

## **APPENDIX 1**

Guidance Notes for Completing Farm Record Sheets  
Codebook  
Farm Record Sheets 23 - 36

## 01 FARM CODES

### Kazakhstan

- 01 Aksharna
- 02 Akumskiy
- 03 Zhambul
- 04 Pakhtaral

### Kyrgistan

- 07 Rasviet
- 08 Experimental Farm
- 09 Sadikov
- 10 Cotton Expt Farm

### Tadjikistan

- 14 K-Z 1st May
- 37 Dustee

### Turkmenistan

- 17 Teze Durmus
- 18 Murgap

### Uzbekistan

- 21 Berdeyev
- 22 Talashkan
- 23 G Gulyama
- 24 Timur Malik
- 25 A Navoi
- 26 Pakhtakor
- 27 Khalkabad
- 28 Shortanbay
- 35 Bukhara
- 36 Gulistan

## 02 FARM MACHINERY

### 01 WHEELED TRACTORS

- 01 small (<60 bhp)
- 02 medium (60-100bhp)
- 03 large (>100bhp)
- 04 other.....

### 02 TRACK-LAYING TRACTORS

- 01 medium (60-100bhp)
- 02 large (>100bhp)
- 03 other.....

### 03 HARVESTER (SELF-PROPELLED)

- 01 small grain
- 02 maize
- 03 cotton
- 04 forage.....
- 05 other.....

### 04 OTHER SELF-PROPELLED MACHINES

- 01 excavator
- 02 dragline
- 03 bulldozer
- 04 leveller/*grader*
- 05 crane
- 06 dumper truck
- 07 hoists/forklift
- 08 sprayer
- 09 lorry
- 10 low-level transporter
- 11 bus
- 12 mini-bus
- 13 pickups/van
- 14 car
- 15 other.....
- 16 *tanker lorry*
- 17 *scraper*
- 18 *tubewell drill*
- 19 *mobile workshop*

### 05 IMPLEMENTS (MOUNTED, TOWED)

- 01 fixed disc plough
- 02 fixed mouldboard plough
- 03 reversible disc plough
- 04 reversible mouldboard plough
- 05 chisel plough
- 06 *ripper/subsoiler*
- 07 *levelling blade/bar*
- 08 *ridger/ridge former*
- 09 *ditcher/trencher*
- 10 interrow cultivator with tines
- 11 rotary cultivator (>1m wide)
- 12 rotary interrow cultivator

- 13 spiketooth/zigzag harrow
- 14 disc harrow
- 15 crumbler
- 16 roller
- 17 rootcrop/*cotton root lifter*
- 18 rootcrop harvester
- 19 forage bar-cutter

**02 FARM MACHINERY CONTINUED.....**

**05 IMPLEMENTS CONTINUED.....**

- 20 flail mower
- 21 forage harvester
- 22 tedder
- 23 windrower
- 24 binder
- 25 baler
- 26 boom sprayer
- 27 mist blower
- 28 air blast sprayer
- 29 sprayer with lances
- 30 bowser
- 31 trailer/*tipping trailer*
- 32 seed drill (small seeds)
- 33 row planter (large seeds)
- 34 fertiliser drill
- 35 muck spreader
- 36 seed/fertiliser drill
- 37 seed/fertiliser row planter
- 38 herbicide applicator
- 39 seed/fert/herbicide drill
- 40 seed/fert/herbicide row planter
- 41 seed broadcaster
- 42 fertiliser broadcaster
- 43 liquid injector (into soil)
- 44 gas injector (into soil)
- 45 fumigator
- 46 irrigation pump
- 47 silage chopper
- 48 circular saw
- 49 hedge trimmer/*cotton topper*
- 50 electrical generator
- 51 mechanical auger
- 52 ripper with mole
- 53 backhoe
- 54 other.....
- 55 *ridger with fertiliser applicator*
- 56 *interrow cultivator with fertiliser applicator*
- 57 *laser leveller*
- 58 *clamshell loader*
- 59 *bale loader*
- 60 *fork lifter*
- 61 *cotton harvester*
- 62 *cotton gleaner*
- 63 *potato planter*
- 64 *buckrake*
- 65 *semi-mouldboard plough (PN-6/8)*

**06 OTHER MACHINES**

- 01 concrete mixer
- 02 fumigator
- 03 general pump
- 04 irrigation pump
- 05 drainage pump
- 06 milking machine
- 07 electrical generator

- 08 heater
- 09 crop drier
- 10 steriliser

## **02 FARM MACHINERY CONTINUED.....**

### **06 OTHER MACHINES CONTINUED.....**

- 11 steam generator
- 12 grain or other mill
- 13 livestock concentrate feed mixer
- 14 mechanical workshop with machines
- 15 knapsack sprayer (hand operated)
- 16 knapsack sprayer (motorised)
- 17 Drilling machine/mechanical auger
- 18 Welder
- 19 other.....
- 20 *cotton boll-breaker*
- 21 *grain separator*
- 22 *grain cleaner*
- 23 *sheep shearing machine*
- 24 *grain crusher (not mill)*

### **07 ALTERNATIVES TO USE OF FARM MACHINES**

- 01 *by hand (where only tools may be used)*
- 02 *by aircraft*
- 03 *by fertigation (fertiliser in irrigation water)*

*Note: if operation is "by hand" then use operation code in "labour use". If "by hand" is associated with machine, then the operation is one of the tasks of the "labour with machine" and need not be specified.*

## **03 FARM OPERATIONS**

### **01 IRRIGATION, LEACHING AND DRAINAGE**

- 01 Leaching
- 02 Pre-irrigating
- 03 Irrigating
- 04 Making furrows/ridges for irrigation
- 05 Making drains

### **02 LAND PREPARATION**

- 01 Primary land tillage (ploughing)
- 02 Secondary land tillage (seedbed preparation)
- 03 Land levelling
- 04 Making broad beds
- 05 Ripping/*subsoiling*/mole draining
- 06 Making ridges/furrows/holes for planting
- 07 *Levelling furrows*
- 08 *Removing stones*

### **03 OPERATIONS ON CROPS**

- 01 Seeding/planting/sowing seed
- 02 Planting other than seed (trees, cuttings, transplants)
- 03 Applying organic fertiliser
- 04 Applying inorganic fertiliser
- 05 Applying agro-chemicals (pesticides, defoliants)
- 06 Weeding (not herbicide)
- 07 Thinning plants (seedlings)

- 08 Interrow cultivation
- 09 Ridging up plants in row
- 10 Pollinating by hand or related activity
- 11 Releasing hosts for biological control
- 12 Scouting or field monitoring
- 13 Pruning trees or topping/slashing plants
- 14 Harvesting
- 15 Lifting a root crop
- 16 Mowing
- 17 Baling/binding
- 18 Eradication of plants

### 03 OPERATIONS ON CROPS CONTINUED.....

- 19 *codes 0304+0308*
- 20 *codes 0104+0304*
- 21 *codes 0304+ 0309*
- 22 *Guarding crop against theft/animals*
- 23 *Cleaning crop product/winning*
- 24 *Threshing*
- 25 *Clearing a space in field*
- 26 *Making firebreaks*
- 27 *Burning crop residues*

### 04 INFRASTRUCTURAL WORK

- 01 Making or repairing trellises/supports
- 02 Building work/maintenance work on buildings/greenhouses
- 03 Repairing machines/implements/motors/pumps/generators
- 04 Constructing/maintaining civil structures
- 05 Laying or maintaining cables, roads, pipes
- 06 Surveying/marketing out in field
- 07 Irrigation construction
- 08 Drainage construction
- 09 Transport of materials

### 05 GENERAL WORK

- 01 Directing/supervising operations
- 02 Painting or applying chemicals by hand
- 03 Making stacks, piles
- 04 Lifting/carrying/loading sacks, bales, produce, materials
- 05 Carting/transporting/towing
- 06 Preparing/treating/processing seed
- 07 Washing
- 08 Drying
- 09 Mixing
- 10 Gardening/mowing lawns
- 11 Making/maintaining ponds
- 12 Producing hosts for biological control
- 13 *Food preparation,cooking*

### 06 FARM ADMINISTRATION

- 01 Farm administrative work (accounts, stock-keeping, budgeting, planning)
- 02 Entertaining/teaching/public addressing

### 07 LIVESTOCK MANAGEMENT

- 01 Feeding stock

- 02 Herding
- 03 Milking
- 04 Assisting with breeding
- 05 Veterinary work
- 06 Mucking out manure/urine
- 07 Cleaning
- 08 Weighing
- 09 Processing products
- 10 Abattoir work/slaughtering
- 11 Training and grooming
- 12 Harvesting fish
- 13 Making/maintaining hives
- 14 Tending silkworms
- 15 Collecting eggs

#### **04 MANAGEMENT GRADES**

- 01 Brigadier
- 02 Deputy Brigadier/assistant supervisor
- 03 Entomologist
- 04 Mechanical engineer
- 05 Agronomist
- 06 Irrigation engineer
- 07 Electrical engineer
- 08 Accountant/finance officer
- 09 Planner
- 10 Director/deputy director

#### **05 SALINITY AND NATURAL SOIL DRAINAGE**

Note that these codes are for subjective assessment of the status of salinity and natural drainage in the field as it exists at the time of assessment. Objective criteria for assessment during 1996 will be given later.

	<b>SALINITY</b>	<b>SOIL DRAINAGE</b>
01	None	Very Rapid
02	Slight	Rapid
03	Moderate	Moderate
04	Severe	Imperfect
05	Very Severe	Very Imperfect

#### **06 CROP CODES**

##### **01 IRRIGATED CROPS**

- 01 Cereals
  - 01 Winter wheat
  - 02 Spring wheat



- 03 Winter barley
- 04 Spring barley
- 05 Oats
- 06 Rye
- 07 Maize grain
- 08 Rice
- 09 Other.....
- 10 *Sorghum*
- 11 *Triticale*
- 02 Fibres
  - 01 Cotton (upland, *G hirsutum*)
  - 02 Cotton (pima, *G barbadense*)
  - 03 Kenaf
  - 04 Other.....
- 03 Roots/tubers
  - 01 Potato
  - 02 Sugar beet
  - 03 Other.....
- 04 Cucurbits
  - 01 Pumpkin/squash
  - 02 Water melon
  - 03 Sweet melon
  - 04 Cucumber/gherkin
  - 05 Other.....

