№0298

Bibliothèque UA/SAFGRAD
01 BP. 1783 Ouagadougou 01
Tél. 30 - 60 - 71 / 31 - 15 - 98
Burkina Faso

FSU/SAFGRAD

SUMMARY OF FARMER-MANAGED

RESEARCH TRIALS, 1984

630.72
OHM

Prepared by: Herbert W. Ohm, Joseph G. Nagy and Sibiri Sawadogo[1]

FSU/SAFGRAD.
Publ. No 85-01 E.

630.72
OHM - 5A

#02 98

FSU/SAFGRAD[2]

SUMMARY OF FARMER-MANAGED RESEARCH TRIALS, 1984

Bibliothèque UA/SAFGRAD
01 BP. 1783 Ouagadougou 01
Tél. 30 - 60 - 71/31 - 15 - 98
Burkina Faso

INTRODUCTION

The objective of this report is to provide agricultural extension personnel of Burkina Faso and agricultural researchers with research results as soon as possible from farmer-managed research trials conducted in 1984 by FSU/SAFGRAD. A more thorough discussion of these and additional results will be provided in a future publication.

During 1984, socio-economic and agronomic research were conducted in five villages which represent a wide range of agro-climatic zones and agricultural productivity. The villages are: 1) Bangasse, 15 km north-west of Kaya; Nedogo, 30 km northwest of Ouagadougou; Diapangou, 15 km west of Fada: Poedogo, 130 km south of Ouagadougou; and Dissankuy 120 km north of Bobo Dioulasso.

In each village, a census was taken to identify all households (Lang, et al.) From this census, a random sample of 30 households was selected. This sample was used as the base for socio-economic surveys. The objective of these surveys was to gather data with which to establish models of agricultural production and consumption behavior. In addition, questionnaires have been conducted to clarify constraints to production. In 1984, we conducted questionnaires on formal and informal agricultural credit, land tenure, and farmer-adoption of technologies.

Farmer-managed agronomic trials were designed to permit economic analysis required to evaluate the potential for farmer adoption of the technologies. The trials focused on three technology themes :
1) construction of tied ridges[3] to reduce surface runoff of rainfall,
2) use of minimal amounts of fertilizers to improve soil fertility, and
3) testing of new crop varieties.

METHODOLOGY

Three experiments were conducted on fields of up to 25 randomly chosen farmers in each of two to five villages. The number of treatments for each experiment was five or less. Each treatment was randomly assigned

.../...

3838

to a parcel of the farmer's field. Parcel size ranged from 0.05 to 0.21 ha, depending upon the size of the farmer's field. The one parcel of each treatment in each farmer's field was considered as an observation.

The farmers managed and carried out the experiments with advisory inputs as needed from FSU field staff stationed in each village. Labor inputs by the farmers were recorded each week by FSU staff on a farmer-recall basis. Prior to harvest all parcels were evaluated for proper application of fertilizer and general condition of the crop. The farmers harvested all parcels. FSU staff weighed the harvest from all parcels.

GENERAL CROP CONDITIONS

Total rainfall for 1984 at all villages was significantly below long-term seasonal average rainfall (Figure 1). At Bangassé, the rains began early in the season and continued regularly until 15 August. Crops were seeded early, beginning at the end of May. Crop growth was good and symptoms due to low soil nitrogen were widely apparent in cereal crops. However, absence of rainfall after 15 August resulted in severe drought stress during flowering. Most maize fields produced no harvest. Based on discussions with farmers, millet yield was estimated by FSU field staff at 45 % of normal and white sorghum yield was estimated at 65 % of normal.

At Nedogo, rains arrived early in the season and some fields were seeded early, at the end of May. Throughout the season, rainfall was very limited but occurred regularly and was adequate for fair crop growth. Many fields were reseeded. Maize, millet and white sorghum yields were estimated at 35,55 and 30 % of normal, respectively.

Because of the absence of and the poor distribution of rainfall at Poédogo, seeding started late, at the beginning of June, and continued until mid-July. Fields which were seeded early, were subjected to severe drought during June and early July. Many maize plants did not survive. However, beginning, mid-July, rainfall was excellent and continued until mid-October. Maize, millet and red sorghum yields were estimated at 40, 120 and 105 % of normal.

At Dissankuy several early season rains occurred. However, no rainfall occurred for nearly a month in June, and many fields either were not seeded until July or had to be reseeded in early July. Maize, millet and white sorghum yields were estimated at 30, 70 and 80 % of normal respectively.

At Diapangou, rainfall was very infrequent until mid-July. Seeding of fields occurred from mid-June to mid-July and plant population densities were irregular and low in most fields. Small, but frequent rainfall during September and October resulted in normal millet yields. Maize and millet yields were estimated at 10 and 100 % of normal, respectively. In mid-October a severe wind storm caused most millet and sorghum plants to lie nearly flat. Some seeds sprouted in the spikes before harvest.

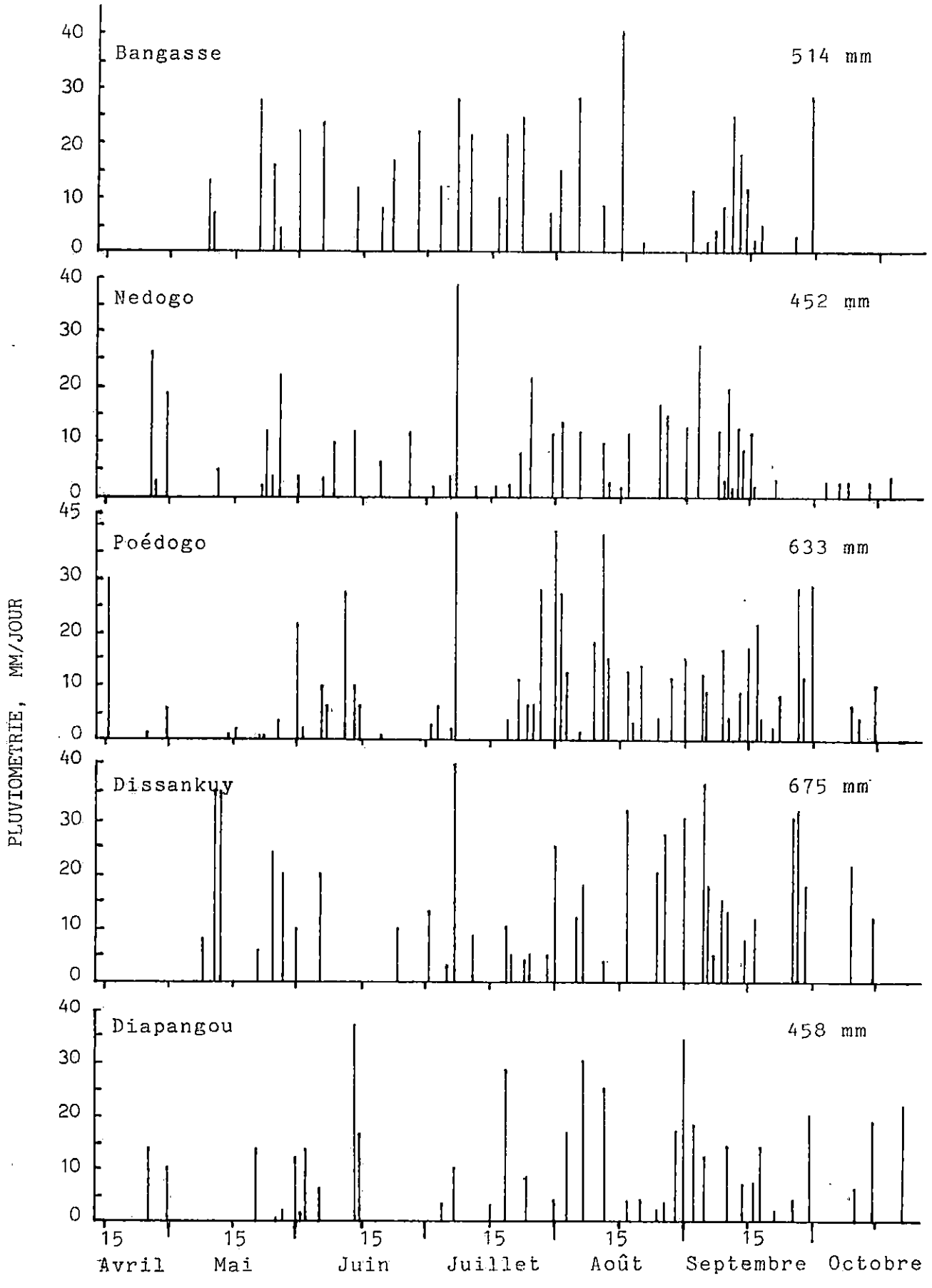

Fig. 1. Repartition des pluies à cinq villages au Burkina, 1984. Les hauteurs annuelles de pluies recueillies dans les 5 villages sont indiquées à droite de chaque Tableau. Les hauteurs annuelles moyennes recueillies dans les localités dont appartiennent ces villages (Bangassé, Nédogo, Poédogo, Dissankuy, Diapangou) sont respectivement : Kaya, 706 ; Pabré, 814 ; Manga, 1197 ; Dédougou, 954 et Fada - N'gourma 886 ( ).

EXPERIMENT I: Effects of Tied Ridges and Fertilizer on Sorghum

Description. The objective was to estimate returns from the investment in the construction of tied ridges and fertilization of sorghum.

