budgets is shown to the right of the aggregate budgets. Detailed notes regarding methodology are shown in the appendix. The appendix shows example year data for AREAX and PRODUCTX; the input data for the five years for PRICEI, PRICEP, CREDIT, and LSDATA; and an example summary printout (from FIM-2).

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APPENDIX

INPUT COST DATA
 Filename = PRICE1

10:59 PM
 08/22/89

Crop	Unit	1983-84	1984-85	1985-86	1986-87	1987-88	Test	
1	Seed							
2	Rice						2.49	
3	Maiz/Jawar						3.20	
4	Cotton						3.07	
5	Sugarcane						1.30	
6	Kharif Oilseeds						5.34	
7	Kharif Pulses						7.66	
8	Kharif Fodders						0.00	
9	Kharif Vegetables						12.94	
10	Wheat						2.13	
11	Barley						1.98	
12	Rabi Oilseeds						3.81	
13	Gram						6.94	
14	Other Rabi Pulses						3.75	
15	Rabi Fodders						0.00	
16	Rabi Vegetables						3.13	
17	Fertilizer							
18	Nitrogen	Rs/Kg	5.47	5.24	5.30	5.31	5.31	5.6
19	Phosphorus	Rs/Kg	3.02	4.35	4.30	4.29	4.98	5.4
20	Potash	Rs/Kg	1.60	2.00	2.00	2.40	2.40	2.9
21	Supplementary Water	Rs/Hr	12.50	14.70	16.80	18.30	20.00	12.2
22	Labor Wage (All Hired)	Rs/Hr						2.5
23	Cotton Wage	% of Labor Wage						75%
24	Farm Power							
25	Tractors	Rs/Hr						70
26	Other	Rs/Hr						104
27	Higher Rate Small Farms	%						10%
28	Lower Rate Large Farms	%						10%
29	Fixed Costs							
30	Rental Rate for Land	Rs/Ha						350
31	Payments to Artisans	Index (1986-87=100)						100
32	Water rate	Index (1986-87=100)						100
33	Land Tax	Index (1986-87=100)						100
34	N used in Sind	Tons	258200	261600	283000	323900	309430	258258
35	P used in Sind	Tons	66200	74000	77400	90900	86250	66225
36	K used in Sind	Tons	7600	6900	8600	10600	8760	7571
37	PLANT PROTECTION (Ha Treat)							
38	Wheat	Ha	3800	1086	2481	2494	2467	3800
39	Cotton	Ha	322014	651051	702700	791500	1419500	322014
40	Rice	Ha	10120	44732	43771	56830	208054	10120
41	Sugarcane	Ha	79976	38196	54794	84799	162744	79976
43	Oilseeds	Ha	32576	3200	10400	9700	6600	32576
44	Fruits	Ha	16394	3862	5453	16446	15441	16394
45	Vegetables	Ha	57533	16322	21811	65784	61764	57533
46	Other & Misc	Ha	1801	0	0	0	0	1801
47	Ave Pesticide Cost	Rs/Ha	287	344	227	232	265	287