**06 CROP CODES CONTINUED....**

- 05 Grain Legumes
  - 01 Groundnut
  - 02 Pea (*Pisum sativa*)
  - 03 Common bean (*Phaseolus vulgaris*)
  - 04 Cowpea (*Vigna unguiculata*)
  - 05 Chickpea (*Cicer arietinum*)
  - 06 Lentil (*Lens esculenta*)
  - 07 Other pulses.....
  - 08 *Green gram, Mash* (*Phaseolus aureus*)
- 06 Vegetables
  - 01 Green leaf type
  - 02 Green herbs
  - 03 Onions (*dry/green*)
  - 04 Garlic
  - 05 Tomato
  - 06 Stem and root type
  - 07 Green maize
  - 08 Green peas/beans
  - 09 Sweet pepper
  - 10 Other.....
- 07 Oilseeds (grown for oil)
  - 01 Groundnut
  - 02 Sunflower
  - 03 Soyabean
  - 04 Rapeseed/mustard
  - 05 Safflower
  - 06 Other.....
- 08 Spices

- 01 Chilli pepper
- 02 Other.....
- 09 Field Fruit crops
  - 01 Strawberry
  - 02 Other.....
- 10 Forage crops
  - 01 Lucerne
  - 02 Silage maize
  - 03 Other silage.....
  - 04 Legume hay
  - 05 Grass hay
  - 06 Grazed pasture
  - 07 Root crops.....
  - 08 Other.....
- 11 Plantation crops
  - 01 Apples
  - 02 Pears
  - 03 Quince
  - 04 Apricot
  - 05 Peach
  - 06 Cherry
  - 07 Plum
  - 08 Persimmon
  - 09 Wine grape
  - 10 Table grape
  - 11 Mulberry
  - 12 Citrus
  - 13 Other fruit.....
  - 14 Walnut
  - 15 Pistachio nut
  - 16 Other nuts.....

**06 CROP CODES CONTINUED....**

- 17 Timber trees
- 18 Ornamental trees
- 19 Gardens
- 20 Other plantation crops.....
- 21 *Pomegranate*
- 20 NON-IRRIGATED CROPS
  - 01 Wheat
  - 02 Barley
  - 03 Grass for conserving
  - 04 Grass for grazing
  - 05 Other .....
  - 06 Other .....
  - 07 Other .....

**07 PRODUCTS FROM HARVEST**

- 01 Crop products:
  - 01 whole plants with grain, pods, stalks and perhaps roots
  - 02 whole green or fresh pods, cobs or fruit
  - 03 green leaves, stems or petioles

- 04 fresh roots, tubers, bulbs or corms
  - 05 dry roots, tubers
  - 06 dry stems, stalks, straw, haulms
  - 07 dry pods, cobs or ears with grain
  - 08 fresh grain, seeds (removed from ear or pod but undried)
  - 09 dry grain, seeds (removed from ear or pod)
  - 10 chaff, dry ears, cobs, pods without grain
  - 11 seed cotton
  - 12 processed lint, fibre
  - 13 processed oil
  - 14 processed sugar
  - 15 dried whole or powdered spice, herb
  - 16 poles, trunks, branches
  - 17 prepared timber
  - 18 flowers
  - 19 perfume
  - 20 nuts in shell and kernels
- 02 Livestock products:
- 01 fresh whole milk
  - 02 separated milk, whey
  - 03 butter, butter fat, cheese
  - 04 other milk products (eg yoghurt, powder)
  - 05 eggs
  - 06 chicks, young birds, young animals for rearing
  - 07 animals for traction, draught or other work
  - 08 live birds, animals for breeding, slaughter
  - 09 meat
  - 10 offal, bones
  - 11 dry skins, pelts
  - 12 wool, hair
  - 13 rendered fat, oil
  - 14 fish fry, fingerlings for rearing
  - 15 mature fish for market or breeding
  - 16 honey in comb, beeswax, jelly
  - 17 extracted honey
  - 18 silkworm cocoons
  - 19 animals, fish, birds for show, decoration, pets
  - 20 processed meat products

**08 IRRIGATION EQUIPMENT AND SYSTEM**

**01 ROTATING SPRINKLER SYSTEMS**

	Corner	system	Code
Frigate	N		01
		Y	02
Valley 600		N	03
		Y	04
Other.....	N		05
		Y	06

**02 LINEAR MOVE SPRINKLERS**

- 01 Dnjepr
- 02 Volzhanka
- 03 Cuban
- 04 DDA 100 MA
- 05 DDA 100

- 06 OKA-2
- 07 Raingun, local
- 08 Raingun, other
- 09 DOS-400
- 10 handmoved
- 11 Other.....

- 03 SOLID SET
  - 01 XID
  - 02 Other.....

04 LOCAL IRRIGATION SYSTEM

Code		Manual control		Computer control	
		- drippers - in-line	- drippers - on-line	- drippers - in-line	- drippers - on-line
01	Drip - local, gravity	Y	N	N	N
02		N	Y	N	N
03		N	N	Y	N
04		N	N	N	Y
05	Drip - local, pressurised	Y	N	N	N
06		N	Y	N	N
07		N	N	Y	N
08		N	N	N	Y
09	Drip - other, gravity	Y	N	N	N
10		N	Y	N	N
11		N	N	Y	N
12		N	N	N	Y
13	Drip - other, pressurised	Y	N	N	N
14		N	Y	N	N
15		N	N	Y	N
16		N	N	N	Y
17	Mini-sprinkler - local	Y		N	
18				N	
19	Mini-sprinkler - other	Y		N	
20			N		Y
21	Impulse system - local		Y		N
22			N		Y

	Impulse system - other	Y	N
23			
	.....	N	Y
24			
05	ALTERNATIVE SURFACE IRRIGATION		
01	Gated pipe, gravity		

**08 IRRIGATION AND EQUIPMENT CONTINUED.....**

02	Gated pipe, pumped
03	Siphon
04	Other.....
06	SUB-SURFACE IRRIGATION
01	With canals
02	With pipes
03	Other.....
07	OTHER NON-TRADITIONAL SYSTEMS
01	Combined irrigation
02	Other.....
08	TRADITIONAL SURFACE SYSTEMS
01	normal furrow
02	using plastic sheet
03	using siphons
04	using spiles
05	border strip
06	border furrow
07	basin (rice)
08	wild flooding
09	other.....

**09 SEED TREATMENT CODES**

01	none
02	at factory but method unknown
03	cold water soaking
04	pre-germination
05	hot water treatment
06	acid treatment
07	fungicide treatment
08	insecticide treatment
09	mixed chemical treatment

**10 AGRO-CHEMICALS AND BIOLOGICAL CONTROL**

01	<i>INORGANIC FERTILISERS</i>	<b>%N</b>	<b>%P<sub>2</sub>O<sub>5</sub></b>	<b>%K<sub>2</sub>O</b>
01	ammonium nitrate		33	
02	ammonium sulphate		21	
03	urea		46	
04	single superphosphate		19.5	
05	double superphosphate		34	
06	monoammonium phosphate (Amofos)	11	46	
07	diammonium phosphate	23	45	
08	potassium chloride			54
09	potassium sulphate			48
10	potassium nitrate		13	45
11	compound (give ratio)			
12	other.....			
13	<i>Glukanat (a mineral deposit with P)</i>			

02 *ORGANIC FERTILISERS*

- 01 fresh manure
- 02 dry manure
- 03 compost
- 04 poultry manure
- 05 factory waste
- 06 other.....

<b>Proprietary Name</b>	<b>Chemical Name</b>	<b>%A.I.</b>
<b>FORMULATION</b>		

03 *INSECTICIDES/ACARICIDES*

- 01 Frivo
- 02 Saparal
- 03 *Sumisidin*
- 04 Nurel D
- 05 Prep
- 06 ARPO
- 07 Ustex
- 08 TMTD
- 09 BI-58

10	Cimbush	
11	Nitrofen	
12	Aktellik	
13	Arvevo	
14	Dursban	
15	Dravin	
16		<i>Sulphur</i>
17	Fazalon	
18	Antio	
19	<i>Sevin</i>	<i>Carbaryl</i>
20	Thiodan	
21	Nissaran	
22	Summit Alfa	
23	Danitol	
24	Omaid	
25	Formalin	
26	Chlorax	
27	<i>Nuron</i>	
28	Decis	
29		Lime-Sulphur
30	Other.....	
31	Other.....	
32	Other.....	

**10 AGROCHEMICALS AND BIOLOGICAL CONTROL CONTINUED.....**

04	FUNGICIDES	
01		Sulphur
02	Beret	
03	Vitavax	
04	Topsin M	
05	Fundazol	
06	Apron	
06	Tkhan	
07	Other.....	
08	Other.....	
05	HERBICIDES	
01	Fuzilade	
02	Dalapon	
03	Treflan	Trifluralin
04	Tompil	
05	Agropur	
06	Dezarmon	
07		2,4-D
08	Prometryne 500	
WP		
09	Other.....	
10	Other.....	
06	DEFOLIANTS	
01		Magnesium chlorate
02	Drop-Ultra	
03	Other.....	

- 07 GROWTH REGULATORS
  - 01 Pix
  - 02 Other.....
  
- 08 OTHER CHEMICALS (details at present unknown)
  - 01
  - 02 SUMI-8
  - 03
  - 04
  - 05 UzTEX
  - 06 Tatril
  - 07 Kurpklan
  - 08
  - 09 Zero
  - 10 Kurkcin
  - 11 Kurakron
  - 12 Fastal
  - 13 Direbec
  - 14 Goldstar
  - 15 N616C16
  - 16 Tuzolim
  - 17 Polstar
  - 18 Cinmix
  - 19 Ammont
  - 20
  - 21 Riol
  - 22 Khumar
  - 23
  - 24 Gronozon
  - 25 Other.....

**10 AGROCHEMICALS AND BIOLOGICAL CONTROL CONTINUED.....**

- 09 BIOLOGICAL CONTROL
  - 01 Trichogramma
  - 02 Gabrabrachon
  - 03 Dendrobacillin
  - 04 Trap Ferolovyshka
  - 05 Other.....

**11 IRRIGATION CANAL TYPES**

- 01 Unlined earth canal
- 02 Lined canal with trapezoidal section
- 03 Canalette
- 04 Temporary field canal (large)
- 05 Temporary furrow to distribute within field



FORM NUMBER..23

FARM NUMBER.....

**Farm level record sheet for farming year 1 November 1996 to 31 October 1997. To be completed by 1 April 1997**

---

**01 GENERAL DETAILS OF FARM:**

01 Coordinates: 02 .....°.....' N; 03 .....°.....' E 04 Altitude .....m

05 Republic..... 06 Oblast.....

07 Rayon..... 08 Farm name.....

09 Total area.....ha 10 Area developed for irrigation:.....ha

11 Total number of houses/homes..... 12 Total resident population.....

**02 NAMES OF FARM STAFF:**

01 Director..... 02 Chief Agronomist.....

03 Chief Mechanic..... 04 Chief Accountant.....

05 Chief Irrigation Engineer.....

**03 MAIN ENTERPRISES OF THE FARM (give brief description):**

.....  
.....  
.....  
.....