The experiment was conducted at Nedogo with manual traction and donkey traction, at Bangassé with manual traction, at Dissankuy with ox traction and at Diapangou with manual, donkey and ox traction. The four treatments were the following: 87) traditional management practices including flat cultivation and no fertilization (the control), 88) construction of tied ridges at one month after seeding and no fertilization, 89) flat cultivation and 100 kg/ha of cotton fertilizer, 14-23-15, applied in a band 10-15 cm from the rows of sorghum two weeks after seeding plus 50 kg/ha of urea, applied in pockets 10-15 cm from the seed pockets one month after seeding, and 90) construction of tied ridges as in treatment 88 plus fertilization as in treatment 89. Locally grown varieties of sorghum were utilized.

The experiment was grown at Dissankuy for the first time in 1984. At Nedogo, Bangassé and Diapangou the experiment was grown in 1983, and in 1984, treatments were assigned to the same parcels as in 1983.

At Bangassé and Dissankuy, the experimental design was a randomized complete block. Farmer's fields were replications. At Nedogo and Dissankuy the experimental design was a split-plot with whole-units (types of traction) arranged in a completely randomized design and treatments were the subunits. The standard errors of the difference between two treatment means are presented to determine whether or not two treatments are statistically different. Generally, one can be 90 to 95 % certain that two means are diffrent if they differ by more than twice the standard error.

Results and Discussion.

The relative responses of sorghum to the four treatments was consistant across the four villages; Nedogo, Bangassé, Dissankuy and Diapangou (Figs. 2 to 5). Treatments consisting of tied ridges for reduction of surface runoff of rainfall, or fertilization to ameliorate the low soil fertility resulted in intermediate levels of sorghum yield. However, consistantly, the greatest yield response was achieved with the combination of tied ridges and fertilization.

Yields of sorghum were generally higher with animal traction than with manual traction (Figs. 2 and 5). However, at Nedogo, the difference was

.../...

significant only for treatment 90, the combination of tied ridges and fertilization. At Diapangou, sorghum yields with ox traction were not superior to those with donkey traction. It is possible that the deeper cultivation with ox traction, compared to donkey traction, accentuated the severe drought conditions in 1984.

Economic analysis (Table I) shows that return/hr for labor inputs to construct tied ridges and or to apply fertilizer, is substantially above the 40 CFA/hr opportunity cost for labor. At all locations, when fertilizer was used alone, treatment 89, some farmers would have lost cash. However, when fertilizer and tied ridges were combined, treatment 90, only 9 % of farmers at Nedogo with manual traction and 17 % of farmers at Bangassé with manual traction would have lost cash.

The combination of tied ridging and fertilization (treatment 90) resulted in the largest net returns. Construction of tied ridges, without fertilization (treatment 88) is less risky than fertilization alone (treatment 89) even though the net returns and the returns/hr of additional labor for fertilization is higher. Even though treatment 90 resulted in the largest net returns, tied ridging alone (treatment 88) was less risky at Nedogo and Bangassé. At all other sites, no farmers would have lost cash for either treatments 88 or 90.

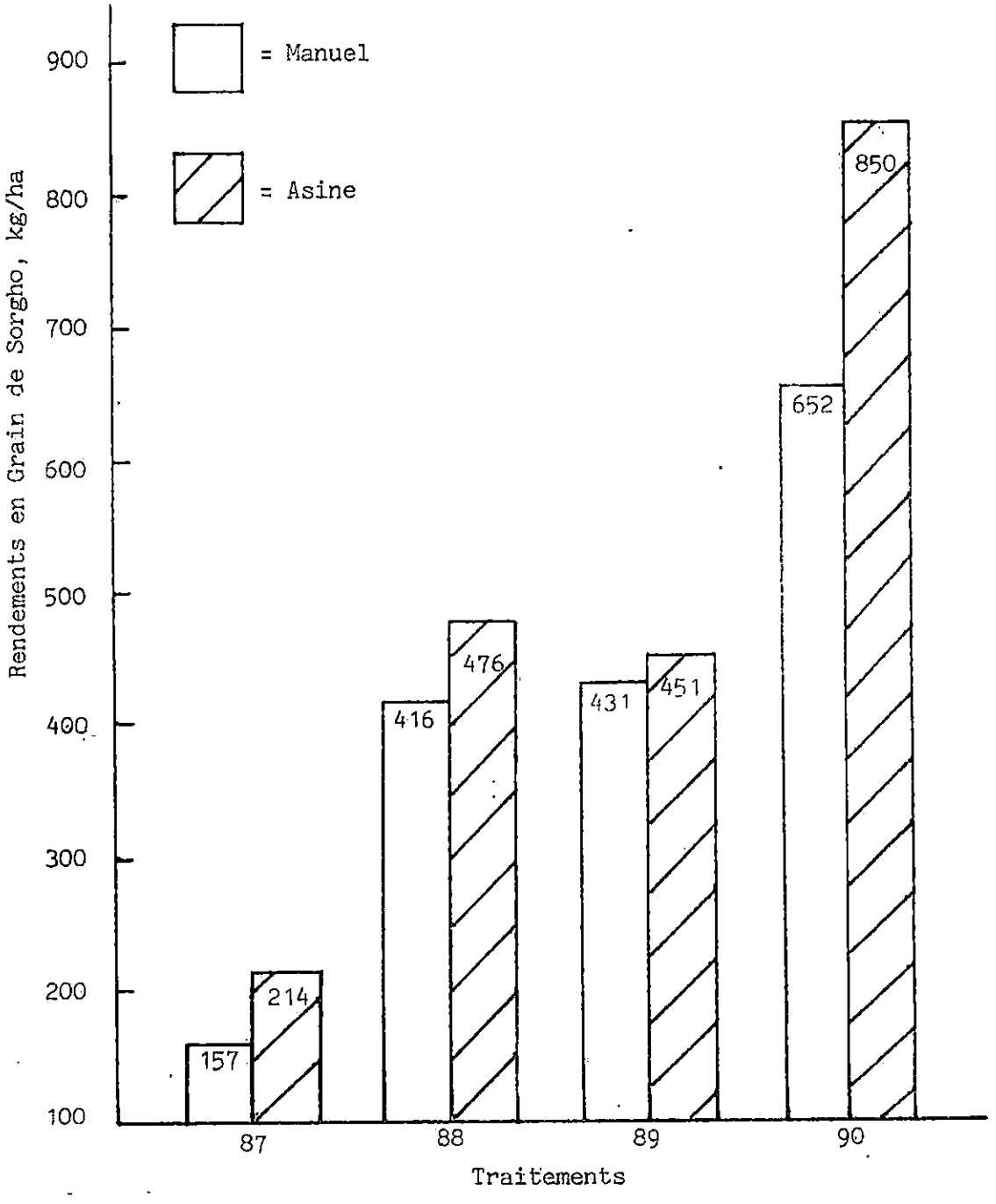

Fig. 2. Effets des buttes cloisonnées (BCL) et des engrais sur les rendements du sorgho cultivé manuellement et avec traction asine à NEDOGO en 1984. Les traitements étaient les suivants : 87) pratiques d'aménagement traditionnelles, sans BCL ni engrais, 88) constructions de BCL un mois après les semis, sans engrais, 89) 100kg/ha d'engrais coton, 14-23-15. appliqués en bande de 10 à 15 cm des lignes de semis deux semaines après les semis plus 50 kg/ha d'urée appliqués en poquet de 10 à 15 cm des poquets de semis un mois après le semis, sans BCL, 90) construction de BCL comme dans le 88 et avec application d'engrais comme dans le 89. L'erreur standard de la différence entre les quatre traitements est de 75 kg/ha pour la traction manuelle et de 63 kg/ha pour la traction asine. L'erreur standard de la différence entre la traction manuelle et la traction asine est de 39.1 kg/ha. Le nombre d'observation de chaque traitement est de 11.