PRODUCT PRICE DATA

Filename = PRICEP

11:06 PM

08/22/89

Season	Crop	Unit	1983-4	1984-85	1985-86	1986-87	1987-88	Test
	YEAR							
Kharif	Rice--Cotton Zone	MT	1815.9	2300.0	2047.9	1868.8	1327.6	1815.9
	Rice--Rice Zone	MT	2160.4	2067.7	2750.0	2427.0	2625.0	2160.4
	Maiz/Jawar--Cotton Zone	MT	2569.9	2241.1	2624.8	2519.2	2547.9	2569.9
	Maize/Jawar--Rice Zone	MT	2555.0	2426.3	2835.7	3104.2	2304.5	2555.0
	Cotton--Cotton Zone	MT	2287.5	1550.0	2429.7	2406.2	2085.9	2287.5
	Cotton--Rice Zone	MT	2631.3	2796.9	2500.0	2421.8	2375.0	2631.3
	Sugarcane--Cotton Zone	MT	300.0	300.0	300.0	300.0	300.0	300.0
	Sugarcane--Rice Zone	MT	300.0	300.0	300.0	300.0	300.0	300.0
	Oilseeds--Cotton Zone	MT	5372.0	6139.1	5131.4	4679.7	808.7	5372.0
	Oilseeds--Rice Zone	MT	3173.5	3616.2	4561.5	4775.9	7107.1	3173.5
	Pulses--Cotton Zone	MT	5962.1	5950.2	6183.9	5440.8	5136.4	5962.1
	Pulses--Rice Zone	MT	62928.7	7829.9	6548.7	5734.8	5012.4	6292.8
	Fodders--Cotton Zone	MT	-----	-----	-----	-----	-----	0.0
	Fodders--Rice Zone	MT	-----	-----	-----	-----	-----	0.0
	Vegetables--Cotton Zone	MT	9776.9	8582.1	7072.6	10226.4	13805.4	9776.9
	Vegetables--Rice Zone	MT	11010.1	11111.3	8086.5	14137.5	13537.8	11010.1
	Fruits--Cotton Zone	MT	5871.0	3976.9	5280.7	5359.3	4132.6	5871.0
	Fruits--Rice Zone	MT	5479.4	5818.1	6431.9	6277.2	4754.7	5479.4
Rabi	Wheat--Cotton Zone	MT	1767.2	19448.0	1976.9	2143.8	2062.5	1767.2
	Wheat--Rice Zone	MT	1644.8	2067.7	2368.8	2029.1	1850.0	1644.8
	Barley--Cotton Zone	MT	1706.8	1980.4	2328.1	2062.5	1565.5	1706.8
	Barley--Rice Zone	MT	1475.0	2414.0	2765.6	1797.9	1876.3	1475.0
	Oilseeds--Cotton Zone	MT	3214.5	4265.1	4062.5	3633.1	9734.4	3214.5
	Oilseeds--Rice Zone	MT	2890.6	4370.3	3616.7	3275.2	11125.0	2890.6
	Gram--Cotton Zone	MT	5158.5	3977.6	5334.7	5662.5	4125.0	5158.5
	Gram--Rice Zone	MT	5921.9	3931.3	6272.9	5027.8	4581.3	5921.9
	Other Pulses--Cotton Zone	MT	3172.5	6897.8	13260.4	10183.3	8801.8	3172.5
	Other Pulses--Rice Zone	MT	2796.8	6897.8	14166.7	10520.8	5625.0	2796.8
	Fodders--Cotton Zone	MT	-----	-----	-----	-----	-----	0.0
	Fodders--Rice Zone	MT	-----	-----	-----	-----	-----	0.0
	Vegetables--Cotton Zone	MT	2592.8	2011.5	2255.7	1717.5	1735.2	2592.8
	Vegetables--Rice Zone	MT	2356.1	1702.9	2328.3	1888.9	2533.2	2356.1
	Rabi Fruits--Cotton Zone	MT	-----	-----	-----	-----	-----	5500.0
	Rabi Fruits--Rice Zone	MT	-----	-----	-----	-----	-----	5500.0

A. AREA INPUT TABLE FOR SIND BY SEASON, DISTRICT, AND CROP

(Revised August 19, 1989)

PAGE 1

Filename = AREAX

01:34 PM

08/20/89

1. KHARIF SEASON FOR 1983-84

DISTRICT	HECTARES (000)										
	Rice	Maize	Jawar	Cotton	Sugar-cane	Oil-seeds	Pulses	Fodder	Vege- tables & Others	Guarseed	Major Fruits
Khairpur	3.1	0.4	24.6	77.7	15.5	0.14	1.61	0	0.81	7.72	13.88
Jacobabad	165.9	0.0	9.2	0.4	0.3	0.00	0.03	0	0.00	0.00	0.01
Sukkur	16.9	0.7	22.7	110.6	9.5	0.09	0.45	0	0.73	6.44	1.93
Shikarpur	79.7	0.2	0.7	0.0	1.0	0.01	0.00	0	0.24	0.04	0.57
Nawabshah	5.7	0.9	21.9	118.9	34.0	0.08	1.68	0	0.13	8.06	6.31
Larkana	177.3	0.0	1.3	0.2	1.6	2.57	0.00	0	0.19	0.00	0.97
Sanghar	4.7	3.5	9.2	143.0	6.7	3.11	2.15	0	0.93	1.27	6.89
Tharparkar	4.6	8.7	238.7	93.6	11.5	23.16	12.53	0	32.97	155.13	9.14
Dadu	57.9	0.5	5.0	7.0	5.9	0.77	0.07	0	0.25	0.00	0.49
Hyderabad	22.5	1.6	14.8	88.3	33.9	0.18	1.37	0	6.96	1.03	10.77
Badin	94.2	1.1	1.5	14.6	47.0	0.03	1.97	0	2.17	0.00	1.77
Thatta	89.5	1.4	1.6	1.2	10.4	0.04	2.17	0	1.24	0.00	3.70
Karachi	0.0	0.0	0.9	0.0	0.0	0.03	0.36	0	0.87	0.47	0.71
TOTAL	722.0	19.0	352.1	655.5	177.3	30.20	24.39	0.00	47.49	180.15	57.13