**04 NEAREST METEOROLOGICAL STATION:**

01 Name and location.....

02 Distance from farm to nearest met station.....km

03 Height above ground of wind speed recorder.....m

**05 PIFAM STAFF (NAMES AND SIGNATURE):**

01 Senior Supervisor. ....

02 Supervisor.....

03 Enumerator.....

04 NWGCoordinator.....

**06 DATE OF COMPLETION OF FORM.....**

FORM NUMBER...24

FARM NUMBER.....

**Complete form as of 1 April 1997 with intended crop pattern for year Nov 1996 to Oct 1997**

Crop code seed	Area (ha)	% of irrigated area	- Expected markets for		
			free order	home market	family
01	02	03	04	05	06
07	08				

**01 IRRIGATED CROPPING PATTERN (Note: there may be double cropping in some fields)**

- 01 Cereals
  - 01
  - 02
  - 03
  - 04
  - 05
- 02 Fibres
  - 01
  - 02
  - 03
- 03 Roots/tubers
  - 01
  - 02
  - 03
- 04 Cucurbits
  - 01
  - 02
  - 03
- 05 Grain Legumes
  - 01
  - 02
  - 03
  - 04
  - 05
- 06 Vegetables
  - 01
  - 02
  - 03
  - 04
  - 05
  - 06
- 07 Oilseeds (grown for oil)
  - 01

- 02
- 08 Spices and herbs
  - 01
  - 02
- 09 Field Fruit crops
  - 01
  - 02
- 10 Forage crops
  - 01
  - 02
  - 03
  - 04
- 11 Plantation crops
  - 01
  - 02
  - 03
  - 04
  - 05
  - 06
  - 07
  - 08

FORM NUMBER...24 CONTINUED

FARM NUMBER.....

**Complete form as of 1 April 1997 with intended crop pattern for year Nov 1996 to Oct 1997**

Crop production (%) - consumption	Crop code seed	Area (ha)	- Expected markets for			
			% of irrigated area	state order	free market	home family
livestock	01 07	02	03	04	05	06

**02 NON-IRRIGATED CROPS**

- 01 X
- 02 X
- 03 X
- 04 X
- 05 X
- 06 X
- 07 X
- 08 X

**03 OTHER FORMS OF LANDUSE ON THE FARM**

- 01 Unused irrigable land X
- 02 Unused non-irrigable land X
- 03 Household plots X
- 04 Common land X
- (for non-agricultural staff) X
- 05 Land in buildings, roads, canals X

**04 TOTAL AREA OF FARM**

01	Gross area of farm		X
02	Gross irrigable area	X	
03	Net irrigable area		X
04	Net irrigated area		X
05	Net irrigated area double cropped in year		X

Indicate the present and intended employment of staff and labour on the farm in 1997

**05 LABOUR RESOURCES (IN EMPLOYMENT):**

Category	Men	Women	Total	Av salary (no.)	Ccy (no.)
no. /month unit	2	3	4	5	6
01 Management staff					
02 Brigadiers, Specialists					
03 Mechanics					
04 Drivers					
05 Labourers					
06 Seasonal workers *					
07 Others.....					
08 Total employees					
09 Extra required					
10 Non-resident employees	%	%			

(\* estimate number likely to be employed during peak requirement)

FORM NUMBER...25 FARM NUMBER.....  
**Farm level record sheet to be completed as of 1 April 1997**

**01 WATER SUPPLY AND WATER USE IN 1997**

01 Planned irrigated net area .....ha      02 Water applied for.....'000m<sup>3</sup>

03 Planned irrigations (main crops):      04 Water allocated.....'000m<sup>3</sup>  
     Crop name      Crop code      No. of irrigations

- 01.....
- 02.....
- 03.....
- 04.....
- 05.....

05 Number of canal off-takes on the farm:  
     01 off main canal.....      02 off inter-farm canal.....

06 Assumed irrigation efficiency (in decimal fraction):  
     01 Main canal conveyance.....

- 02 Secondary canal conveyance.....
- 03 Tertiary canal conveyance.....
- 04 Average field application.....

**02 VERTICAL DRAINAGE DURING PERIOD APRIL 1996 TO MARCH 1997:**

- 01 Number of wells on farm.....
- 02 Number of working wells on farm.....
- 03 Av working hours per well in month.....h
- 04 Av well yield ..... l/s
- 05 Total drained area on farm .....ha

**03 HORIZONTAL DRAINAGE DURING PERIOD APRIL 1996 TO MARCH 1997:**

- 01 Total drained area of farm (excluding vertical drainage) .....ha
  - 01 open drains.....ha
  - 02 subsurface .....ha
- 02 Total collector drain length on farm.....km
- 03 Of 02, what length is not working .....km
- 04 Total field drain length on farm.....km
  - 01 open drains .....km
  - 02 subsurface .....km
- 05 Of 04, what length is not working .....km
  - 01 open drains.....km
  - 02 subsurface .....km
- 06 Volume of water drained in year ..... '000m<sup>3</sup>
  - 01 total pumped but not used for irrigation ..... '000m<sup>3</sup>
  - 02 in total pumping-hours in year ..... h

FORM NUMBER..26

FARM NUMBER.....

**A farm level record sheet to record the situation as at 1 April 1997**

**USE OF INPUTS BY FARM**

**Local currency rate to US\$=.....**

Product (enter product code or name if code not in code book)	Units Required	Ordered in	Carry- in	Deliv- in	Price/ over	Price/ ered so	Details unit in	of		
		1997	1997	from	far this		local 1996	product month currency		
	8	9	10	1	2	3	4	5	6	7

**01 FERTILISERS**  
**%P<sub>2</sub>O<sub>5</sub> %K<sub>2</sub>O**

**(1)%N**

01 Inorganic fertilisers  
01  
02  
03  
04  
05  
06

02 Organic fertilisers  
01  
02  
03  
04

**02 PESTICIDES  
FORM**

**(2) %A I**

01 Insecticides  
01  
02  
03  
04  
05

02 Fungicides  
01  
02  
03

03 Herbicides  
01  
02  
03

04 Defoliantes  
01  
02  
03

05 Other  
01  
02  
03

**03 SEED  
Variety**

01  
02  
03  
04  
05  
06  
07  
08  
09  
10

Notes: (1) enter nutrient content in terms of pure N, P<sub>2</sub>O<sub>5</sub> and K<sub>2</sub>O not N, P and K  
(2) enter % active ingredient (A I) and formulation (FORM) using codes in codebook  
(3) if product is not in codebook write name on form and give details on back of sheet

FORM NUMBER..27

FARM NUMBER.....

**Complete form as at 1 April 1997 to indicate the status of existing farm machinery**

---

Comments	Enter machine code from the codebook	Total number	Number operating	---- Non-operational ---- no. repairable	no. derelict	
	1	2	3	4	5	6
<b>01</b>	<b>WHEELED TRACTORS</b>					
	01					
	02					
	03					
	04					
	05					
<b>02</b>	<b>TRACK-LAYING TRACTORS</b>					
	01					
	02					
	03					
	04					
<b>03</b>	<b>HARVESTER (SELF-PROPELLED)</b>					
	01					
	02					
	03					
<b>04</b>	<b>OTHER SELF-PROPELLED MACHINES</b>					
	01					
	02					
	03					
	04					
	05					
	06					
<b>05</b>	<b>IMPLEMENTS (MOUNTED, TOWED)</b>					
	01					
	02					
	03					
	04					
	05					
	06					
	07					
	08					
	09					
	10					
	11					
	12					
	13					
	14					
	15					
	16					
	17					
	18					
	19					
	20					
	21					
	22					
<b>06</b>	<b>OTHER MACHINES</b>					
	01					
	02					
	03					
	04					
	05					
	06					
	07					

08  
09  
10

FORM NUMBER...28 FARM NUMBER..... MONTH.....  
**To be completed as at 1 April 1997 to indicated actual or intended crop, and again thereafter whenever a crop is planted in a sample field**

---

**01 SELECTION OF SAMPLE FIELDS AND SAMPLE PLOTS:**

Field Basin number length (m)	Farm's code for field	Crop code	Date planted (or NP= not pltd)	Row-crop interrow spacing (cm)	Strip width (m)	Basin width	Row-crop row length (m)	Strip length (m)
01	02	03	04	05	06	07	08	09

01  
02  
03  
04  
05  
06  
07  
08  
09  
10

Extra fields if necessary:

11  
12

**01 SELECTION OF FIELDS AND SAMPLE PLOTS CONTINUED:**

Field number	Field area (ha)	Field slope (m/m)	Drainage code	Av journey distance from farm buildings (km)	----- Sample plots -----	Code	
11	12	13	14	15	-across plot- no. of rows width (m) length (m)	18 Irrigation method	19

01  
02  
03  
04  
05  
06  
07  
08  
09  
10

Extra fields if necessary:

11



**02 GIVE REASONS FOR SELECTION OF FIELDS ABOVE:**

.....

.....

.....

.....

(RECORD FIELDS ON FARM MAP AND MAKE SKETCH OF SELECTED FIELDS ON SHEETS PROVIDED)

FORM NUMBER...29 FARM NUMBER.....