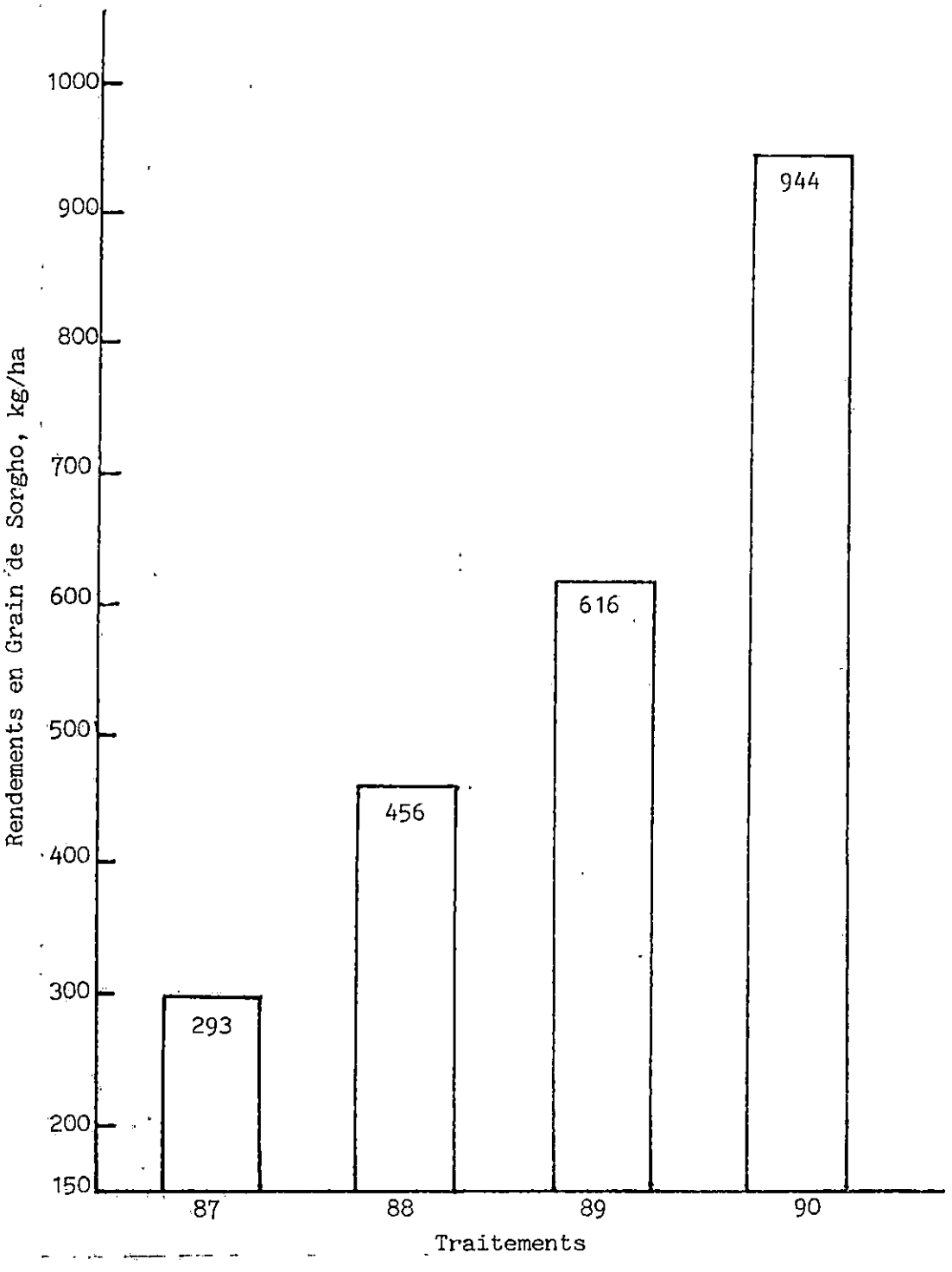

Fig. 3. Effets des buttes cloisonnées (BCL) et des engrais sur les rendements du sorgho cultivé manuellement à BANGASSE en 1984. Les traitements étaient les suivants : 87) pratiques d'aménagement traditionnelles, sans BCL ni engrais, 88) constructions de BCL un mois après les semis, sans engrais, 89) 100 kg/ha d'engrais coton, 14-23-15, appliqués en bande de 10 à 15 cm des lignes de semis deux semaines après les semis plus 50 kg/ha d'urée appliqués en poquet de 10 à 15 cm des poquets de semis un mois après les semis, sans BCL, 90) construction de BCL comme dans le 88 et avec application d'engrais comme dans le 89. L'erreur standard de la différence entre les quatre traitements est de 145 kg/ha. Le nombre d'observation de chaque traitement est de 12.

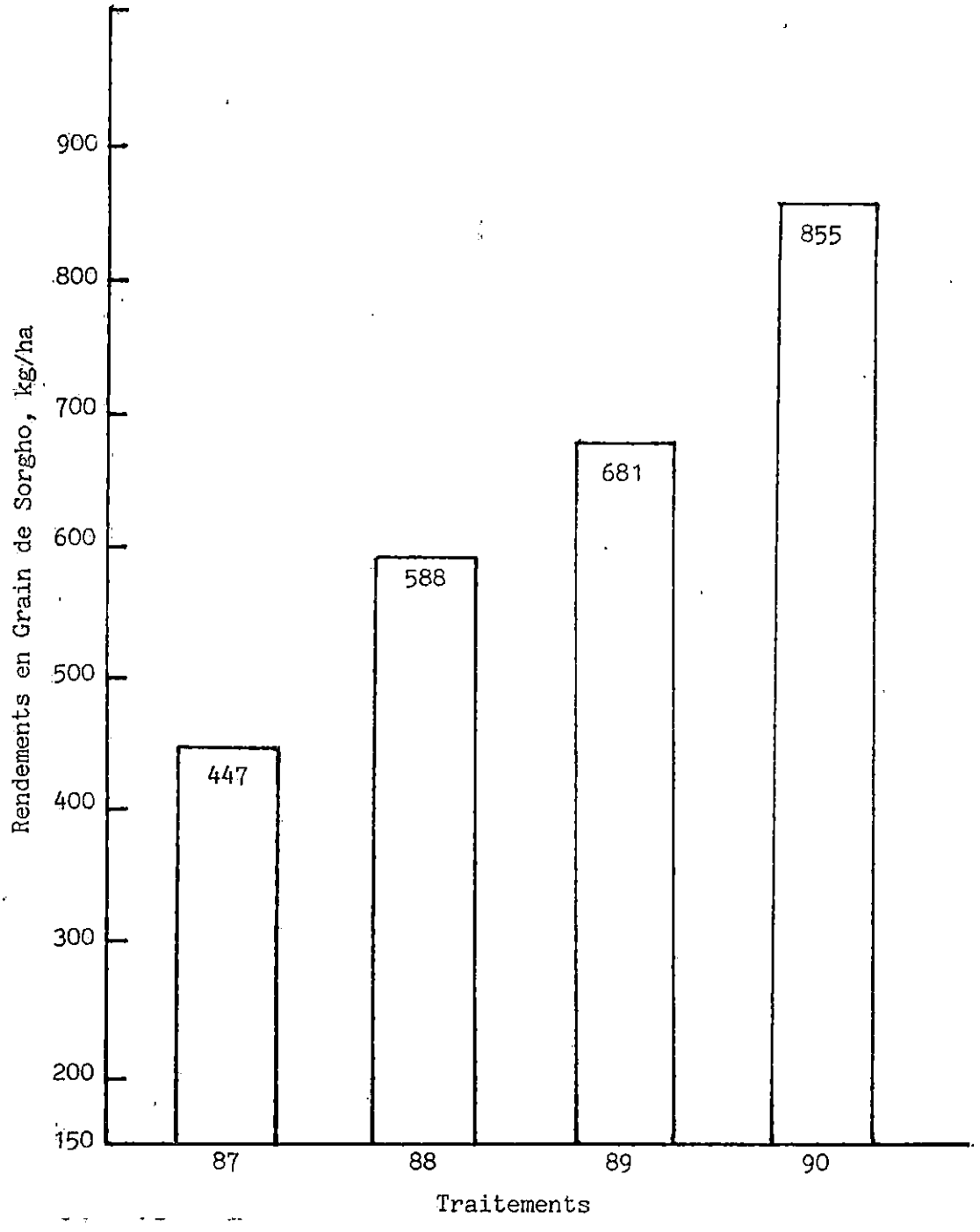

Fig. 4. Effets des buttes cloisonnées (BCL) et des engrais sur les rendements du sorgho cultivé avec traction bovine à DISSANKUY en 1984. Les traitements étaient les suivants : 87) pratiques d'aménagement traditionnelles, sans BCL ni engrais, 88) constructions de BCL un mois après les semis, sans engrais, 89) 100 kg/ha d'engrais coton, 14-23-15, appliqués en bande de 10 à 15 cm des lignes de semis deux semaines après les semis plus 50 kg/ha d'urée appliqués en poquet de 10 à 15 cm des poquets de semis un mois après les semis, sans BCL, 90) construction de BCL comme dans le 88 et avec application d'engrais comme dans le 89. L'erreur standard de la différence entre les quatre traitements est de 35 kg/ha. Le nombre d'observation de chaque traitement est de 25.