2. RABI SEASON FOR 1983-84

PAGE 2

DISTRICT	HECTARES (000)										
	Wheat	Barley	Tobacco	Mustard Rapeseed Oilseeds	Gram	Other Pulses	Fodders	Vege- tables	Other	Minor Fruits	
Khairpur	91.0	0.5	0.110	7.1	2.4	0.2	18.17	2.16	0.00	2.26	
Jacobabad	47.0	0.0	0.000	5.2	50.9	0.0	2.85	32.51	0.00	0.00	
Sukkur	104.9	0.6	0.013	12.5	21.4	2.8	9.72	5.50	0.00	0.23	
Shikarpur	17.8	1.0	0.009	5.9	22.6	1.8	2.55	20.52	0.00	0.08	
Nawabshah	188.7	0.2	0.011	19.5	2.1	0.0	17.31	3.61	0.00	2.06	
Larkana	53.3	2.0	0.000	9.9	5.5	0.2	38.60	26.67	0.00	1.01	
Sanghar	149.2	0.0	0.000	14.3	0.4	0.6	9.26	3.37	0.00	0.81	
Tharparkar	148.2	0.0	0.000	4.2	0.1	0.7	15.73	4.07	0.00	0.66	
Dadu	71.2	2.0	0.172	8.4	2.9	1.6	10.31	5.82	0.00	0.35	
Hyderabad	98.7	0.0	0.008	3.3	1.4	1.5	6.70	10.99	0.00	2.00	
Badin	35.5	6.0	0.000	4.4	0.8	1.3	5.31	3.98	0.00	0.12	
Thatta	4.9	14.3	0.000	1.4	0.5	1.0	3.97	0.79	0.00	0.46	
Karachi	0.3	0.0	0.000	0	0.0	0.1	3.30	0.22	0.00	0.59	
TOTAL	1010.7	26.6	0.323	96.100	111.0	11.6	143.76	120.20	0.00	10.64	

B. PRODUCTION INPUT TABLE FOR SIND BY SEASON, DISTRICT, AND CROP

Filename = PRODUCTX

10:30 AM

08/20/89

1. KHARIF SEASON FOR (YEAR)

1983-84

5.9 bales = 1 H. TON

PAGE 1

DISTRICT	1000 M. TONS										
	Rice	Maiz	Jawar	Cotton	Sugar-cane	Oil-seeds	Pulses	Fodder	Vege-tables	Guarseed & Other	Major Fruits
Khairour	4.3	0.2	15.4	22.2	545.4	0.2	0.7	0.0	0.5	5.1	88.61
Jacobabad	382.3	0.0	5.1	0.1	12.3	0.0	0.0	0.0	0.0	0.0	0.02
Sukkur	31.6	0.4	13.8	32.7	355.4	0.1	0.2	0.0	0.9	3.9	15.42
Shikarpur	204.0	0.1	0.4	0.0	33.8	0.0	0.0	0.0	0.2	0.0	4.34
Nawabshah	5.8	0.5	14.1	41.5	1409.7	0.0	0.8	0.0	0.2	5.4	54.22
Larkana	484.1	0.0	0.7	0.0	53.7	0.9	0.0	0.0	0.1	0.0	7.29
Sanghar	7.6	1.8	5.2	49.6	280.5	5.7	1.2	0.0	1.3	0.8	52.25
Tharparkar	7.7	4.5	84.1	27.9	464.3	15.5	5.3	0.0	39.9	55.2	70.38
Dadu	112.9	0.3	2.7	2.0	211.0	0.3	0.0	0.0	0.2	0.0	3.03
Hyderabad	32.3	0.9	8.4	27.6	1477.1	0.1	0.7	0.0	11.7	0.6	94.23
Badin	102.6	0.4	0.7	2.1	2081.7	0.0	0.9	0.0	3.7	0.0	14.52
Thatta	103.6	0.7	0.7	0.2	432.2	0.0	0.9	0.0	1.3	0.0	30.57
Karachi	0.0	0.0	0.4	0.0	0.0	0.0	0.2	0.0	0.5	0.2	4.44
TOTAL	1478.8	9.8	151.7	205.8	7357.1	22.8	10.9	0.0	60.6	71.3	439.3