**Please complete this record sheet as of 1 April 1997**

**01 LOCATION OF SAMPLE PLOTS IN SELECTED FIELDS:**

	Plot no.	1	1	2	2	3	3	4	4	5	5
	5	5									
Field no.		1	2	3	4	5	6	7	8	9	10
	11	12									

(give dimensions in m)

- 01
- 02
- 03
- 04
- 05
- 06
- 07
- 08
- 09
- 10

Extra fields if necessary:

- 11
- 12

**02 DETAILS OF FIELD CANAL SERVING THE SELECTED FIELDS**

Field no.	Type (code)	Av top width (cm)	Av bottom width (cm)	Av depth top to bottom	Distance from main canal	Av slope along field	Av supply to field canal	Hydraulic head to field		
no.	(code)	width (cm)	width (cm)	top to bottom	from main canal	along field	supply to field canal	field canal to		
furrow (cm)		01	02	03	04	05	06	07	08	09

- 01
- 02
- 03
- 04
- 05
- 06

07  
08  
09  
10

Extra fields if necessary:

11  
12

(If there is more than one field canal serving the field enter data under "11" and make note)

### 03 DETAILS OF FIELD DRAIN SYSTEM SERVING THE SELECTED FIELDS

Field no.	Average top width	Average bottom width	Average depth top to bottom (cm)	Distance from main drain (km)	Average slope along field (m/m)	Subsurface drains spacing (m)	Average depth (m)
01	02	03	04	05	06	07	08

01  
02  
03  
04  
05  
06  
07  
08  
09  
10

Extra fields if necessary:

11  
12

**(Monthly farm level record sheet. Please read notes before completion)**

**01 CLIMATE DATA FOR MONTH (FROM NEAREST MET STATION)**

Mean or m/sec	- Air temperature, deg C --					Rainfall	- Eo -		RH	Wind	Daily	
hours	total	maximum	minimum	mean	mean	month	month	%	speed	sun	total	
1	2	3	4	5	6	7	8	9	10	11		
01 mean						XXXXXXXXXXXXX						
02 total	XXXXXXXXXXXXXXXXXXXXX							XXXXXXXXXXXXX				

**02 EMPLOYMENT DURING MONTH**

01	Seasonal workers (numbers):	beginning	end
	01	02	03
	01 men (over 16)		
	02 women (over 16)		
	03 children (under 16)		
02	Major change in other categories from previous month (give details):.....		
.....			
.....			

**03 PLANTING/HARVESTING IN MONTH AND PURCHASE OF INPUTS IN MONTH**

Crop code	Area planted		Area harvested		Code		Purchased	
beginning	end	beginning	end	seed	fertiliser/	qty		
price paid*	ha	ha	ha	ha	agrochem	(give units)	local sum/kg	
01	02	03	04	05	06	07		08
09								
01					01			
02					02			
03					03			
04					04			
05					05			
06					06			
07					07			
08					08			
					*	Enter	exchange	rate to

US\$.....

**04 USE OF SEED, FERTILISER AND AGROCHEMICALS DURING MONTH**

Seed Qty	Units	Qty	Fertiliser	Units	Qty	Agrochemical	Unit
code	used		code	used		code	
used	01	02	03	04	05	06	07
							08
09							
01							
02							
03							
04							
05							
06							



**(Please read notes carefully before completing this form. Records required are units used in the whole sample field unless otherwise indicated)**

01 FIELD NO..... 02 CROP name.....code..... 03 Net area.....(ha)

**04 WATER APPLICATION**

Operation Duration of code irrigation	Dates	Water depth in canal (cm)	Float time for 10m (sec)	Flow rate by float (l/s)	Flow rate by weir (l/s)	Length of furrow/strip (m)	No. irrigated at same time (h)
	01	02	03	04	05 06	07	08

09  
01  
02  
03  
04

**05 ORGANIC FERTILISER**

Dates Type Quantity Intended  
code treatment rate  
(code)

(t) (t/ha)

10  
01  
02  
03  
04

**06 PLANTING/SOWING**

Dates	Var	Seedlings used (no.)	Seed sown (kg)	Intended sown (units/ha)	Seed rate
01	02	03	04	05	06 07 08 09

*Note: if a crop is being sown also complete form 28*

**07 INORGANIC FERTILISER**

Dates Fertiliser Qty Intended How  
How code applied rate applied  
applied (code)

(t) (kg/ha) (code)

10  
01  
02  
03  
04  
05

**08 AGRO-CHEMICALS**

Dates	Product	Application	Intended
name	liquid	product	rate
(code)	(l)	(kg)	(kg/ha)
01	02	03	04
05	06	07	08 09

**09 MACHINERY USE IN FIELD AND CROP**

Date	No. Tractor	Implement	No. units	Duration	Total	Labour with	Operation
	machine (no)	days code	code	working	(h/d)	machine-h	
01	02	03	04	05	06	07	08
		09					

01  
02  
03  
04

05  
06  
07  
08

**10 LABOUR USE (NOT WITH MACHINES)  
SUPERVISORS IN FIELD**

**11**

	Date	No.	Operation	Persons	Duration	Total	Date	Grade	Persons
	Total		days	code	(no.)	(h)	man-h		
	code	(no.)	(h)					01	02
	01	02	03	04	05	06			
03	04								
01							01		
02							02		
03							03		
04							04		
05							05		
06							06		
07							07		
08							08		
09							09		

**(Monthly field record sheet. Please read notes before completion)**

01 FIELD NO..... 02 CROP CODE.....

Plot number

01 CROP MEASUREMENTS (average) 01 02 03 04 05 av.  
record

**First half of month**

- 03 Height of crop (cm)
- 04 Rooting depth (cm)
- 05 No. flowers, ears, cobs/plant
- 06 No. of unopen bolls/plant (cotton only)
- 07 No. of open bolls /plant (cotton only)

**Second half of month**

- 08 Height of crop (cm)
- 09 Rooting depth (cm)
- 10 No. flowers, ears, cobs/plant
- 11 No. of unopen bolls/plant (cotton only)
- 12 No. of open bolls /plant (cotton only)

02 PLOT MEASUREMENTS Per Plot number Score for  
weed damage m or m<sup>2</sup> 01 02 03 04 05 av.

(0=none, 4=severe)

**In March only**

- 13 No. of plants  
X
- 14 No. of weeds

**In June only**

- 15 No. of plants  
X
- 16 No. of weeds

**In October only**

- 17 No. of plants  
X
- 18 No. of weeds

**03 PESTS AND DISEASES**

Name of pest Date E=Eggs Score  
Action

crop or disease first L=Larvae for  
 (use noticed N=Nymphs damage  
 farm  
 0=none operation A=Adults  
 4=severe code) F=Fungus  
 B=Bacterium  
 V=Virus  
 01 02 03  
 04 05  
 19 .....  
 20 .....  
 21 .....  
 22 .....

FORM NUMBER..33 FARM NUMBER.....  
 MONTH.....

**(Monthly field record sheet. Please read notes before completion)**

01 FIELD NO..... 02 CROP CODE.....

**03 GROUNDWATER MEASUREMENTS**

Value Date of  
 record  
 01 02  
 x

**01 Plot chosen as representative**

**02 1st week of month**

- 01 Depth of watertable (cm)
- on water sample:*
- 02 Temperature (deg C)
- 03 Electrical conductivity (dS/m)
- 04 pH
- 05 Redox potential (mV)

**03 3rd week of month**

- 01 Depth of watertable (cm)
- on water sample:*
- 02 Temperature (deg C)
- 03 Electrical conductivity (dS/m)
- 04 pH
- 05 Redox potential (mV)

**04 WATER IN FIELD CANAL FOR IRRIGATION**

Canal 1 Canal 2  
 Canal 3 Av  
 01 02  
 03 04



- 01 Date of sample  
*on water sample immediately from canal:*
- 02 Temperature (deg C)
- 03 Electrical conductivity (dS/m)
- 04 pH
- 05 Redox potential (mV)

**05 WATER IN FIELD DRAIN (IF THERE IS ONE)**

	Before irrigation	After
irrigation	01	02
01 Date of sample <i>on water sample immediately from canal:</i>		
02 Temperature (deg C)		
03 Electrical conductivity (dS/m)		
04 pH		
05 Redox potential (mV)		

FORM NUMBER..34

FARM NUMBER.....

HARVEST RECORD SHEET - 01 FIELD NO..... 02 CROP CODE.....

CROP

NAME.....

**03 HARVEST OF SAMPLE PLOTS**

**NOTE** - PLOT size is smaller this year: for row crops 2rows x 10 along row; for other crops 3m x 3m. Please harvest the five sample PLOTS in the sample field by HAND immediately before the farm staff harvest the whole sample field. With great care, weigh the produce from each sample plot using the scale provided. If more than one harvest is taken, for example, as with cotton, tomatoes, green maize cobs from a crop of forage maize, etc, then record weights, product code and date on separate rows of the table below. Retain the sheet if more harvests are expected and submit it after final harvest; for lucerne after say 3 harvest. At any one harvest, if more than one weighing from the plot is necessary, then record the weight of each on separate paper, add these weights and enter only the total for the plot in the table below. At harvest time record the weight of the whole product being harvested, for example seed cotton, wheat straw with ears and grain together, whole groundnut plants with pods. If the crop has a recordable bi-product, such as the straw from wheat or haulms from a legume crop, then arrange to thresh the heads, winnow the grain and weigh the components separately.

01 Width of plot across field or rows .....m

02 Length of plot down field or along rows .....m

		Plot number			
Product	Date of Item	01	02	03	04
05	code harvest				
	00	01	02	03	04
05	06 07				

**Weight of material harvested in field (kg):**

- 03 first harvest
- 04 second harvest
- 05 third harvest
- 06 fourth harvest
- 07 fifth harvest

**Total weight of products after processing (kg):**

- 08 main product
- 09 first bi-product
- 10 second bi-product

**04 HARVEST OF WHOLE SAMPLE FIELD**

**NOTE** - When the five sample plots have been cleared and weighed only then may the farm staff harvest the whole sample field. Try to measure the production from the whole field with accuracy, by using the farm weighbridge, counting the number of bags, estimating from the volume in the trailer/lorry, etc. In the case of some crops record also the production of the bi-product, straw from wheat for example which may be estimated from the number of bales if the straw is baled, or by weighing a sample

length of windrow from the combine and measuring the total length of windrow in the field. Please submit any separate weighings and calculations which you did on a separate sheet.