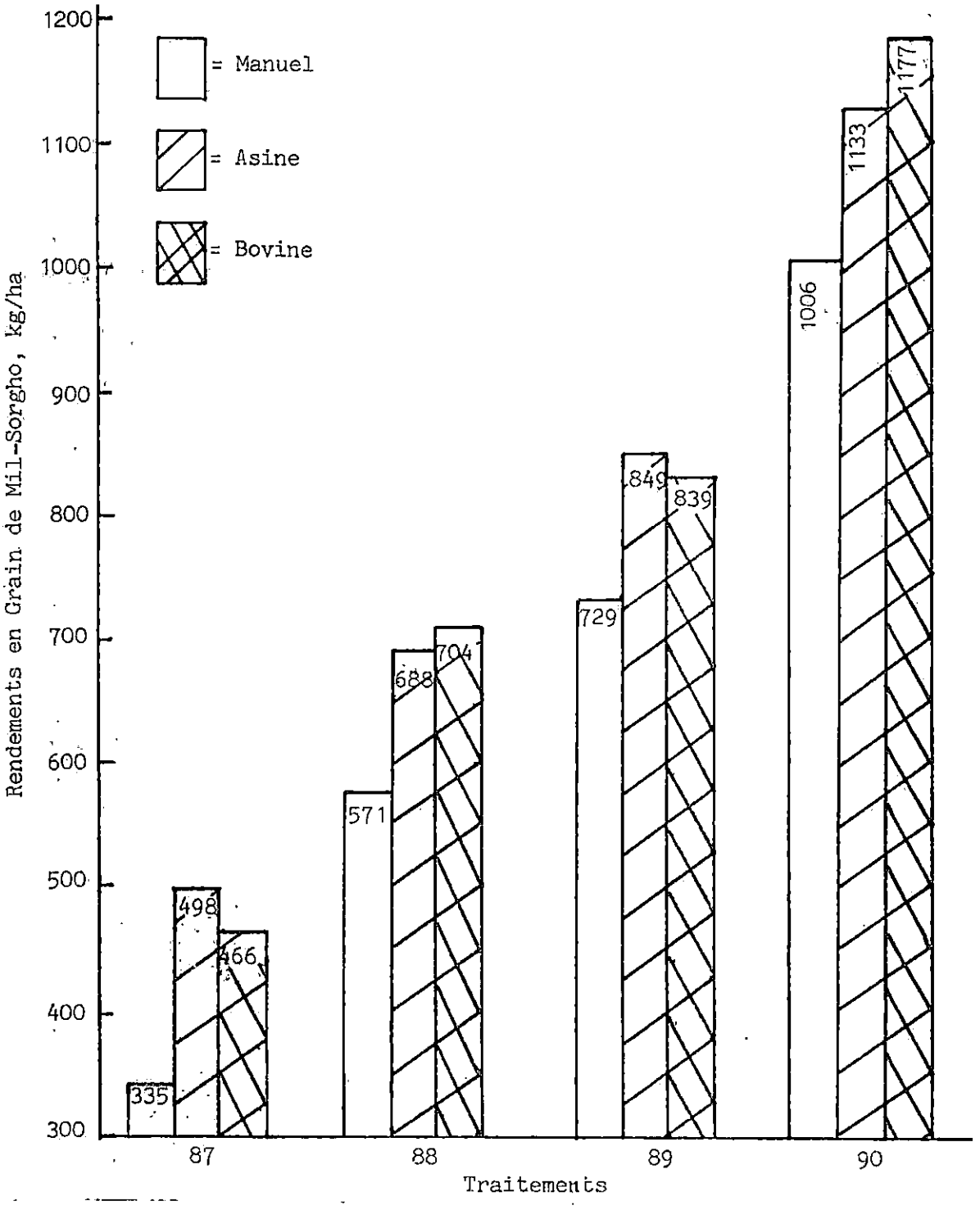

Fig. 5. Effets des buttes cloisonnées (BCL) et des engrais sur les rendements du Mil (85%)-Sorgho (15%) cultivé manuellement, avec traction asine et avec traction bovine à DIAPANGOU en 1984. Les traitements étaient les suivants : 87) pratiques d'aménagement traditionnelles, sans BCL ni engrais, 88) constructions de BCL un mois après les semis, sans engrais, 89) 100 kg/ha d'engrais coton, 14-23-15, appliqués en bande de 10 à 15 cm des lignes de semis deux semaines après les semis plus 50 kg/ha d'urée appliqués en poquet de 10 à 15 cm des poquets de semis un mois après les semis, sans BCL, 90) construction de BCL comme dans le 88 et avec application d'engrais comme dans le 89. L'erreur standard des différences entre les quatre traitements ces tractions (manuel, asine et bovine) sont respectivement : 48, 45 et 47 kg/ha. L'erreur standard des différences entre les trois types des tractions est de 40 kg/ha. Le nombre d'observation de chaque type de traction est de 19.

Table 1.Economic Analysis of Farmer Managed Trials of Sorghua with Fertilizer and Tied Ridges, 1984.

	Treatments 1/				S.E. of Difference Between 2 Treatment Means	Number of Farmers
	87	88	89	90		
Nedogo, Manual Traction						
Grain Yield, kg/ha	157	416	431	652	75.1	11
Gain in Yield Above Traditional, kg/ha	-	259	274	495		
Gain in Net Revenue, CFA 2/	-	23828	13275	33607		
Return/hr. of Additional Labor, CFA 3/	-	238	664	280		
% Farmers Who Would Have Lost Cash	-	0	27	9		
Nedogo, Donkey Traction						
Grain Yield, kg/ha	214	476	451	849	63.4	11
Gain in Yield Above Traditional, kg/ha	-	262	237	635		
Gain in Net Revenue, CFA	-	24104	9871	46487		
Return/hr. of Additional Labor, CFA	-	321	494	489		
% Farmers Who Would Have Lost Cash	-	0	36	0		
Bangasse, Manual Traction						
Grain Yield, kg/ha	293	456	616	944	145.0	12
Gain in Yield Above Traditional, kg/ha	-	163	323	651		
Gain in Net Revenue, CFA	-	14996	17783	47959		
Return/hr. of Additional Labor, CFA	-	150	889	400		
% Farmers Who Would Have Lost Cash	-	0	8	17		
Dissankuy, Ox Traction						
Grain Yield, kg/ha	447	588	681	855	35.1	25
Gain in Yield Above Traditional, kg/ha	-	141	234	408		
Gain in Net Revenue, CFA	-	12972	9595	25603		
Return/hr. of Additional Labor, CFA	-	173	480	270		
% Farmers Who Would Have Lost Cash	-	0	28	0		
Diapangou, Manual Traction						
Grain Yield,kg/ha	335	571	729	1006	48.4	19
Gain in Yield Above Traditional, kg/ha	-	236	394	671		
Gain in Net Revenue, CFA	-	21712	24315	49799		
Return/hr. of Additional Labor, CFA	-	217	1216	415		
% Farmers Who Would Have Lost Cash	-	0	26	0		
Diapangou, Donkey Traction						
Grain Yield, kg/ha	498	688	849	1133	45.6	19
Gain in Yield Above Traditional, kg/ha	-	190	351	635		
Gain in Net Revenue, CFA	-	17480	20359	46487		
Return/hr. of Additional Labor, CFA	-	233	1018	489		
% Farmers Who Would Have Lost Cash	-	0	21	0		
Diapangou, Ox Traction						
Grain Yield, kg/ha	466	704	839	1177	46.8	19
Gain in Yield Above Traditional, kg/ha	-	238	373	711		
Gain in Net Revenue, CFA	-	21896	22383	53479		
Return/hr. of Additional Labor, CFA	-	292	1119	563		
% Farmers Who Would Have Lost Cash	-	0	5	0		

1/ 87 = Traditional (flat cultivation and no fertilizer); 88 = Tied ridges constructed one month after seeding;89 = 100 kg/ha 14-23-15 two weeks after seeding + 50 kg/ha urea one month after seeding; 90 = 88 + 89.

2/ Net revenue = yield gain x grain price (92 CFA/kg) minus fertilizer cost; (78 CFA/kg for 14-23-15, and 66 CFA/kg for urea), Includes interest charge for six months at rate of 15%.

3/ Net revenue/additonal labor of tied ridging and fertilizer application. Manual, Donkey, and Ox traction require 100, 75, and 75 hours of additional labor/ha for tied ridging respectively. Fertilizer application requires 20 additional hours/ha.

EXPERIMENT II: Effects of Tied Ridges on Maize

Description. The objective was to evaluate the effects of tied ridges on the yield of maize grown on compound fields. Compound fields, on which maize is usually grown, are well fertilized with manures and organic wastes, and rainfall is usually the most limiting constraint. The experiment was conducted at Nedogo with donkey traction, Bangassé and Poedogo with manual traction, Dissankuy with ox traction, and at Diapangou with manual and ox traction. Local varieties of maize were utilized.

The two treatments were the following: 85) traditional management practices including flat cultivation (without tied ridges) and 86) construction of tied ridges one month after seeding. We had planned that half of the farmers at Poedogo and Dissankuy (villages at which mulch was most available) were to apply mulch at 5 T/ha to the parcel of treatment 86 after construction of tied ridges. We reasoned that farmers would have access to sufficient mulch for one-half of their compound maize field which is usually very small in area. However, only four farmers at Poedogo and two farmers at Dissankuy had access to sufficient, mulch. We abandoned the application of mulch.

The experiment was grown at Poedogo and Dissankuy for the first time in 1984. At Nedogo, Bangassé and Diapangou the experiment was grown in 1983, and in 1984, treatments were assigned to the same parcels as in 1983 to capitalize on residual soil water which might be present as a result of tied ridges in 1983.

At Nedogo, Bangassé, Poedogo and Dissankuy, the experimental design was a randomized complete block. Farmer's fields were replications. At Diapangou, the experimental design was a split-plot with whole units (types of traction) arranged in a completely randomized design and treatments were the subunits. The statistical significance of differences between maize yield means of the two treatments (flat cultivation and tied ridges) was determined by the t-test on pairs of observations. A pair of observations, the yield for maize with flat cultivation and the yield for maize with tied ridges, was obtained from each farmer's field.

A t-test value at the 0.2, 0.05 or 0.001 level of probability indicates that one can be 80, 95 or 99 % certain that the two treatment means are different.

.../...

Because of drought conditions which were particularly damaging to maize in 1984, the experiment on several farmers' fields in each village was abandoned. This resulted in a limited number of observations for treatments. Although the number of observations was less than desired, the results show that at all villages, representing a wide range of yield levels, maize with tied ridges produced greater yields than maize without tied ridges (Figs. 6 to 10).

At Diapangou the experiment was grown with manual traction and with ox-traction (Fig. 10). With both types of traction, yields of maize with tied ridges were greater than yields of maize without tied ridges. Maize with ox traction produced greater yields than maize with manual traction.

The economic analysis presented in Table 2. shows that in all trials, the increase of maize yields from tied ridging compared to maize yields with flat cultivation, results in returns which are much greater than the 40 CFA/hr opportunity cost of labor. The results emphasize the value of water conservation by construction of tied ridges on the fertile compound fields on which maize is grown.

