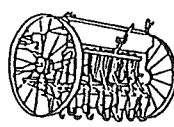
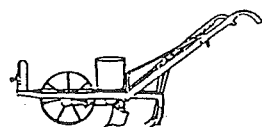


Questionnaire 3

Sowing Equipment

1. Implements used



- Seed spacing planters (see below)
- Seed drills (see page 4)
- Others: (e.g. row markers, plant hole attachments) (see page 7)

2. The seed spacing planters

2.1. Seed spacing planters used in the project region:

Please state type, make and manufacturing firm/country:.....

.....

Approximate price of the implements:..... Weight:.....kg

Seed spacing planters are used in: single rows twin rows rows

Description of the implements (e.g. type of sowing mechanism, seed container etc.):.....

.....

.....

How are the implements adjusted (set) for differently calibrated seed material or for differing quantities (e.g. changes in seed quantity by means of gear adjustment, adaptation of differing seed material by changing the cell disk) ?

.....

.....

.....

Description of the sowing shares (e.g. disc share, sabre-shaped share etc.):.....

.....

Can the implements be fitted with a device for fertilising the rows at the same time ? yes no

If yes, to what extent is this possibility made use of ? (State reasons briefly):

.....

.....

2.2. Types of crop and row spacing:

What crops are sown with seed spacing planters in your project region ? Please also state the spaces between the rows left for the individual crops:

Crop type	Row spacing
.....	.....cm
.....	.....cm
.....	.....cm
.....	.....cm
.....	.....cm
.....	.....cm

Can you say anything about the average time requirement for the above seed spacing planter for a particular crop type ?

Crop type	average time requirement in h/ha	Row spacing in cm
.....

To what extent does interfarm use of the seed spacing planters take place ? frequently seldom not at all

2.3. Quality of the seed spacing planters used in the project region:

Quality of material: good adequate poor Sowing accuracy: good adequate poor

If applicable please provide information on the poor material quality or sowing accuracy:

.....

.....

Trouble frequency: low
(e.g. clogging) medium
 high

Repair frequency: low
 medium
 high

What faults or repairs occur frequently? To what extent can these repairs be carried out by the farmers or village craftsmen?

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

Do you consider the implement price in relation to the quality of material and work to be:

reasonable too expensive

For the farmers the implement is: within means only attainable with loan too expensive

2.4. Acceptance of the Seed spacing planters:

Do you consider the seed spacing planters you have mentioned to be an appropriate solution for sowing seed in accordance with the ecological and technical framework conditions? (State reasons briefly):

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

Are the seed spacing planters accepted by the farmers? (State reasons briefly):

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

Do you know of or have you undertaken any further developments or improvements of the Seed spacing planters used in your project region which have had a positive influence on their assignment (e.g. as regards break-down frequency, frequency of repair, precision etc.)?

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

What change would in your opinion have a positive impact on the acceptance of the seed spacing planters among the farmers (e.g. lower prices for the implements, simplification of the implements)?

.....
.....

3. The seed drill

3.1. Types of seed drill used in the project region:

Please state type, make and manufacturing firm/country:.....

.....

Approximate price of the implement:..... Weight:.....kg

Maximum working width:.....cm Number of sowing rows (maximum):.....

Space between rows adjustable: from:.....cm to:.....cm

Description of the implements (e.g. type of sowing mechanism, tyres, seed container etc.):

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

How are the implements adjusted (set) for differently calibrated seed material or for differing quantities (e.g. changes in seed quantity by means of gear adjustment)?

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

Description of the sowing shares (e.g. disc share, sable-shaped share etc.):.....

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

3.2. Types of crops and row spacing:

What crops are sown with seed drills in your project region ? Please also state the space between the rows left for the individual crops.

Crop type	Row spacing
.....	.....cm
.....	.....cm
.....	.....cm
.....	.....cm
.....	.....cm
.....	.....cm

Can you say anything about the average time requirement of the seed drills for a particular crop type ?

Crop type	time requirement in h/ha	Number of rows sown	Row spacing in cm
.....

To what extent does interfarm use of the seed drills take place ?

frequently
 not at all

3.3. Quality of the seed drills used in the project region:

Quality of material: good Sowing accuracy: good
 adequate adequate
 poor poor

If applicable please provide information on the poor material quality or sowing accuracy:

.....

.....

Trouble frequency: low Repair frequency: low
(e.g. clogging) medium medium
 high high

What faults or repairs occur frequently ? To what extent can these repairs be carried out by the farmers or village craftsmen ?

.....

.....

.....