01 Net area harvested.....ha

Item production (t)	Date	Method of harvest (code)					Total main product
		opera- tion	machine	imple- ment			
bi-products first second third							
07 00 08	01	02	03	04	05	06	

- 02 First harvest
- 03 Second harvest
- 04 Third harvest
- 05 Fourth harvest
- 06 Fifth harvest
- 07 Total after processing
- 08

## NOTES ON COMPLETION OF THE FARM DATA COLLECTION SHEETS

*Note: changes to the April 1996 edition are indicated in italics.*

### Introduction

*This second edition of notes is intended for use after April 1997 when it replaces the first edition of April 1996. These notes are for the benefit of the members of the national working groups, the supervisors and the enumerators involved in the Pilot Farm Monitoring Programme PIFAM (formerly Water Use and Farm Management Survey) being conducted through 1997 by WARMAP. The 1996 survey of the 36 farms in the Aral Sea basin has been completed and the results will be published soon. For 1997, the number of farms has been reduced to 22 on the basis of suitability as pilot projects and five have been nominated as being pilot farms for the first round of implementation. The outstanding field equipment will be distributed during the spring of 1997 and instruction on its use will be given during the PIFAM seminar in Tashkent during February 1997.*

*The codebook which follows these notes is very important as codes are now required for almost all sections in monthly record sheets. Please take great care in selecting the code and that you have used the full code (all the digits) for the item or operation. It is now unlikely that you will be unable to find the code you need so please look until you find the code that most suits: the exception may be with agrochemicals for which an exhaustive list of those available and their characteristics is not known to us. As before, should you be unable to find a suitable code then write a note on the front or back of the sheet to give us full details.*

*The record sheets which accompany these notes are of four types:*

- 1. farm level records to describe the situation on the whole farm as at 1 April 1997, the start of the main season, (nos 23-29),*
- 2. monthly farm level record sheet to describe activities and changes in resources on a monthly basis (no 30),*
- 3. forms mostly to record monthly base data relating to characteristics of the ten fields selected for intensive study on each farm (nos 31-34),*
- 4. forms for recording met data and a log of daily water balance in fields for irrigation scheduling (35-36).*

*Type 1 forms should be completed as soon as possible after 1 April 1997 and sent to Tashkent. Other types of form should be completed by the end of each month from April 1997 onwards and sent to Tashkent, with a copy to your NWG Coordinator, not later than three days later. In order to make this possible, it is important that monthly record sheets are completed **on a daily basis** so that at the end of the month you can post them without delay. A copy of all completed forms should be posted to the RWG and addressed to:*

*700 000 Uzbekistan  
Tashkent  
Central Post Office Box No. 4240  
Coordinator of RWG, PIFAM*

*In any section of a record sheet, if there are insufficient rows to record all the data during the month then use a second sheet and mark it at the top as such. If you are*

*unable to get the data enter "na" for "not available" or "not appropriate" but if the value is zero please enter "0". UNDER NO CIRCUMSTANCES LEAVE BLANKS: any blanks, nonsense data, fabricated data or lack of necessary effort to obtain data, will result in the form not being accept and no payment for the month.*

### **The Sample Fields on each Farm**

*For the 1997 season, the sample fields and plots should be the same even though change in the crop may no longer reflect the cropping pattern of the farm, which was the basis of their selection in 1996. In the event of a serious problem with the field, (for example, it will not be planted or it will be divided by two crops) then it will be necessary to relocate it as close as possible to the original field. In this event please follow the instructions of April 1996 and submit details of the field and sample plots on form 28, give reasons for the changes and a sketch plan with measured distances.*

Although there is considerable variation in the size of farms which would justify variable numbers of sample fields to reflect the farm size, this would create different work loads for the Supervisors and Enumerators. For this reason it is proposed to standardise the number of sample fields to 10 per farm. The selection of the fields should in the first instance reflect the cropping pattern.

**For example**, if the whole farm is irrigated and there are only three crops, cotton, wheat and lucerne, which account for 90 percent or more of irrigated land use, and their cultivated areas are respectively 47, 32, and 18 percent of irrigated area, then the number of fields should be 4.7, 3.2 and 1.8 respectively, or when rounded, should be 5, 3 and 2 respectively (total 10).

As **another example**, if the cropping is 13 percent irrigated winter wheat, 29 percent rainfed spring wheat, 23 percent irrigated table grapes, 19 percent rainfed apples and 9 percent dryland walnuts, the number of fields would be 1, 3, 2, 2 and 1 respectively (total 9 fields). This requires the choice of one more field which requires judgement. One basis might be to locate the extra field in a part of the farm which, for example, has a high watertable and drainage problem and is used for pasture. On another farm there might be a salinity problem justifying the location of the extra field there. Another approach might be to ask the management if they plan to increase the area of any crop: let us suppose that the reply is to increase production of irrigated winter wheat, then the number of fields of this crop could be increased from 1 to 2.

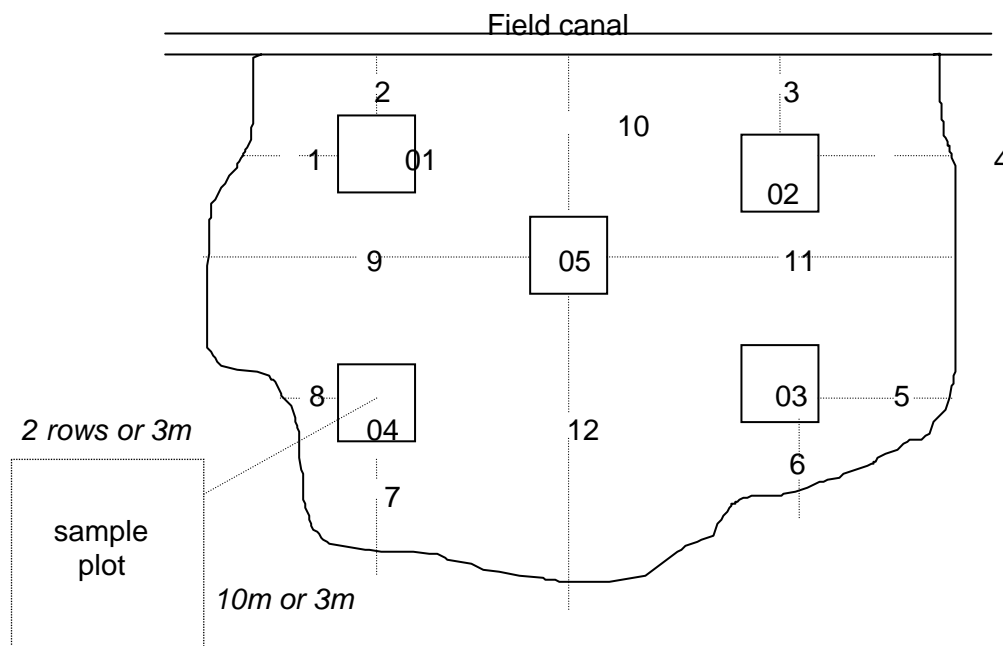
There is considerable variation in the size of fields and even the concept of a "field" is difficult to define. For our purposes, a "field" is a unit of land, probably between 5 and 20 ha in size, which is uniform as far as it is possible to judge in regard to physical characteristics (slope, soil type, shading by trees, irrigation supply and drainage). In addition it will be regarded as a single unit by the farm management in that all farm operations on the field and on the crop in the field will be conducted at the same time: land preparation, irrigation, leaching, planting, weed control, spraying, harvesting. It will have a field canal along one side and may be subdivided into subunits by irrigation furrows made after planting of the crop. It **may or may not** be supplied with a drainage system and be surrounded by the same crop or a different crop. If the crop is already planted at the time of field selection, ideally the crop in the field will be visibly uniform; if not, then look for another field.

## Selection of Sample Plots in the Sample Fields

The figure below shows what might be a typical selected irrigated field (generally they may be more regular in shape than this). You have to locate and mark out 5 sample plots in this field and this should be done as soon as possible after planting. The objective is to mark out sample plots towards each corner and one in the centre as shown in the figure; this layout will measure trends down the row, across the rows, and centrality. To do so you will need 20 short stakes about 40 cm long cut from a coppice and a tape measure. The stakes should be sharpened at one end and the other end painted white. *Use the tape measure supplied.*

If the crop is planted in rows (say 90 cm apart; eg cotton) drive a stake in the row as the first corner, then count 10 rows across the field and at right angles drive in the second stake. A right-angle can be obtained by marking 4m along the row and 3m across the row and the hypoteneuse should be adjusted to 5m (8m, 6m and 10m gives a more accurate right-angle, etc). Down the row each side measure 10m and drive in the other corner posts. You have marked out a plot 10 rows (9m) by 10m. Don't forget to record the interrow spacing on the record sheet. The reason for placing the stakes in the crop row is to avoid interrow cultivators.

*If the crop is broadcast or planted in narrow rows (eg wheat, lucerne) then mark out a plot 3m x 3m. If the crop is in wide rows mark out a plot of 2 rows by 10m along the rows. The important thing is to record on the sheet what you have done. Make a sketch map of the field and the location of the sample plots on the sheet provided.*



The distances numbered [1] to [12] in the figure should be measured and recorded on your sketch. In addition please enter the dimensions in the appropriate boxes on the record sheet. Notice that the numbering pattern is clockwise so make sure that you have them in the correct order. If you do not have a long tape measure, say so on the record sheet and wait for the supply of the tape measure from the project. *Note that [9] + [11] + 2 or 3 = central width of field in m, and [10] + [12] + 3 or 10 = row length in centre of field in m (depending on plot size).* Measure the area of the field with accuracy and record it. If it is irregular, then sketch the field, sub-divide it

into more or less regular shaped parts, measure the area of each and add the components.

These sample plots have now been marked permanently for the rest of the season until harvest or until October, whichever is earlier. Many measurements will be taken from these plots during the season.

### **Daily water balance and irrigation scheduling**

There are three different approaches to irrigation scheduling:

- the traditional local system based on gravimetric recording of soil moisture content,
- devices which record soil moisture suction pressure directly, eg tensiometers,
- calculating residual soil moisture from daily evaporation.

The last of these three methods is the one to be described here. Forms 35 and 36 are provided for recording the data and completing the calculations but please note that it is a daily process for each farm and the farm assistant should be trained in order to help.

### **Installing the evaporimeter**

Daily evaporation from an open water surface is measured in an evaporation pan. These have been made locally to the specifications of the USDA Class A pan and all farms (except the two extra in Kyrgistan) have been supplied with one.

Choose a site not too far from the assistant's house and preferably with a water source close by. It should be sufficiently far from trees and buildings that they do not cast a shadow over the site except within half an hour of sunrise and sunset. The site should be open to the direction of the prevailing wind during the irrigation season.

The pan needs to be mounted 200mm above the general ground level and the best way to do this is to build a circular wall of this height using bricks or blocks fixed by mortar. The diameter of the pan is 1.2m so the diameter of the wall should be 1.5m. The interior space of the wall should be filled with coarse sand or gravel with care to obtain an horizontal surface on which to place the pan. Fill the pan with **clean** water to about 50mm from the lip of the pan and check that it is still horizontal with a spirit level. You will need to change the water periodically when it has become green or leaves have accumulated, and the inside of the pan should be cleaned before refilling with clean water.

Variation in water level is normally measured by a vernier screw with a hook on the bottom inside a stilling well, to minimise waves caused by wind. We have ordered a rain gauge, an hook gauge and stilling well from Europe but they will not now arrive until September 1996. Meanwhile please fix a 300mm plastic ruler vertically to the side of the pan using a clip or clothes peg. Mount the ruler with 300mm at the top and 0mm at the bottom. Do not move the ruler once it is fixed in place.

When the water level has fallen by about 30mm (about 5 days in summer) after reading the level you will need to add more water to the original level, about 50 mm below the lip. During heavy rain the water level may rise so that you must bale some out after recording the level.