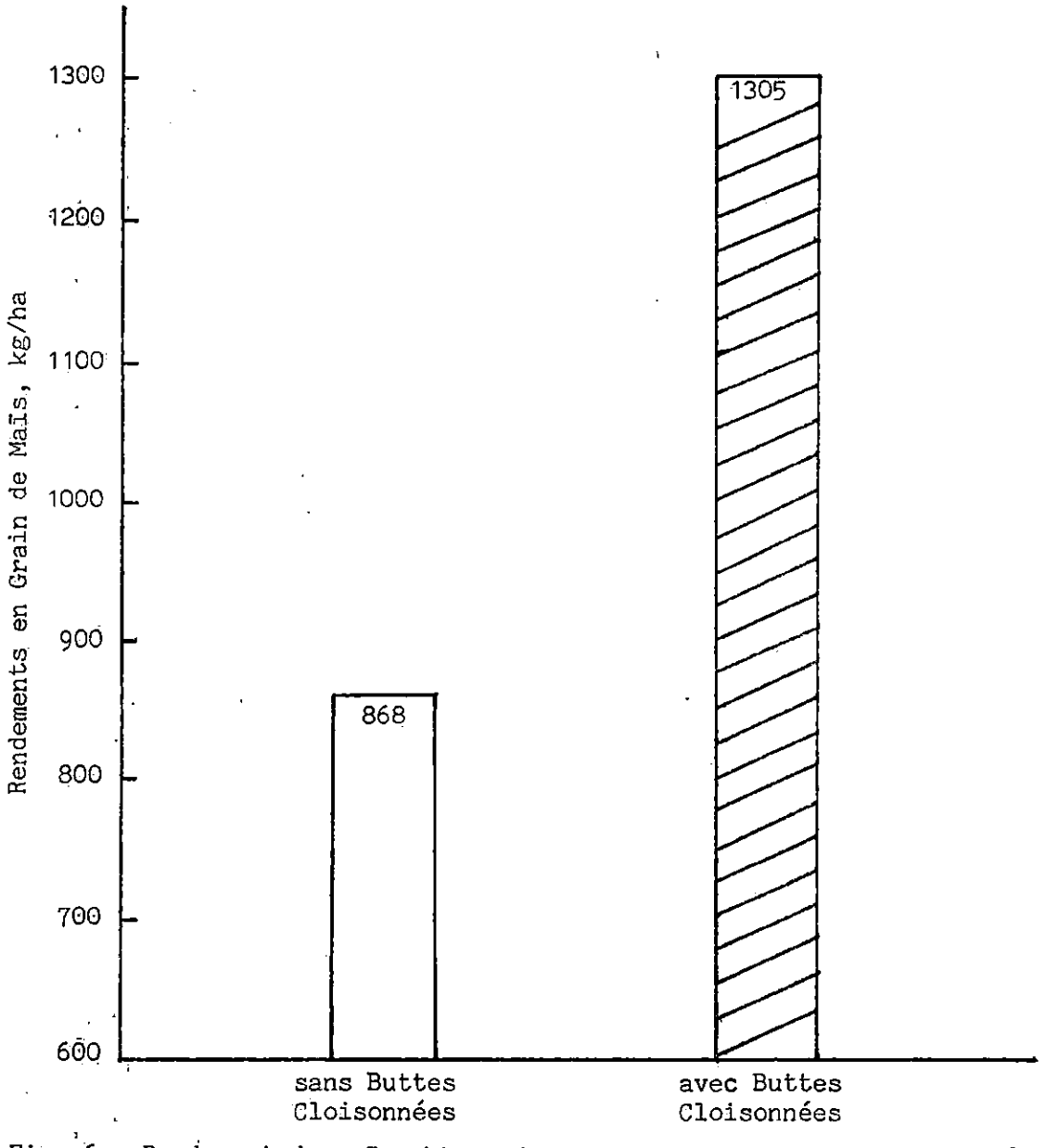

Fig. 6. Rendement de maïs obtenu dans un des champs de case cultivés à la main à NEDOGO en 1984. Une moitié du champ a été cultivé à plat tandis que sur l'autre moitié, des buttes cloisonnées ont été construites un mois après les semis. La différence entre les traitements est significative à 0.001 au niveau (t-test). Le nombre de paires d'observation est 8.

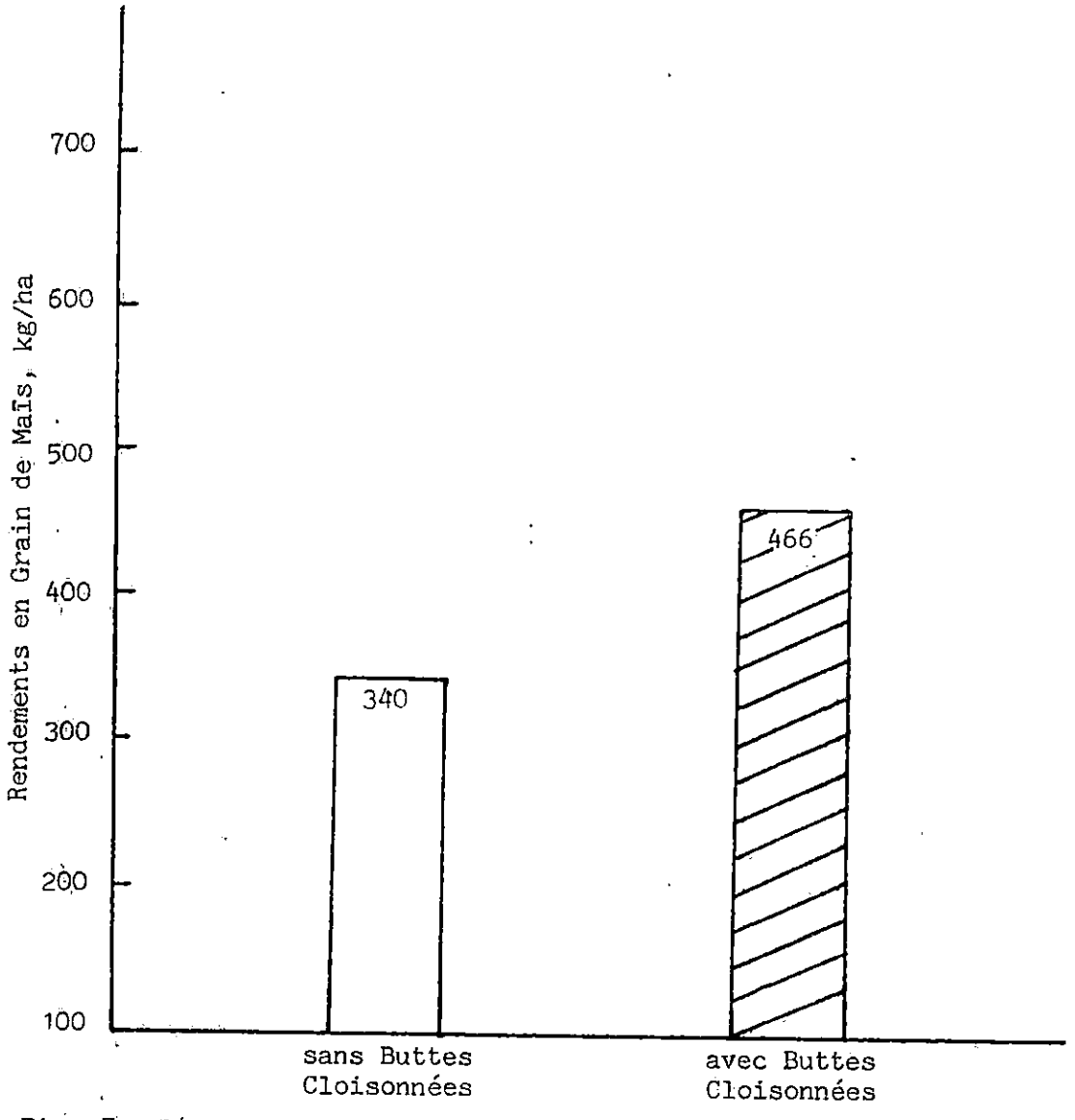

Fig. 7. Rendement de maïs obtenu dans un des champs de cases cultivés à la main à BANGASSE. Une moitié du champ a été cultivé à plat tandis que sur l'autre moitié, des buttes cloisonnées ont été construites un mois après les semis. La différence entre les traitements est significative à 0.001 au niveau (t-test). Le nombre de paires d'observation est 12.