Do you consider the implement price in relation to the quality of material and work to be

reasonable too expensive

For the farmers the implement is: within means only obtainable with loan too expensive

3.4. Acceptance of the seed drills:

Do you consider the seed drills you have mentioned to be an appropriate solution for sowing seed in accordance with the ecological and technical framework conditions ? (State reasons briefly):

.....

.....

.....

Are the seed drills accepted by the farmers ? (State reasons briefly):

.....

.....

.....

Do you know of or have you undertaken any further developments or improvements of the seed drills used in your project region which have had a positive influence on their assignment (e.g. as regards breakdown, frequency of repair, precision etc.) ?

.....

.....

.....

What change would in your opinion have a positive impact on the acceptance of the seed drills among the farmers ? (e.g. lower prices for the implements, simplification of the implements)

.....

.....

.....

Do you know of or have you undertaken any further developments or improvements of the seed drills used in your project region which have had a positive influence on their assignment (e.g. as regards breakdown, frequency of repair, precision etc.) ?

.....

What change would in your opinion have a positive impact on the acceptance of the seed drills among the farmers ? (e.g. lower prices for the implements, simplification of the implements)

.....

Questionnaire 4

Plant tending implements

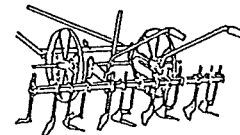
1. Implements used
- Cultivators/hoes (see below)
 - Ridge plough (see Questionnaire No.2, page 1)
 - Other tending implements (see page 4)

2. The cultivator/hoe

2.1. Types of cultivator/hoe used in the project region:



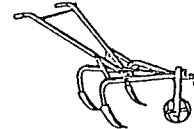
single row units



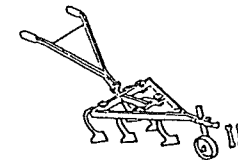
multi-row units

For multi-row units please state the number of rows:

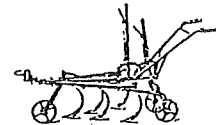
Working width:



not variable



adjustable by sliding the tines on the tine holder



adjustable by swivelling the tine holders via lever/spindle

Number of tines or cutting blades per row:

Form of tines or cutting blades (e.g. duckfoot; possibly with sketch):

.....

Further explanations/special features regarding the cultivator/hoes types used:

.....

.....

2.2. Types of crops and average time requirement of the cultivators/hoes:

What crops are tended using cultivators/hoes drawn by draught animals ?

Crop type	Row spacing
.....	.....cm
.....	.....cm
.....	.....cm
.....	.....cm
.....	.....cm

Can you say anything about the average time requirement of the cultivator/hoe for a particular crop type ?

Crop type	time requirement in h/ha	Row spacing in cm
.....

2.3. Origin, price and quality of the cultivators/hoes used in the project region:

Please state type, make and manufacturing firm/country:.....

Material used for production (e.g. frame in wood, tines in scrap material):.....

Approximate price of implement:..... Weight in kg:.....

Quality of material: good adequate poor

If applicable please provide information about poor material quality:.....

Breakdown frequency: low Repair frequency: low
 (e.g. clogging) medium medium
 high high

What faults or repairs occur frequently ? To what extent can these repairs be carried out by the farmers or village craftsmen ?

Do you consider the implement price in relation to the quality of material and work to be:

reasonable too expensive

For the farmers the implement is: within means only obtainable with a loan too expensive

2.4. Acceptance of the cultivators/hoes:

Do you consider the cultivators/hoes you have mentioned to be an appropriate solution for tending plants in accordance with the ecological and technical framework conditions ? (State reasons briefly):

.....

Are the cultivators/hoes accepted by the farmers ? (State reasons briefly):

.....

Do you know of or have you undertaken any further development or improvement of the cultivators/hoes used in your project region which have had a positive influence on their assignment (e.g. as regards trouble frequency, susceptibility to repairs etc.) ?

.....

What change would in your opinion have a positive impact on the acceptance of the cultivators/hoes among the farmers (e.g. lower prices for the implements, simplification of the implements) ?

.....

Do you know of or have you undertaken any further development or improvement of the implements used in your project region which have had a positive influence on their assignment (e.g. as regards breakdown frequency, frequency of repairs etc.) ?

.....

.....

.....

What change would in your opinion have a positive impact on the acceptance of the implements among the farmers ? (e.g. lower prices for the implements, simplification of the implements)

.....

.....

.....