2. RABI SEASON FOR

1983-84

PAGE 2

DISTRICT	1000 M. TONS									
	Wheat	Barley	Tobacco	Mustard & Rapeseed Oilseeds	Gram	Other Pulses	Fodder	Vege-tables	Minor Fruits	
Khairpur	163.1	0.3	1.6	4.3	1.7	0.1	615.3	4.4	14.244	
Jacobabad	54.6	0	0.0	2.5	39.3	0.0	66.1	15.2	0.003	
Sukkur	194.9	0.3	0.0	7.1	18.5	1.3	286.4	23.8	0.999	
Shikarpur	23.0	0.5	0.0	3.2	19.5	0.8	82.4	21.4	0.26	
Nawabshah	438.9	0.1	0.0	12.8	1.6	0.0	748.4	19.4	22.977	
Larkana	74.6	1.2	0.0	5.3	4.7	0.1	1126.0	15.1	5.131	
Sanghar	336.6	0.0	0.0	8.8	0.2	0.3	307.9	21.5	4.47	
Tharparkar	306.9	0.0	0.0	2.8	0.0	0.2	582.6	28.2	3.059	
Dadu	95.9	1.0	0.2	5.2	2.2	0.7	383.9	7.2	1.339	
Hyderabad	204.9	0.0	0.0	2.2	1.1	0.7	291.9	98.3	9.079	
Badin	45.7	3.2	0.0	2.7	0.6	0.5	182.8	28.5	0.35	
Thatta	6.3	7.1	0.0	0.7	0.4	0.4	156.9	2.6	1.81	
Karachi	0.4	0.0	0.0	0	0.0	0.0	23.6	1.3	3.263	
TOTAL	1945.8	13.7	1.8	57.6	89.8	5.1	4854.2	286.9	68.0	

CREDIT INPUT
 Filename = CREDIT

11:14 PM
 08/22/89

Source: 1987-88 Pakistan Ag Statistics

Item	From	Rs Millions				
	Ag Stat Table	1983-84	1984-85	1985-86	1986-87	1987-88

ADBP						
Short Term Loans	86	309.7	498.0	629.3	590.0	776.6
Medium Term Loans	86	82.9	151.6	261.1	229.3	375.5
Long Term Loans	86	429.6	427.1	531.6	683.1	778.8
Landless Loans	88	45.0	40.5	235.7	204.9	368.7
<5.06 Ha	88	72.3	149.4	253.4	212.7	277.7
<20.23 Ha	88	428.6	597.0	604.5	720.0	826.4
Commercial Banks						
<5.06 Ha	93	898.0	1020.0	1466.7	2078.0	1138.7
<20.23 Ha	93	410.1	397.3	482.6	549.8	380.3
Short Term Loans	94	1267.8	1393.6	1934.7	2658.1	1539.4
Long Term Loans	94	121.3	158.6	121.1	97.6	69.1
Sm Farms--LS	95	1.4	0.0	0.2	0.9	0.8
Sm Farms--Poultry	95	19.9	35.9	17.4	49.6	22.4
Lg Farms --LS	95	1.5	0.0	0.0	6.1	0.0
Lg Farms--Poultry	95	3.6	7.3	41.6	215.9	239.4
Taccavi Loans	96	0.9	1.6	1.0	4.0	3.0
Coop Loans Advanced	97	0.0	49.9	69.8	216.2	110.0
Percent Interest Free Loans--Coops	97 & 98	97.5%	84.9%	94.3%	86.2%	93.9%
Percent Interest Free Loans--Comm Banks	93 & 98	41.6%	43.3%	60.1%	66.8%	67.6%
Percent Interest ADBP		11.0%	11.0%	12.0%	12.0%	12.0%
Percent Interest Comm Bks--Short Term Loans		10.0%	10.0%	10.0%	10.0%	10.0%
Percent Interest Comm Bks--Long Term Loans		13.0%	13.0%	13.0%	13.0%	13.0%
Percent Interest Coops--Short Term Loans		12.0%	12.0%	12.0%	12.0%	12.0%
Percent Interest Coops--Long Term Loans		12.5%	12.5%	12.5%	12.5%	12.5%

LIVESTOCK ENTERPRISE DATA
 Filename = LSDATA
 11:16 PM
 08/22/89

		1983-84	1984-85	1985-86	1986-87	1987-88	Test

Inventory--SIND							
Buffalo	Hd (000)	2455	2512	2571	2632	2693	2571
Cattle	Hd (000)	2826	2860	2895	2930	2965	2895
Sheep & Goats	Hd (000)	10323	10672	11032	11404	11789	11032
Animal Price Index	85-86 = 100	-----	-----	100	-----	-----	100
Milk Price Index	85-86 = 100	-----	-----	100	-----	-----	100
Wool Price Index	85-86 = 100	-----	-----	100	-----	-----	100
Hair Price Index	85-86 = 100	-----	-----	100	-----	-----	100
Conc Price Index	85-86 = 100	-----	-----	100	-----	-----	100
Vet & Med Index	85-86 = 100	-----	-----	100	-----	-----	100
=====							