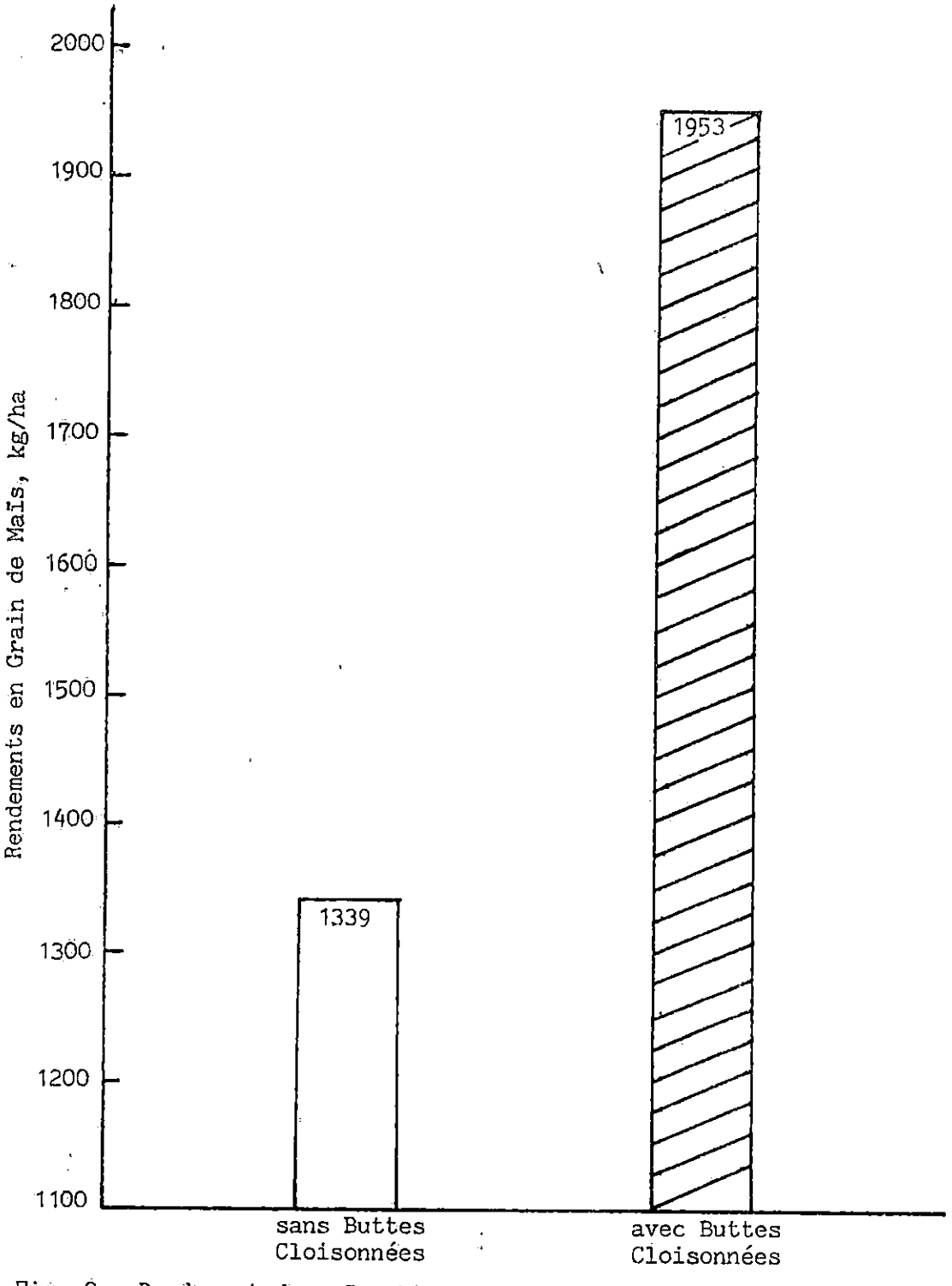

Fig. 8. Rendement de maïs obtenu dans un des champs de case cultivés à la main à POEDOGO en 1984. Une moitié du champ a été cultivé à plat tandis que sur l'autre moitié, des buttes cloisonnées ont été construites un mois après les semis. La différence entre les traitements est significative à 0.2 au niveau (t-test). Le nombre de paires d'observation est 19.

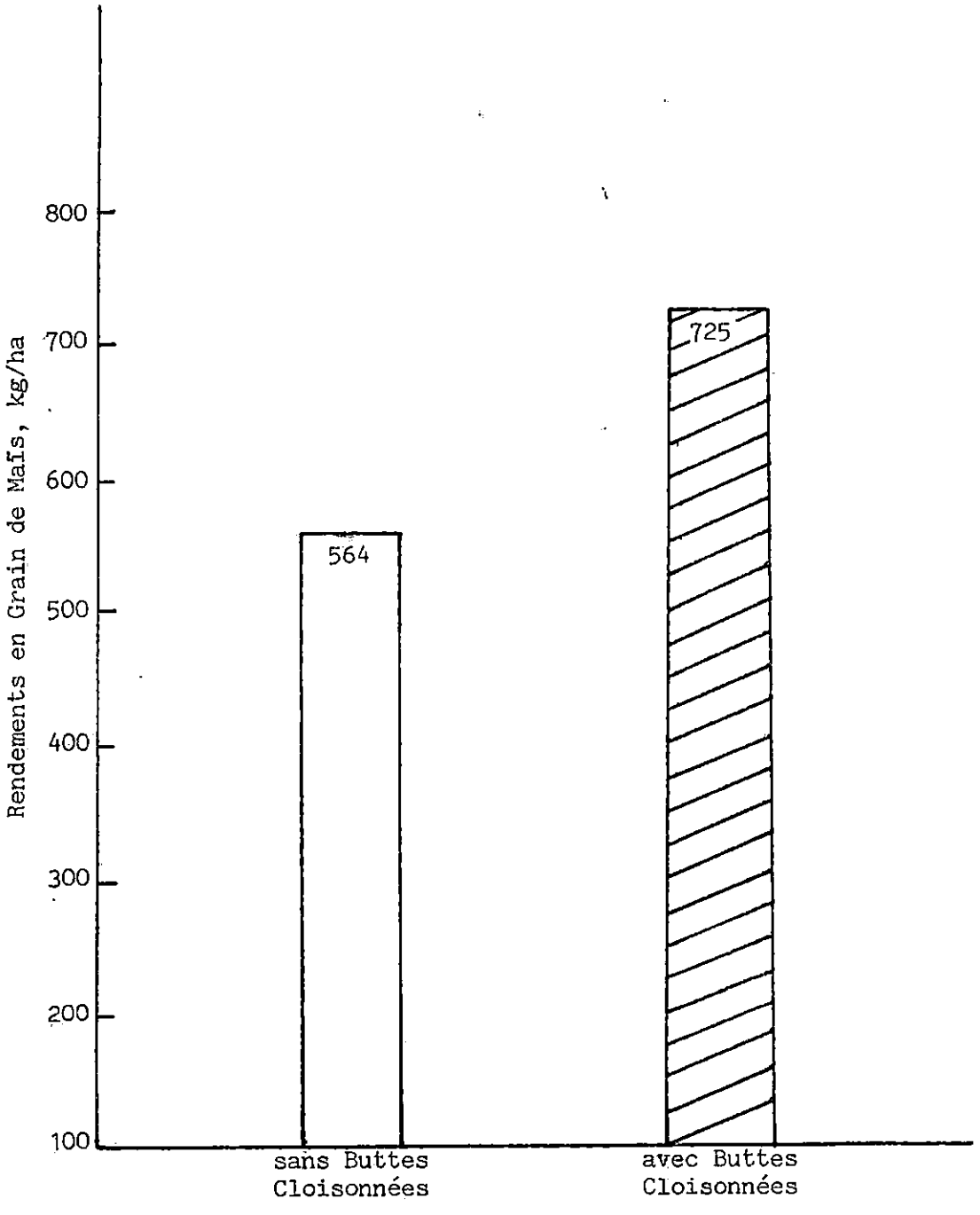

Fig. 9. Rendement de maïs obtenu dans un des champs de case cultivés à la main à DISSANKUY en 1984. Une moitié du champ a été cultivée à plat tandis que sur l'autre moitié, des buttes cloisonnées ont été construites un mois après les semis. La différence entre les traitements est significative à 0.001 au niveau (t-test). Le nombre de paires d'observation est 16.