Annex III: Interpretable Questionnaires

Country	Climatic zone	Farms with an. trac.
=====	=====	=====
BENIN	subhumid	< 2 %
BOTSWANA	semihumid/-arid	30 - 50 %
BURKINA FASO	semiarid	5 - 10 %
BURKINA FASO	semihumid/-arid	5 - 10 %
CAMEROON	humid	< 2 %
CAMEROON	highlands	5 - 10 %
CENT AFR REP	subhumid	10 - 30 %
CHAD	semihumid/-arid	10 - 30 %
COTE DIVOIRE	subhumid	< 2 %
ETHIOPIA	highlands	> 50 %
ETHIOPIA	highlands	30 - 50 %
ETHIOPIA	semihumid/-arid	> 50 %
ETHIOPIA	highlands	10 - 30 %
ETHIOPIA	highlands	> 50 %
GHANA	semihumid/-arid	10 - 30 %
GHANA	semihumid/-arid	10 - 30 %
GHANA	semihumid/-arid	2 - 5 %
GHANA	semihumid/-arid	10 - 30 %
GHANA	subhumid	2 - 5 %
LESOTHO	highlands	30 - 50 %
MALAWI	highlands	2 - 5 %
MALI	semihumid/-arid	10 - 30 %
MALI	semihumid/-arid	> 50 %
MALI	semihumid/-arid	> 50 %
MALI	semihumid/-arid	30 - 50 %
NIGER	semiarid	5 - 10 %
NIGER	semiarid	5 - 10 %
NIGER	semiarid	10 - 30 %
SENEGAL	semihumid/-arid	> 50 %
TANZANIA	subhumid	< 2 %
TANZANIA	highlands	10 - 30 %
TOGO	subhumid	< 2 %
TOGO	semihumid/-arid	10 - 30 %
TOGO	subhumid	< 2 %
TOGO	subhumid	< 2 %
TOGO	semihumid/-arid	
TOGO	semihumid/-arid	2 - 5 %
TOGO	semihumid/-arid	< 2 %
TOGO	semihumid/-arid	> 50 %
ZAMBIA	highlands	10 - 30 %

Country	Climatic zone	Farms with an. trac.
ZAMBIA	highlands	5 - 10 %
ZAMBIA	highlands	10 - 30 %
ZAMBIA	highlands	2 - 5 %
ZAMBIA	highlands	> 50 %
ZAMBIA	semihumid/-arid	30 - 50 %
ZAMBIA	semihumid/-arid	5 - 10 %
ZAMBIA	highlands	30 - 50 %
ZIMBABWE	highlands	30 - 50 %
BOLIVIA	highlands	> 50 %
BOLIVIA	highlands	30 - 50 %
BOLIVIA	highlands	> 50 %
BOLIVIA	highlands	10 - 30 %
BOLIVIA	semihumid/-arid	5 - 10 %
BRAZIL	semihumid/-arid	10 - 30 %
BRAZIL	subtropic	> 50 %
BRAZIL	subhumid	10 - 30 %
BRAZIL	semihumid/-arid	> 50 %
BRAZIL	humid	5 - 10 %
BRAZIL	subhumid	2 - 5 %
BRAZIL	subhumid	5 - 10 %
BRAZIL	subtropic	30 - 50 %
BRAZIL	subhumid	2 - 5 %
BRAZIL	subtropic	> 50 %
BRAZIL	subtropic	> 50 %
BRAZIL	subtropic	5 - 10 %
BRAZIL	highlands	30 - 50 %
BRAZIL	subtropic	5 - 10 %
BRAZIL	subtropic	10 - 30 %
BRAZIL	subtropic	> 50 %
BRAZIL	subtropic	10 - 30 %
BRAZIL	subtropic	30 - 50 %
BRAZIL	subtropic	> 50 %
BRAZIL	subtropic	> 50 %
BRAZIL	subtropic	> 50 %
BRAZIL	humid	30 - 50 %
DOMINICAN REP	subhumid	
DOMINICAN REP	subhumid	10 - 30 %
DOMINICAN REP	humid	< 2 %
ECUADOR	highlands	2 - 5 %
ECUADOR	highlands	30 - 50 %
MEXICO	semihumid/-arid	30 - 50 %
PERU	highlands	> 50 %
PERU	highlands	30 - 50 %
PERU	highlands	> 50 %
PERU	highlands	> 50 %
PAKISTAN	subtropic	5 - 10 %
THAILAND	semihumid/-arid	> 50 %