TABLE 1. NET FARM CROP INCOME SUMMARY--SIND

	SEASON ZONE FARMSIZE	Khariif Cotton Small	Khariif Cotton Medium	Khariif Cotton Large	Khariif Rice Small	Khariif Rice Medium	Khariif Rice Large
GROSS CROP REVENUE	Rs	2246811	1111031	2388739	1989824	1031644	1309017
Seed	Rs	181009	129022	156282	67326	56310	100337
---N	Rs	262325	171884	205749	104683	50835	52815
---	Rs	65808	43120	51615	26261	12753	13249
--K	Rs	3980	2608	3121	1588	771	801
Pesticides	Rs	2342	1579	1918	1706	775	702
Equip. Water	Rs	359293	219890	280104	469718	210517	187292
Labor--Hired	Rs	45571	83099	416349	28404	37467	154291
Power--Tractor	Rs	407605	245282	271218	190228	79092	68199
--Other	Rs	45636	26072	24173	533446	205993	140213
FC--Land Rent	Rs	133355	64381	47880	97170	31601	17517
--Land Taxes	Rs	9108	4715	5045	5118	2251	1870
--Artisians	Rs	148858	84686	93898	94872	41873	35514
--Water Rate	Rs	74552	48232	57757	60437	28312	27510
--Interest	Rs	213422	35916	78760	155512	17629	28815
--Depreciation	Rs	64332	44209	81600	46876	21700	29854
TOTAL CROP EXPENSES	Rs	2017195	1204694	1775466	1883346	797879	858979
NET FARM CROP INCOME		229615	-93663	613270	106478	233765	450039

TABLE 1 NET FARM CROP INCOME SUMMARY--SIND (Continued)

	SEASON ZONE FARMSIZE	Rabi Cotton Small	Rabi Cotton Medium	Rabi Cotton Large	Rabi Rice Small	Rabi Rice Medium	Rabi Rice Large	SIND CROP TOTAL
GROSS CROP REVENUE	Rs	2891029	727771	925460	3286150	1630518	2857720	41010342
Seed	Rs	5750	4671	4745	11478	6678	7565	30974162
Fertilizer--N	Rs	210265	86856	84210	118249	45816	43575	30872847
--P	Rs	52748	21789	21125	29665	11494	10931	30172308
--K	Rs	3190	1318	1278	1794	695	661	29968437
Pesticides	Rs	590	244	236	332	128	122	29957220
Supp. Water	Rs	252089	105220	105473	162400	63863	64948	30702189
Labor--Hired	Rs	31265	34454	133996	16168	17559	70077	29278895
Power--Tractor	Rs	272520	101237	90781	137566	49374	43224	29208415
--Other	Rs	210370	78843	68311	117575	41068	35435	28498394
FC--Land Rent	Rs	123941	36660	21759	69702	19338	11259	27805520
--Land Taxes	Rs	8221	3224	3095	3178	1237	1088	27433658
--Artisians	Rs	121080	48059	46834	50372	19811	18549	27710257
--Water Rate	Rs	68301	27593	26934	31868	12634	12218	27390104
--Interest	Rs	198356	20452	35791	111552	10788	18521	27488764
--Depreciation	Rs	59791	25174	37082	33625	13279	19188	27146849
TOTAL CROP EXPENSES	Rs	1618477	595793	681651	895523	313761	357360	434608020
NET FARM CROP INCOME		1272552	131978	243810	2390628	1316756	2500360	-393597679

TABLE 2. SUMMARY NET FARM LIVESTOCK INCOME--SIND (Excluding Farm Produced Forages)

	Buffaloes	Cattle	Sheep & Goats
Livestock Units	514277	578978	551581
Animal Sales Revenue	1300	758	4590
Milk Revenue	8100	1114	75
Wool Revenue			100
Hair Revenue			30
Concentrate Cost	450	99	59
Vet & Med Cost	170	63	366
GROSS INCOME/UNIT	9400	1872	4855
TOTAL EXPENSES/UNIT	620	162	419
NET LIVESTOCK INCOME/UNIT	8780	1711	4435

NET FARM LIVESTOCK INCOME 4515353458 990370438 2446371165

TABLE 3. NET FARM INCOME--SIND

NET FARM INCOME--CROPS	-393597679
NET FARM INCOME--LIVESTOCK	7952095061
SIND TOTAL NET FARM INCOME	7558497382