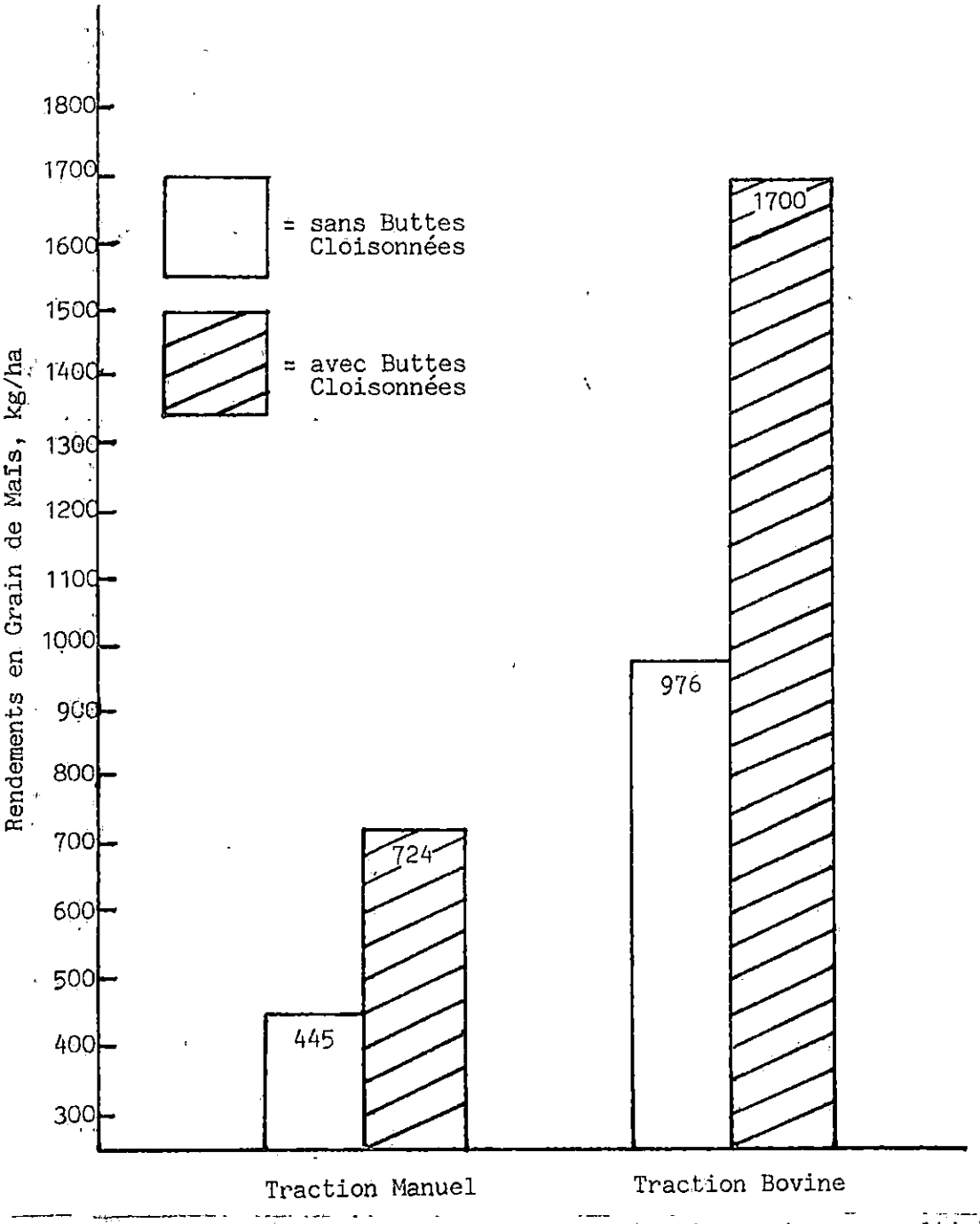

Fig. 10. Rendement de maïs obtenu dans un des champs de case cultivés à la main et avec la traction bovine à DIAPANGOU en 1984. Une moitié du champ a été cultivée à plat tandis que sur l'autre moitié, des buttes cloisonnées ont été construites un mois après les semis. La différence entre les traitements est significative à 0,05 pour la traction manuelle (culture à la main) et à 0.02 au niveau pour la traction bovine (t-test). Le nombre de paires d'observation à la traction manuelle est 7 et à la traction bovine 7. L'erreur standard de la différence entre la traction manuelle et la traction bovine est de 175.2 kg/ha.

Table 2 Economic Analysis of Farmer Managed Trials of Maize with Tied Ridges, 1984.

	Treatments 1/		Number of Farmers
	B5	B6	
	Nedogo, Donkey Traction		
Grain Yield, kg/ha	869	1305*** 5/	19
Gain in Yield Above Traditional, kg/ha	-	436	
Gain in Net Revenue, CFA 2/	-	40112	
Return/hr. of Additional Labor, CFA 3/	-	535	
% Farmers Not Covering Labor Opp. Cost 4/		21	
	Bangasse, Manual Traction		
Grain Yield, kg/ha	341	466***	12
Gain in Yield Above Traditional, kg/ha	-	125	
Gain in Net Revenue, CFA	-	11500	
Return/hr. of Additional Labor, CFA	-	115	
% Farmers Not Covering Labor Opp. Cost		8	
	Poedogo Manual Traction		
Grain Yield, kg/ha	1339	1953*	8
Gain in Yield Above Traditional, kg/ha	-	614	
Gain in Net Revenue, CFA	-	56488	
Return/hr. of Additional Labor, CFA	-	565	
% Farmers Not Covering Labor Opp. Cost		25	
	Dissankuy, Ox Traction		
Grain Yield, kg/ha	564	725***	16
Gain in Yield Above Traditional, kg/ha	-	161	
Gain in Net Revenue, CFA	-	14812	
Return/hr. of Additional Labor, CFA	-	197	
% Farmers Not Covering Labor Opp. Cost		6	
	Diapangou, Manual Traction		
Grain Yield, kg/ha	445	724**	7
Gain in Yield Above Traditional, kg/ha	-	279	
Gain in Net Revenue, CFA	-	25668	
Return/hr. of Additional Labor, CFA	-	257	
% Farmers Not Covering Labor Opp. Cost		29	
	Diapangou, Ox Traction		
Grain Yield, kg/ha	976	1700***	7
Gain in Yield Above Traditional, kg/ha	-	724	
Gain in Net Revenue, CFA	-	66608	
Return/hr. of Additional Labor, CFA	-	888	
% Farmers Not Covering Labor Opp. Cost		0	

1/ B5 = Traditional (flat cultivation and no fertilizer); B6 = Tied ridges constructed one month after seeding.

2/ Net revenue = yield gain x grain price (92 CFA/kg)

3/ Net revenue/additonal labor of tied ridging. Manual, Donkey, and Ox traction require 100, 75, and 75 hours of additional labor/ha for tied ridging respectively.

4/ A 40 CFA/hr. opportunity cost of labor is used.

5/ *,**,***, and **** indicate a level of significance of 0.2,0.05,0.02, and 0.001 respectively for differences between treatments B5 and B6 as determined by the T-Test for paired observations.

EXPERIMENT III: Effects of Volta Phosphate and Tied Ridges on Millet

Description. The objective was to evaluate the economic returns of two levels of fertilization and tied ridges on millet.

The experiment was conducted the third year, in 1984, at Nedogo and Bangassé with manual traction only. Local varieties of millet were utilized.

The five treatments were the following: 80) traditional management practices including flat cultivation (without tied ridges) and no fertilization, 81) construction of tied ridges one month after seeding, 82) 100 kg/ha of Volta phosphate (VP1) applied in the seed pocket plus 50 kg/ha urea applied in pockets 10-15 cm from the seed pockets two weeks after seeding, and construction of tied ridges one month after seeding, 83) 200 kg/ha of VP1 and 50 kg/ha urea applied together in a pocket 10-15 cm from seed pockets two weeks after seeding, and 84) 100 kg/ha VP1 plus 50 kg/ha urea applied as in treatment 82, but without tied ridges.

In 1984, treatments were assigned to the same parcels as in 1982 and 1983 to capitalize on the availability of phosphorus for utilization by plants, from VP1 applied in previous years.

At Nedogo and Bangassé, the experimental design was a randomized complete block. Farmer's fields were replications. The standard error of the difference between two treatment means are presented to determine whether or not two treatments are statistically different. Generally, one can be 90 to 95 % certain that two means are different if they differ by more than twice the standard error.

Results and Discussion

Grain yields of millet for treatments 82 to 84 tended to be greater than yields of millet for treatment 80 at Nedogo (Fig. 11) and Bangassé (Fig. 12) but yield differences from that of treatment 80 were significant only for treatments 82 at Bangassé and for treatments 81 to 84 at Nedogo. Responses from treatments 82 to 84, those in which fertilizer was applied, were generally greater in 1984 than in 1983 (Lang, et al.) or 1982 (FSU/SAFGRAD, 1983). The increased response of the fertilization treatments in 1984 may reflect the availability of phosphorus for uptake by plants from VP1 which was applied in 1982 and 1983, as well as in 1984.

Tied ridges without fertilizer, treatment 81) resulted in a significant yield increase compared to treatment 80 at Nedogo. This treatment

.../...

requires no cash inputs, but this practice does not contribute to soil fertility improvement over years.

Tied ridges in combination with fertilization resulted in the greatest yield of millet in 1984, which is consistant with our results in 1983 and 1982.

The mean yield increases at Nedogo for treatments 81 through 84 are adequate to cover the opportunity cost of labor (Table 3). In Bangassé, opportunity costs of labor are only covered for treatments which include tied ridging (81 and 82). When fertilizer is used alone in treatments 83 and 84, mean yield increases are not sufficient to cover the opportunity cost of labor, resulting in negative net revenues. At both locations, the percentage of farmers who would have lost cash is high for treatments 83 and 84. Treatment 82 at both locations provides the largest net returns and highest return/hr of additional labor and again emphasizes the gains to be made by combining soil fertility and water conservation method.