Annex IV: Sources for Figures C 16, C 17 and C 18

Country	Draft an. (1000)	Source no. draft an.	No. draft an. taken	Arable ld. (1000 ha)	Rural pop. (1000)	Rur. pop./ 100ha a.l.	Draft an./ 100ha a.l.
ALGERIA	319	a	319	6967	5726.00	8.22	4.58
ANGOLA	58	a	300	2950	6556.00	22.22	10.17
	300	b					
	350	c					
BENIN	26	a	35	1390	2762.00	19.87	2.52
	35	b					
BOTSWANA	490	b,c	490	1360	778.00	5.72	36.03
BURKINA FASO	88	a	142	2650	6228.00	23.50	5.36
	142	b,c					
BURUNDI	6	a	1	1120	4583.00	40.92	0.09
	0	b					
	1	f					
COTE D'IVOIRE	36	a	38	2380	6153.00	25.85	1.60
	38	b					
CAMEROON	59	a	67	5930	6660.00	11.23	1.13
	67	b					
CENT AFR REP	12	a	9	1920	1775.00	9.24	0.47
	9	b					
CHAD	194	a	194	3200	4077.00	12.74	6.06
	180	c					
CONGO	0	a,b	0	655	1109.00	16.93	0.00
EGYPT	904	a	1000	2360	20620.00	87.37	42.37
	1000	c					
	3480	j					
ETHIOPIA	5230	a	6000	13200	35094.00	26.59	45.45
	6000	b,c					
GABON	0	a,b	0	290	841.00	29.00	0.00
GAMBIA	9	a	55	167	550.00	32.93	32.93
	55	b					
	48	c					
GHANA	53	a	21	1140	7548.00	66.21	1.84
	21	b					
GUINEA	24	a	100	1500	4867.00	32.45	6.67
	100	b,c					

Country	Draft an. (1000)	Source no. draft an.	No. draft an. taken	Arable ld. (1000 ha)	Rural pop. (1000)	Rur. pop./ 100ha a.l.	Draft an./ 100ha a.l.
KENYA	908	a	700	1880	17528.00	93.23	37.23
	700	c					
LIBERIA	0	a,b	0	126	1668.00	132.38	0.00
LIBYA	44	a	44	1795	517.00	2.88	2.45
MADAGASCAR	1320	a	330	2550	8265.00	32.41	12.94
	330	b,c					
	1644	j					
MALAWI	74	a,b,c	74	2350	5767.00	24.54	3.15
MALI	544	a	380	2073	7056.00	34.04	18.33
	380	b,c					
MAURITANIA	137	a	5	196	1327.00	67.70	2.55
	4	c					
MOROCCO	1370	a	1370	7930	8959.00	11.30	17.28
	1223	k					
MOZAMBIQUE	121	a	100	2860	12149.00	42.48	3.50
	100	b,c					
NIGER	241	a	26	3750	5748.00	15.33	0.69
	26	c					
NIGERIA	1168	a	250	28800	67175.00	23.32	0.87
	200	c					
RWANDA	107	a	0	825	5956.00	72.19	0.00
	0	b					
SENEGAL	185	a	530	5220	5382.00	10.31	10.15
	510	b					
	530	e					
SIERRA LEONE	5	a	1	1650	2415.00	14.64	0.06
	1	b,c					
SOMALIA	395	a	395	1065	3485.00	32.72	37.09
SUDAN	1100	a	1100	12420	14513.00	11.69	8.86
TANZANIA	1189	a	600	4150	19587.00	47.20	14.46
	600	c					
TOGO	6	a	8	1360	2222.00	16.34	0.59
	8	b					
	7	c					
TUNISIA	197	a	197	3171	2003.00	6.32	6.21
UGANDA	635	a	600	5000	13681.00	27.36	12.00
	600	b					
ZAIRE	0	a,b	0	6050	21474.00	35.49	0.00
ZAMBIA	240	a	240	5180	5003.00	9.66	4.63
	180	c					
ZIMBABWE	453	a	500	2680	6563.00	24.49	18.66
	500	c,j					
	800	b					