## Farm Level Record Sheets

### FORM NUMBER 23

#### 01 GENERAL DETAILS OF FARM:

01-03 Geographical co-ordinates of farm - enter the degrees and minutes north and east of the centre of the farm.

04 Altitude in m above mean sea level at the centre of the farm.

05-08 Enter names

09 Farm area - enter the **total** area of the farm in ha.

10 Area developed for irrigation - enter the area in ha which has been developed for irrigation even though some may not be cultivated during 1997 for some reason.

11 Number of homes - enter the total number of houses or apartments providing homes for residents on the farm.

12 Total residents - enter the total resident population including children and those people who do not work on the farm but who live there.

#### 02 NAMES OF FARM STAFF:

01-05 Enter names

#### 03 MAIN ENTERPRISES ON THE FARM:

*Briefly describe the crop, livestock, agro-processing or any other type of enterprise on the farm, such as shop, guest house.*

#### 04 NEAREST METEOROLOGICAL STATION:

01-03 Give details.

#### 05 PIFAM STAFF:

01-04 Enter names and get signatures.

#### 06 ENTER DATE

### FORM NUMBER 24

#### 01 IRRIGATED CROPPING PATTERN:

*List the irrigated crops using the crop codes in the codebook and for each one, enter the area in ha and the percentage of the net irrigated area that this represents. Using percentages, ask the farm director for an estimate of how the production from these crops is expected to be disposed of under the headings in the table.*

#### 02 NON-IRRIGATED CROPS

*List the non-irrigated crops on the farm, if any, with the net area of each.*

#### 03 OTHER FORMS OF LANDUSE ON THE FARM:

*Enter the areas of other forms of landuse, noting that **irrigable** means the area which has been planned and developed for irrigation and **irrigated** is the area which is expected to be used for irrigated cropping this season. The*



reasons for the difference may be soil salinity, damage to a canal or shortage of water.

- 04 **TOTAL AREA OF FARM:**  
*Enter total areas again noting the difference between irrigable and irrigated as in 03, and the difference between gross area and net area. Note the net area of irrigated land which it is expected will have more than one crop during the year November 1996 to October 1997.*
- 05 **LABOUR RESOURCES EMPLOYED ON FARM:**  
*Enter the number of employed staff and labour by category and their average salary in local currency.*

#### FORM NUMBER 25

- 01 **WATER SUPPLY AND WATER USE IN 1997:**  
*These questions relate mainly to planned use of water on the farm during the main season.*
- 02 **VERTICAL DRAINAGE DURING APRIL 1996 TO MARCH 1997:**  
*This section summarises the performance of any vertical drainage on the farm during the last 12 months*
- 03 **HORIZONTAL DRAINAGE DURING APRIL 1996 TO MARCH 1997:**  
*This section summarises the performance of horizontal drainage on the farm in the past 12 months.*

#### FORM NUMBER 26

*This form summarises the requirement and availability of seeds and agro-chemicals just before the main planting season begins. Enter the current exchange rate of your currency against the US dollar in the space at the top.*

- 01 **FERTILISERS:**  
*Using the codes in the codebook, list the inorganic and organic fertilisers available and expected to be used on the farm. Take care that the nutrient content corresponds closely with those shown in the codebook and write the values in columns 8-10. Note that P is 44% of  $P_2 O_5$  and K is 83% of  $K_2 O$ . Organic fertilisers are important to the nutrient balance given the shortage of mineral fertilisers in the area. Note that most animal manures are stacked for some time before use and that during this period much of the N is lost by volatilisation and leaching by rain. Use your judgement from the average composition given in the codebook but note that most will be closest to "dry manure".*
- 02 **PESTICIDES:**  
*Refer to the list of pesticides in the codebook which have been recorded as being used in the area. Check carefully by looking at the label on the container that both the concentration of active ingredient and the formulation are correct before using the code on the form. If the product is not listed in the code book, make a note on the form of the name and its details.*
- 03 **SEED:**

List the seeds of the main crop types which are to be planted by crop code from the codebook. If the variety of the seed is known, write this on the form.

#### FORM NUMBER 27

This form is unchanged since last year excepting that the machines names are replaced by your entry of the machine codes form the codebook.

#### FORM NUMBER 28

Note that the columns have been changed since last season.

##### 01 SELECTION OF SAMPLE FIELDS AND SAMPLE PLOTS:

In column 02 enter the name, number or code which the farm uses to identify the sample field so that we have a permanent record of the location. Use the codebook to enter the crop code in column 03 and the date it wa planted in column 04: write NP if it has not yet been planted. Give the average dimensions in columns 05 to 10 of the furrows, strips or basins in the sample field which will be irrigated. In columns 11 to 13 enter the field area, average slope and drainage class using the drainage codes in the codebook. The average journey distance to be entered in column 14 is so that we can get some idea of how far the farm tractors will travel to and from the field from their normal place of origin: the driver's home, the machinery pool, the farm workshop, etc. Give the new dimensions of the sample plots in columns 15 to 17 and use the irrigation codes in the codebook to enter the intended method of irrigation.

##### 02 REASONS FOR CHOOSING THE SAMPLE FIELDS

Please repeat your reasons for choosing the sample fields particularly noting any changes sinse last year.

#### FORM NUMBER 29

This form is unchanged from last year except that slope is to be recorded in m/m.

### **Field Level Record Sheets**

#### FORM NUMBER 30

This form is provided for you to be able to record some of the monthly changes which happen at farm level. Various earlier forms enabled you to record the situation on the farm as of 1 April 1997, the start of the main planting season. A copy of this form for each farm should be posted to the NWG and RWG at the end of each month.

##### 01 CLIMATE DATA

This requires a visit or telephone call to your nearest meteorological station for mean and total values of climate data for the month. *The absolute lowest and highest and the monthly mean minimum and maximum temperatures during the month are required (columns 3-6), together with the mean daily*

*temperatures column 02. Total rainfall and open water evaporation (Eo) for the month are recorded in columns 07 and 08. The monthly mean of the daily mean relative humidity (RH) is entered in column 09, and likewise the monthly means of average daily wind speed and actual sunshine hours in columns 11 and 12, if these are available.*

02 EMPLOYMENT DURING THE MONTH

This section is for recording any significant changes in the pattern of employment on the farm which may have occurred during the month and since you completed form 24. This is most likely to be in the category of seasonal workers so here the numbers at the start and the end of the month are required. Part 02 gives space for you to comment on any other significant changes you hear about.

03 PLANTING AND HARVESTING AND PURCHASE OF INPUTS DURING MONTH

This section is for recording the progress with planting and harvesting of crops during the month: enter the total areas of each both at the start and the end of the month. There is space for up to 8 main crops. If you wish to record details of more crops then open a second record sheet for the month and note that it is so at the top. With crops such as cotton and tomatoes with sequential harvesting (at least when harvested by hand) then record the area which has been harvested at least once during the month: the total over the months will be greater than area planted but will indicate the number of times the crop is picked. For example, if 20 ha of tomatoes were planted but the total of all harvested area is 70 ha then the crop has been picked on average 3.5 times. *Enter the codes for seed, fertiliser and agrochemicals purchased during the month in columns 06 and 07, taking care to enter the units in column 08. Use local currency per kg to give the purchase price in column 09 and enter the current exchange rate per US dollar in the space below.*

04 USE OF SEED, FERTILISER AND AGRO-CHEMICALS DURING MONTH

This section is for recording the farm's use of seed, fertiliser and agrochemicals during the month and is a supplement to form 26. Enter the quantity (with units) of seeds, fertilisers, pesticides and other chemicals used on the crops of the farm during the month against the code for each product from the codebook. We are not asking for the data broken down by crop but the monthly net withdrawal of products from the stores for use on the farm.

05 USE OF IRRIGATION WATER DURING MONTH

This section is to record the overall use of irrigation water by the farm during the month and is designed to be recorded by decad (note that the third decad may have 10 or 11 days depending on the month). The water received will be derived by measurements of flow rates into the farm from the main supply canals (01), by the total of drainage water from vertical wells used for irrigation (02) and from collectors (03). The area irrigated (04) is the total area of all fields on the farm that have received irrigation during the month and includes double the area of any fields which have been irrigated twice during the month.

06 *PLANTING OR HARVESTING OF SAMPLE FIELDS DURING THE MONTH*  
*Mark fields which have been either planted or harvested during the month.*

## FORM NUMBER 31

*This is a monthly record sheet for each sample field. Please post 10 forms for each farm to both the NWG and the RWG at the end of the month. It is provided for recording operations and use of inputs in the fields and on the crops being monitored. It is intended to be an all-purpose form but does NOT cover the following:*

- harvesting of the crop
- measurements on the crop and soil
- the sampling schedule
- records on the canals and drains and structures or meteorological data
- regular records at farm level.

These matters are dealt with elsewhere.

*Open a new form for each field each month. Please check that all the details about field number, crop and area are completed.*

### 04 WATER APPLICATION IN FIELD DURING THE MONTH

This section is for recording the leaching and irrigation water applications. There is space to enter up to four separate applications in the month. If you have installed a gauging weir in the supply canal *or field* canal then calculate the discharge rate and enter it under column 06. For routine recording of canal flow, cut a measuring stick and using the tape measure, cut or paint marks at 1cm, 5cm and 10cm intervals. Use the measuring stick to record under column 03 the average depth of flow along 10m of the canal which you have measured and marked with the tape measure. Drop a stick or straw onto the surface of the flow above the first mark and note the time it takes to float the 10m; repeat several times and record the average time under column 04. *Calculate the discharge rate in the canal by the method shown in the attached Appendix A and enter the value under column 05.*

### 05 USE OF ORGANIC FERTILISER IN FIELD DURING THE MONTH

Record the use of organic fertiliser in the field in this section. If application takes place over more than one day then enter the range of dates under column 01. Refer to the codebook to enter the code under column 02 for the type of fertiliser being applied. In column 03 you are required to record the actual quantity being applied to the field (not per ha). You should note the quantity being brought to the field and any surplus taken away. In the case of manure this may be difficult, but consult the farm staff for an estimate of the quantity which the trailer or lorry can carry. If necessary estimate the volume of the organic fertiliser and record that with a note to explain what you have done and the units. Column 04 is only to record the rate that the farm **intends** to apply and this should be obtained from the Brigadier, Agronomist or the Manager. Do NOT calculate the rate from column 03 and the field area as we will do that later by computer.

### 06 USE OF SEEDS AND SEEDLINGS IN FIELD DURING THE MONTH

This section is for recording details of the seed used for planting *and transplanting of seedlings*. Ask the Brigadier for details of the type and variety of seed being used and any pre-treatment which it has received. Write in words the type or variety of the crop being sown in column 06. *Use the codebook to describe any pre-treatment given to the seed or seedlings in column 10. Column 07 allows you to record the number of seedlings, bulbs,*

tubers or saplings being sown if this is based on numbers rather than weight. Columns 08 and 09 are completed in the same manner as columns 03 and 04 except that it should be possible to assess the exact weight of seed used in this field, if necessary by weighing it before it goes into the hoppers, or by weighing the quantity need to refill the hoppers after sowing is complete.

07 **USE OF INORGANIC FERTILISER IN MONTH**

*This section is for recording the use of inorganic fertiliser. Enter the date or dates of the application under column 01. As with seed, note the quantity brought to the field and the residue taken away and record the quantity used in the field under columns 03. Only enter the farm's **intended (not "norm")** rate in column 04. If the fertiliser is applied through a combination seed drill or a separate fertiliser distributor this will reflect in the implement code used under section 09 but use the same machine code here in column 05. If it is applied by hand, by air or through the irrigation water use the code in column 05 which may be found in Section 2.7 on page 4 of the codebook at the end of "machine codes". Any machine code will appear again in section 9.*

08 **USE OF AGROCHEMICALS**

*This section is for recording the use of all agro-chemicals (except fertiliser). This year we provide a list of possible products at the end of the codebook, as yet incomplete in details. Before entering the code in column 07, consult the bottle or packet label in order to check the type and use, the **SCIENTIFIC** name and the **PERCENTAGE OF ACTIVE INGREDIENT**, which is more useful than the proprietary name. If the pesticide is liquid then note the quantity used in the field in litres in column 08, otherwise in kg under column 09. It may have been pre-mixed with water and brought to the field in a bowser so two sets of machines will be entered in section 09 and you will need to calculate the net quantity of the product actually applied in the field by obtaining the rate of dilution in water and the amount of the mixture used in the field. As with seed, do **NOT** calculate the rate of application as we will do this, but ask the management for their **intended** rate and enter this under column 10. Under column 11 record the method of application using the machine code or other codes as in section 07 above, noting that any machine code will be used again in section 9.*

09 **MACHINERY USE IN FIELD AND CROP**

*This section is for recording details of the use of machines in the field for the direct benefit of the crop: we want the total number of machine-hours for each machine in the field during the month. The 8 rows may be used either for different operations on the same day or different days or different operations. If the operation takes place over two or more days, then either record it on separate lines OR better, enter a range of dates and in column 2 note the number of days that machines are working in the field. Column 03 is for recording the code of the tractor used **or any other self-propelled machine**. Refer again to the codebook under "implements" to select the code for the implement which the tractor or other vehicle is using: if necessary use the next line if the same tractor uses more than one implement at the same time. Record the number of machines of each type working at the same time in column 05. Make a note of the time in hours from the arrival of the machines at the field to the time of departure from the field, including therefore any idle or "downtime" while in the field. You might care to record the reasons for any idle or downtime if this is protracted: eg "plough broken", "puncture", "run out of fuel", "raining", etc. Enter the average hours of work per day in column 06*

and then multiply the values in columns 02 x 05 x 06 to calculate the total machine hours in the field for the date(s) shown. Under column 08, enter the number of people who came with the machine as driver, mechanic, operator, assistant, etc. but not those who simply got a ride to the field in order to do field work (which is entered below under "Labour use"). Use a code to describe the nature of the operation under column 09, by reference to the operation codes in the codebook.

10 **USE OF GENERAL LABOUR ON THE CROP BUT NOT WITH THE MACHINE**

*This section is for recording the use of general field labour and **not** workers associated directly with a machine. As above use column 02 to record the days of work against the operation code in column 03. The number of persons should be recorded under column 04 and the duration of the work under column 05. If people come and go during the day, then keep notes on a separate sheet and enter net total values in columns 04 and 05. Multiply columns 02 x 04 x 05 and enter the total manhours in column 06.*

11 **TIME SPENT BY SUPERVISORS IN THE FIELD**

*The time spent by Brigadiers and Agronomists (management staff) should be recorded in this section. This may prove difficult if the supervisor comes and goes during the day: either try to record it or at least ask them how many hours they spent at that field. Refer to the codebook for the codes of different personnel.*

**FORM NUMBER 32**

*This is a monthly record sheet for each sample field on the farm. Please post 10 forms for each farm to both the NWG and the RWG at the end of the month. It is provided for the regular recording of measurements made on the growing crop at the five sample plots in each of the selected sample fields on the farm. These measurements require only a soil auger and a tape measure, which you should have available.*

- 01 Record your number for the sample field, and  
02 the code for the crop from the codebook.

01 **CROP MEASUREMENTS**

*This section is for recording measurements on the growing crop in each of the five sample plots. Please record the actual date in the month that you make the measurement and note that you should aim to record the data at about two-weekly intervals, in the first and second halves of the month.*

03 With the tape measure, or a measuring stick with painted marks, stand in the centre of the plot and judge the average height of the crop in cm.

04 Using the soil auger, make a bore immediately below an average plant. Carefully remove the soil cores and examine them for fresh roots and note the depth at which the last root is seen. The first point is that to make too many auger bores in the plot will affect the yield in the plot so choose points just outside it. The second point is that this is not an exact science and you may miss the deepest roots, so take note of the values recorded previously. If the latest one is less than previously, repeat the bore and decide whether or not the previous or the latest value is the more representative. The third point

is to note the presence of an indurated layer which would restrict root development to less than would be expected: this may be a plough-pan, hard rock, gravel or a gypsic horizon. If the watertable is consistently close to the surface this too may limit rooting depth.

05 Count the number of flowers on 10 plants in a row chosen at random say in the centre row of the sample plot. Divide the value by 10 in order to record the average number per plant. With cotton, this is straightforward but count flowers as open flowers and not green buds or bolls. With maize, record the number of cobs, and with wheat, barley, etc record the number of ears per plant taking care to distinguish between individual plants and tillers. With crops which are close-drilled or broadcast, measure a square metre on the ground, count the number of plants and flowers/ears if possible, and calculate the average. With many crops it will not be possible to record the number of flowers as they are too many, lucerne for example: in this case enter "many". If there are no flowers, cobs or ears, enter "none".

06 In the case of cotton, please count the number of bolls on a random row of ten plants in the plot. A "boll" for this purpose will be the total number of unopened bolls from immediately after flowering to bursting.

07 Also in the case of cotton, please record the number of open bolls, including any from which the fibre has already been harvested.

08-12 This is the same sequence of records but to be measured in the second half of the month about two weeks after the records in 03-07.

## 02 PLOT MEASUREMENTS

13 This entry is for the month of *March* only. For row crops, count the number of plants in a 10m row and divide by 10 to get the average number per m (record the unit as /m as well as the average). For close-drilled and broadcast crops, mark out a one metre square and count the plants in it. Do this several times and record the average, noting the value to be /m<sup>2</sup>. Distinguish between individual plants and tillers or side-branches on individual plants: we want only the number of plants.

14 This entry also is for the month of *March*. Estimate the number of weeds per square metre whether or not the row crop is clean-weeded between the rows. Count major weeds but ignore very small weeds. If weeds with rhizomes or stolons are present, treat each well-rooted plantlet as a separate weed even if still attached to the parent plant.

*15 and 17 Repeat the count of plant population again in June and October. If there is a difference from the value in 13, then please give reasons unless the reason is a change in crop (which we will note from other forms).*

*16 and 18 Repeat the count of weeds again in June and October. The value is likely to be greater than in March unless the field has been weeded. A new column has been added for you to assess the severity of weed competition with the crop: 0 is none and 4 is most severe.*

## 03 PESTS AND DISEASES

The next section is for recording the arrival and severity of pests and diseases attacking the crop. You will need to get the advice of the farm agronomist or entomologist/pathologist in order to complete this section. The

pests will be one of the following groups: insects, molluscs, arachnids, birds or rodents (or in exceptional cases, nematodes). The appearance of disease may be more difficult to identify but again try to recognise whether the disease is a fungus, bacterium or virus.

Col 1 Try to obtain the scientific name in Latin but failing that write in the local name in Russian. Write in the names in the spaces provided.

Col 2 Record the date the pest or disease is first noticed, whether or not it has yet caused any damage.

Col 3 You should note the appearance of eggs, larvae, nymphs or adults of the pest, or the disease as a fungus, bacterium or virus.

Col 4 Here you should rate the damage caused to the crop by the pest or disease. This will be a very subjective assessment. If there is no obvious damage or the damage is insignificant then use "0". If the damage is as severe as it is likely to be and will seriously affect yield then use "4" for severe. It follows that "1" is slight, "2" is moderate and "3" is considerable.

Col 5 Record the action taken by the farm (if any) by using the farm operation code from the codebook. You will then of course record the details of the operation in sheet no. 13.

### FORM NUMBER 33

*This is a monthly record sheet for each sample field. Please return 10 forms to both NWG and RWG each month by post. It is a new record sheet for recording the results from the use of the portable water tester water level tester supplied from Europe. You have had a demonstration of the meter which is easy to use. The most difficult and essential thing is to check the calibration of pH and EC periodically. The SANIIRI lab will organise this. Please report any problems with the instruments immediately to the RWG in Tashkent.*

*Make an initial survey of the five plots in the field to establish which one is most representative of the field as a whole. If the soil is sandy and likely to collapse into the groundwater, insert a 35mm plastic tube into the reference auger hole to 3m with 0.5m above ground.*

#### 03 GROUNDWATER MEASUREMENTS

- 01 *Indicate which sample plot is being used as the reference auger hole.*
- 02 *During first week of month record the depth of the watertable. Lift out a water sample and immediately pour it into the black tray at the base of the tester and read its temperature. Switch to electrical conductivity and measure the reading, followed by pH and redox potential.*
- 03 *Repeat the operations in 02 in the third week of the month, two weeks later.*

#### 04 WATER FROM FIELD CANAL

*During the irrigation of the field, take a water sample in the black base of the tester and immediately record its temperature, followed by the other measurements. If there is not irrigation of the field during the month, note this in the space on the form.*



05 WATER FROM FIELD DRAIN

*If the sample field is served by one or more field drains, and the drain(s) is flowing, sample the water immediately before and after irrigation. On each occasion record the temperature immediately after taking the sample, and then the other measurements.*

FORM NUMBER 34

*This form is for harvesting the crop and will be required only for that purpose. It should be posted to the NWG and RWG immediately after final harvest of the field. In the event of sequential harvesting the form should be retained until the final harvest is complete. In the case of lucerne, the form should be retained for three consecutive harvests before posting. Where the margin of the rice field is harvested early in order to promote ripening of the remainder, record the yield of the margin as first harvest and the remainder as second. The net area is that of the whole field planted to rice.*

*This is the only form which you will need to record crop harvest data. The same form allows you to record the yield you have measured in each of the five sample plots in the field, which should be done first, and then the estimated yield of the whole sample field. The notes to cover this important stage in data recording are given on the form itself.*

**Irrigation Scheduling Record Sheets**

FORM NUMBER 35

*This form is the unchanged form 16 of last year and is for use with the evaporimeter pan. One form is required for the farm per month.*

Recording is best done at the same time each day with great discipline and 0700 is recommended. At the start, read the water level on the *hook gauge* and enter this "today" value against the date in col 2. The next day at the same time the new "today" reading is entered in col 2 and yesterday's "today" value is copied as "yesterday's" level to col 1 on the same line. The difference between the values in cols 1 and 2 is then calculated and entered in col 3. Through the irrigation period, rainfall is unlikely at most farms so zero is entered in col 4 and the value in col 5 will therefore be the same as col 3.