Country	Draft an. (1000)	Source no. draft an.	No. draft an. taken	Arable ld. (1000 ha)	Rural pop. (1000)	Rur. pop./ 100ha a.l.	Draft an./ 100ha a.l.
COSTA RICA	76	a	76	285	713.00	25.02	26.67
EL SALVADOR	52	a	52	565	2351.00	41.61	9.20
GUATEMALA	138	a	138	1360	4462.00	32.81	10.15
HONDURAS	80	a	80	1575	2722.00	17.28	5.08
MEXICO	2781	a,d	2781	23200	26411.00	11.38	11.99
NICARAGUA	120	a	120	1095	1419.00	12.96	10.96
PANAMA	46	a	46	438	603.00	13.77	10.50
ARGENTINA	805	a	805	26300	3497.00	1.33	3.06
BOLIVIA	327	a	327	3270	2893.00	8.85	10.00
BRAZIL	8787	a	7000		37056.00		10.77
	7000	d					
	7182	i					
CHILE	276	a	276	5350	1732.00	3.24	5.16
COLOMBIA	1350	a	1350	3805	8824.00	23.19	35.48
ECUADOR	267	a	267	1650	3260.00	19.76	16.18
GUYANA	17	a	17	480	233.00	4.85	3.54
PARAGUAY	192	a	192	2060	1883.00	9.14	9.32
PERU	287	a	287	3385	7924.00	23.41	8.48
SURINAME	1	a	1	47	67.00	14.26	2.13
URUGUAY	122	a	122	1400	435.00	3.11	8.71
VENEZUELA	197	a	197	3130	2147.00	6.86	6.29

Country	Draft an. (1000)	Source no. draft an.	No. draft an. taken	Arable ld. (1000 ha)	Rural pop. (1000)	Rur. pop./ 100ha a.l.	Draft an./ 100ha a.l.
BANGLADESH	13621	a	13621	8895	75088.00	84.42	153.13
BURMA	3368	a	3368	9596	18821.00	19.61	35.10
INDIA		a			501251.00		51.91
		d					
		g					
		j					
INDONESIA	6623	a	4556	15800	80972.00	51.25	28.84
	4556	g					
	11794	j					
KAMPUCHEA	1140	a	1140	2910	5461.00	18.77	39.18
KOREA DPR	361	a	361	2300	7735.00	33.63	15.70
KOREA REP	902	a	1562	1991	10792.00	54.20	78.45
	1562	g					
LAOS	592	a	592	880	3147.00	35.76	67.27
MALAYSIA	250	a	250	1040	5344.00	51.38	24.04
NEPAL	1296	a	3922	2292	15888.00	69.32	171.12
	3922	g					
PAKISTAN	5759	a	4506	20269	57093.00	28.17	22.23
	4506	g					
PHILIPPINES	4043	a	3400	4530	27341.00	60.36	75.06
	3400	g					
SRI LANKA	236	a	337	912	8712.00	95.53	36.95
	337	g					
THAILAND	4892	a	4000	17693	33218.00	18.77	22.61
	4000	g					
VIETNAM	2201	a	2201	6200	38975.00	62.86	35.50

Sources: a = Alexandratos, Bruinsma, et al. (1982), interpolated (1987)
b = Starkey (1988b)
c = Starkey (1986)
d = Starkey (1988a)
e = CERNAT (1988)
f = Jaeger (1988)
g = APO (1983), data for 1978/79
h = Ramaswamy (1981)
i = ENBRATER (1986b)
j = FAO (1987)
k = Elhindy und Chiche (1988)

Data for arable land area and rural population (1987), FAO (1988)

Annex V: Draft Power Capacity and Draft Power Requirements

Table 1: Normal draft power of various animals. Source: Hopfen (1969)

Animal	Average weight	Approximate draft	Average speed of work	Power developed
	in kg	in kg	in m/s	in kpm/s
Light horses	400 - 700	60 - 80	1.0	75
Bullocks	500 - 900	60 - 80	0.6 - 0.85	56
Buffaloes	400 - 900	50 - 80	0.8 - 0.9	55
Cows	400 - 600	50 - 60	0.7	35
Mules	350 - 500	50 - 60	0.9 - 1.0	52
Donkey	200 - 300	30 - 40	0.7	25

Table 2: Draft requirements of some farm implements for operations on medium loam soils. Source: Hopfen (1969)

Operation	Draught requirement in kp
Ploughing fallow land with single mouldboard	
11.4 cm wide, 12.7 cm deep	89
14.0 cm wide, 12.7 cm deep	94
16.5 cm wide, 15.2 cm deep	121
25.0 cm wide, 18.0 cm deep	170
Plowing fallow land with double mouldboard	
30.0 cm wide, 5.5 cm deep	116
Harrowing plowed soil	
18-tine peg tooth harrow, 6.3 cm deep	46
5 spring tines, 11.4 cm deep	118
Heavy harrowing 165 - 320 wide	80 - 100
Light harrowing 320 cm wide	90
Levelling plowed soil with a 180-cm-long board ridden by a person of 53 kg weight	90
Rolling	96
Cultivating, 3-tine cultivator, 9 cm deep	53
Wheeled transport of loads up to 1 metric ton on average farm roads	90 - 120