In the event of needing to add or bale-out water to re-establish the level in the required zone (50-80mm from lip), do this immediately after taking the "today" reading. When the new level is as you want it, take the reading and enter the value under "yesterday" (col 1) for tomorrow's date. That is, when you take the reading of the level tomorrow morning, you will subtract this value from the new level rather than as indicated above, copying down the "today" value from yesterday. This sounds confusing but will soon become clear!

*You have been supplied with a rainfall gauge to be installed near the pan. You must record any rainfall during the same 24 hour period as you measure evaporation from the pan. If there has been rain in the last 24 hours since yesterday, then record the amount (in mm) in col 4. In this case, the rain falling in the pan will have compensated for the loss due to evaporation. If the rainfall is slight then the new level will be still lower than yesterday but if the rainfall is great, the level will be greater than yesterday. In this latter case, col 3 value will be negative but the sum of cols 3*

and 4 to be entered in col 5 will again be positive. Please check your arithmetic carefully! If you do not have a rain gauge and there is rain then you will not be able to record the evaporation on that day, so enter the average of the previous five days in brackets.

The conditions surrounding the pan have an effect on the rate of evaporation and furthermore, the western methodology is based not on evaporation from an open water surface but on evapotranspiration from a standard reference crop of grass. Thus the value of Epan in col 5 must be adjusted to reference crop evapotranspiration ETo by a **pan factor**. The factors given in Table 1 have been calculated by experiment and you need to choose the factor with care using the climate data means that you obtain monthly from the nearest meteorological station.

Firstly, decide on average wind speed: in most parts of the basin this is "light" but may be "moderate" during April/May and even "strong" in Golodneya steppe where wind from the west funnels between outlying mountains.

Secondly, decide whether your pan location is case A or B: is it surrounded by green vegetation or dry fallow? If case A then measure the distance of green crop upwind of the pan and decide if it is approximately nearest to 1m, 10m, 100m or 1000m. Conversely, if the case is B, what is the corresponding distance upwind of the dry fallow? The case may change with the season and with it the pan factor.

Thirdly, note the seasonal variation in mean relative humidity: mostly this is >70 percent December to March, and is between 40 and 70 percent for the rest of the year except during the hot months of June to August in desert areas when it falls below 40 percent.

From the above decisions, you may now read the pan factor which you should record at the top of form 16 in the space provided. Note that the value may change with the month.

The final step is to multiply the value of Epan in col 5 by this pan factor in order to calculate the reference crop evapotranspiration ETo. This is the estimated daily water loss from a standard crop of grass about 300mm tall, well fertilised, irrigated and growing vigorously. This value is assumed to apply to the whole farm.

### FORM NUMBER 36

*This is a monthly form for each sample field and is form 17 from 1996 unchanged. It is where the irrigation schedule is calculated and as such, one form must be completed **per month** for **each of the sample fields**. It uses the daily ETo value from form 35, adjusted for contributions from rain and groundwater, as a basis for estimating the evaporative loss of water from the crop growing in the sample field. These daily losses are accumulated day-by-day for comparison with the water which you will calculate to be available for use by the crop from the "reservoir" represented by the rootzone of the soil profile. You will estimate the crop's net consumptive use of water in columns 1 to 10; the water available to the crop in columns 11 to 13; the diminishing balance between them in column 14 and you will note the irrigation record in column 15.*

The first step is to decide the vegetative stage from the age and appearance of the crop in the sample field: "initial" (I - from sowing, through germination to the formation of seedleaves and perhaps the first 2-4 true leaves), "vegetative" (II - from the start of rapid vegetative growth until the flowers appear when growth rate slows down),

“flowering” (III - which is the main flowering period but includes the early stage of seed formation), and “maturation” (IV - when most of the fruit and seeds are developing and maturing). You must use your judgement to decide on the growth stage. In most crops, the stage of greatest sensitivity to moisture stress is during flowering but vegetables which do not flower before harvest, and cotton, are notable exceptions. Enter the growth stage (I,II,III or IV) in column 1 for the first day of the month; you don't need to copy it all down the page, but you will need to enter it again if you think there has been a change from the current to the next growth stage.

From Table 2, note the crop coefficient ( $K_c$ ) for the crop and its growth stage concerned and enter the value in col 2. While looking at Table 2 also note the depletion factor ( $D$ ) for the growth stage of the crop and enter its value in col 12. These values can be copied down the page, occasionally changing the value up or down towards the value which you will have to enter when there is a change in the growth stage.

Transfer the calculated value of the reference crop evapotranspiration ( $ET_o$ ) from col 6 of Form 16 to col 3 here and multiply by the  $K_c$  value in col 2 in order to enter the crop evapotranspiration ( $ET_c$ ) in col 4.

If it has rained, transfer the rainfall amount from col 4 of form 16 to col 5 here **but first multiply it by 0.75** because only this fraction of the rain is assumed to be **effective**. There are several methods for calculating only the portion of rainfall which recharges the water reserve in the rootzone, ie that which is effective, but they are complex and here we will use this factor for simplicity.

You will be regularly recording the average depth of the watertable from the augerholes in the five sample plots: enter the average in col 6. If it is more than 3m then enter “D” for “deep”. *Use Table 3 to estimate the likely daily contribution of water into the rootzone making an assumption about which column most represents your soil type, but take care since the value can have a big impact on the irrigation schedule.* In order to estimate the groundwater contribution, first note the measured rooting depth in column 11 (you have been measuring the average rooting depth of the crop on a weekly basis by using the soil auger to trace the extent of root extension). **Subtract** rooting depth from the depth of the watertable and use this value in *Table 3 to estimate the* daily contribution from the groundwater to the crop, and enter it in col 7.

Add the values in cols 5 and 7, being the only source of water for the crop other than irrigation, and enter the total in col 8. This value subtracted from the daily evapotranspiration in col 4, gives the net consumptive demand which is entered in col 9.

The net consumptive demand needs to be accumulated day by day in col 10. However, the start date is important and is the day when last the soil profile to rooting depth was **completely recharged** with water either by heavy rainfall or irrigation (or from a risen watertable). This is defined as the day when the soil profile was last wetter than the level of field capacity. **Field capacity** is an imprecise term unless defined in terms of suction pressure, but for this purpose, it is when the soil pores in the whole rootzone have been filled with water and have drained by gravity, a process which takes hours in a sandy soil and at least a day in a clay soil (in practice, the process does not stop thus making a definition in physical terms impossible).

### Table 3 GROUNDWATER CONTRIBUTION TO ROOTZONE

Depth of ground-water below root depth (cm)	Daily water-rise into rootzone (mm)			
	Coarse loamy sand	Clay loam	Loam	Silt loam
30	2.0	8.0	>10	>12
40	1.1	6.5	>10	>12
50	0.7	4.5	>10	>12
60	0.5	3.3	>10	>12
70	0.4	2.5	>10	>12
80	0.3	1.5	10.0	>12
90	0.3	1.1	8.0	>12
100	0.3	0.9	6.5	12.0
110	0.2	0.7	5.0	11.0
120	0.2	0.6	4.0	8.5
130	0.2	0.5	3.0	7.0
140	0.1	0.4	2.6	6.0
150	0.1	0.3	2.2	5.0
160	0	0.3	1.9	4.3
170	0	0.2	1.5	3.8
180	0	0.2	1.1	3.0
190	0	0.2	0.9	2.6
200	0	0.2	0.8	2.3
250	0	0.1	0.5	1.3
300	0	0.0	0.3	0.8
350	0	0	0.2	0.6
400	0	0	0.2	0.4
500	0	0	0.1	0.2
600	0	0	0.0	0.1

The next daily task is to estimate the water which was stored in the rootzone at the time of its last complete recharge by either rainfall or irrigation. At the top of form 17 is space to enter the available water capacity of the soil (AWC). This is defined as the amount of water in the soil between field capacity and permanent wilting point (PWP), which is the notional dryness of the soil at which the crop would die, but as with FC it is better defined in terms of soil suction. The undisturbed soil cores which *have been taken* will later be used by the SANIIRI laboratory to measure the real moisture characteristics of the soils in the sample fields but in the meantime, the following values (in mm/m of soil depth) may be used as approximations:

Soil class	% local clay	Available water capacity stone-free	very stony
------------	--------------	-------------------------------------	------------

fine	50	170	50
medium	25	140	40
coarse	10	80	20

Most soils in the Basin are likely to be “medium” and not very stony, and therefore are likely to have an AWC of about 140mm/m of soil. Adjust your value up or down from the table dependent on the stoniness of the soil and the “local clay” content of the soil.

You have already entered your estimate of the average the rooting depth of the crop in col 11 and the depletion factor (from Table 2) in col 12. Multiply the AWC by values in cols 11 and 12 and divide by 1000: this is the readily available soil moisture (RAM) to be entered in col 13. RAM is the maximum amount of water which we would permit the crop to extract from the soil before irrigating it, since to allow more depletion could significantly reduce the yield.

Calculate the balance of water remaining in the rootzone by subtracting the cumulative consumptive water use for the period in col 10 from the value in col 13. Unless the crop is irrigated, or there is heavy rain, or the groundwater contribution is substantial, the cumulative consumptive use will steadily rise until it equals and then exceeds the RAM in the soil. That is, the balance will at first be positive and then negative. Please do not use the arrival of a negative balance to advise the farm management to irrigate the field since we want to compare their actual irrigation schedule with the theoretical schedule. *Only on the pilot farms during 1997 will we try to change the irrigation schedules on the basis of the daily water balance.*