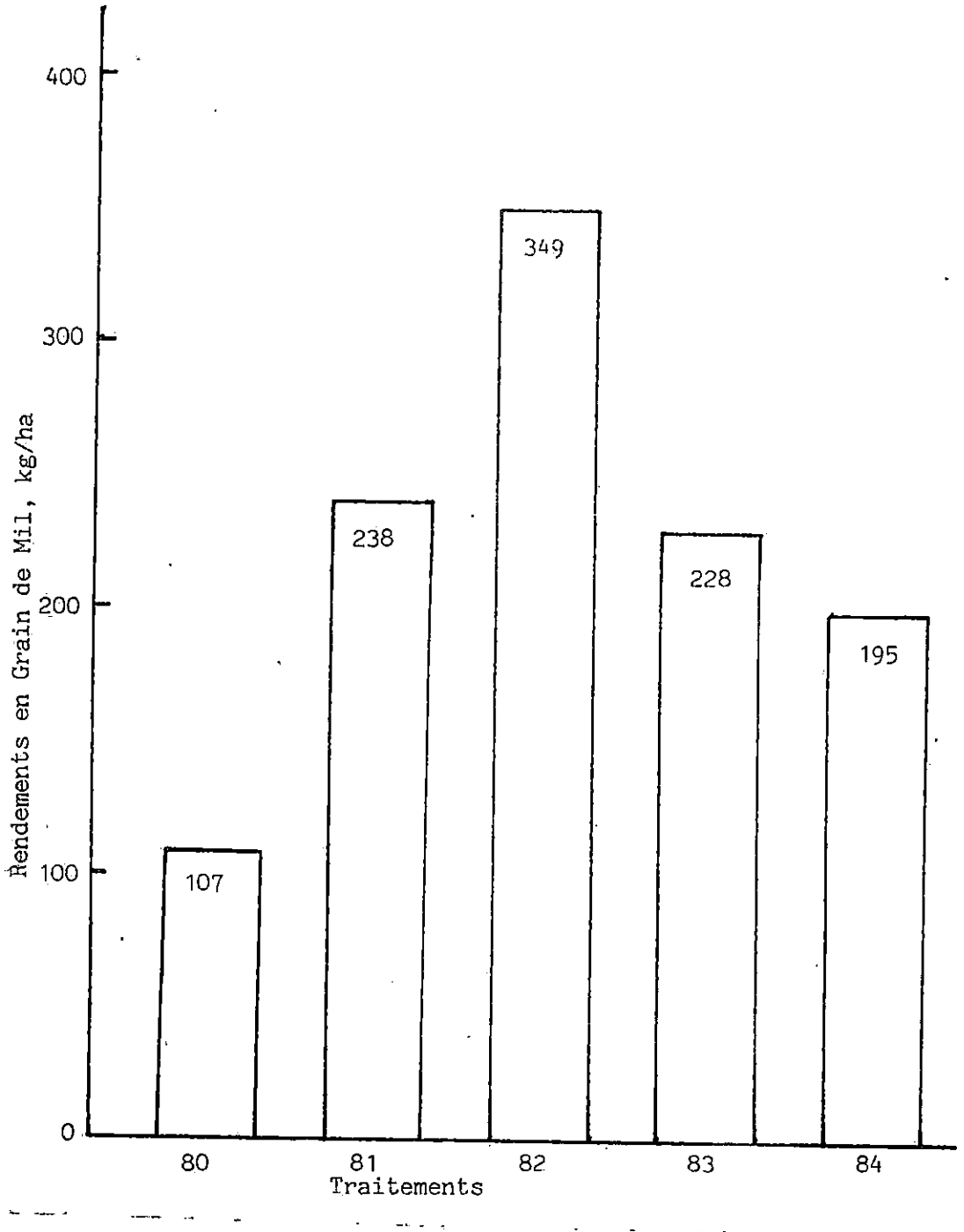

Fig. 11. Effets des buttes cloisonnées (BCL), Volta phosphate (VP1) et l'urée sur les rendements du petit mil cultivé manuellement dans les champs à NEDOGO en 1984. Les traitements étaient les suivants : 80) pratiques d'aménagement traditionnelles, sans BCL, VP1 ou urée, 81) construction de BCL un mois après les semis, sans VP1 ou urée, 82) construction de BCL comme au traitement 81, mais avec application de 100 kg/ha de VP1 dans les poquets de semis et en dessous des semis plus 50 kg/ha d'urée appliqués en poquet de 10 à 15 cm des poquets de semis deux semaines après les semis, 83) 200 kg/ha de VP1 et 50 kg/ha d'urée appliqués ensemble dans les poquets de 10 à 15 cm des poquets de semis deux semaines après les semis, 84) 100 kg/ha de VP1 et 50 kg/ha d'urée appliqués comme dans le traitement 82, mais sans BCL. L'erreur standard de la différence entre les cinq traitements est de 28.0 kg/ha.

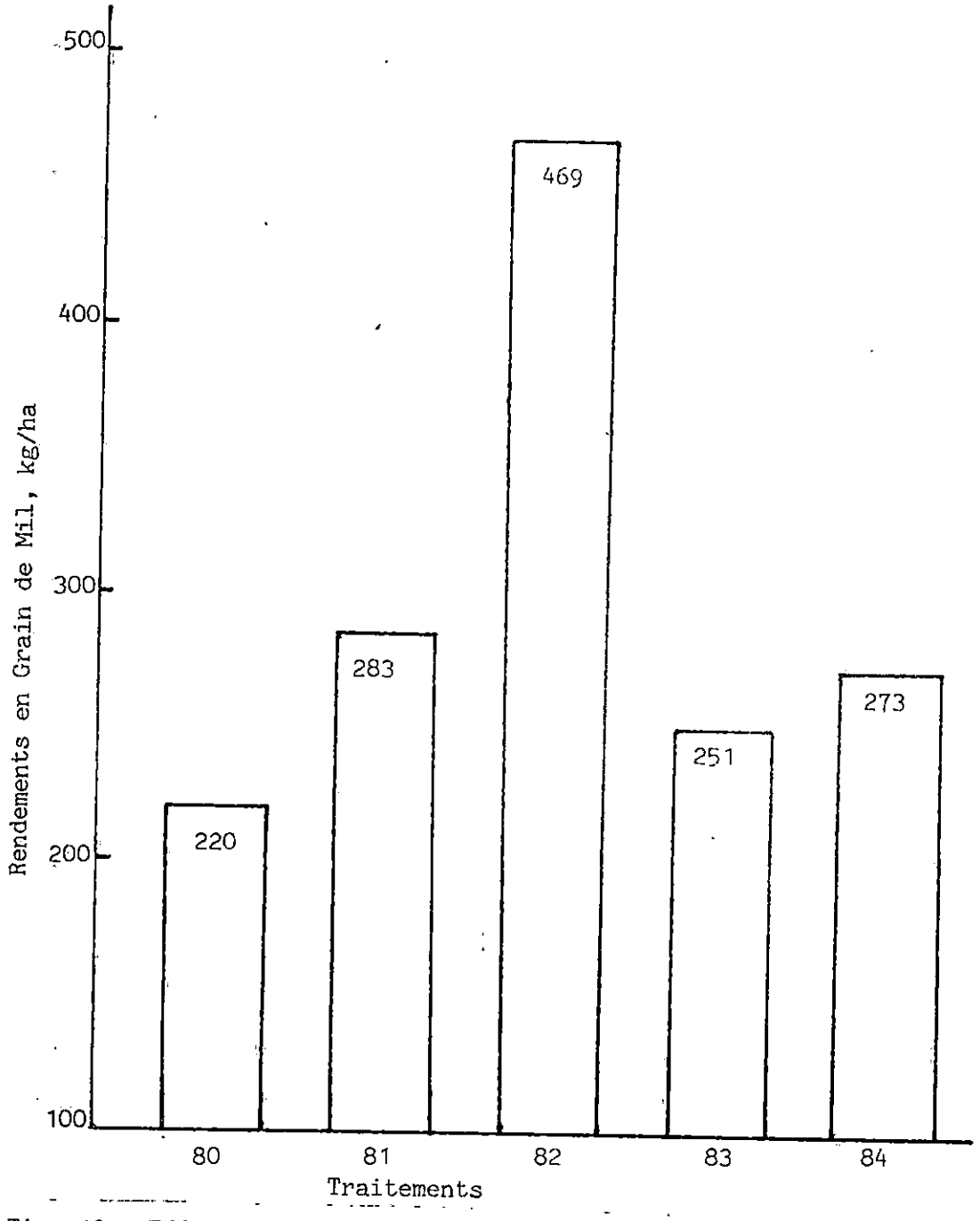

Fig. 12. Effets des buttes cloisonnées (BCL), Volta phosphate (VP1) et l'urée sur les rendements du pétit mil cultivé manuellement dans des champs à BANGASSE en 1984. Les traitements étaient les suivants : 80) pratiques d'aménagement traditionnelles, sans BCL, VP1 ou urée, 81) construction de BCL un mois après les semis, sans VP1 ou urée, 82) construction de BCL comme au traitement 81, mais avec application de 100 kg/ha de VP1 dans les poquets de semis et en dessous des semis plus 50 kg/ha d'urée appliqués en poquet de 10 à 15 cm des poquets de semis deux semaines après les semis, 83) 200 kg/ha de VP1 et 50 kg/ha d'urée appliqués ensemble dans les poquets de 10 à 15 cm des poquets de semis deux semaines après les semis, 84) 100 kg/ha de VP1 et 50 kg/ha d'urée appliqués comme dans le traitement 82, mais sans BCL. L'erreur standard de la différence entre les cinq traitements est de 28.0 kg/ha.

Table 3 Economic Analysis of Farmer Managed Trials of Millet with Volta Phosphate and Tied Ridges, 1984.

	Treatments 1/					S.E. of Difference Between 2 Treatment Means	Number of Farmers
	T0	T1	T2	T3	T4		
Nedogo, Manual Traction							
Grain Yield, kg/ha	107	238	349	228	195	28.0	11
Gain in Yield Above Traditional, kg/ha	-	131	242	121	88		
Gain in Net Revenue, CFA 2/	-	12052	16029	2209	1861		
Return/hr. of Additional Labor, CFA 3/	-	121	134	110	93		
% Farmers Who Would Have Lost Cash	-	0	0	55	55		
Bangasse, Manual Traction							
Grain Yield, kg/ha	220	283	469	251	273	40.3	17
Gain in Yield Above Traditional, kg/ha	-	63	249	31	53		
Gain in Net Revenue, CFA	-	5796	16673	-6071	-1360		
Return/hr. of Additional Labor, CFA	-	58	139	-	-		
% Farmers Who Would Have Lost Cash	-	0	6	59	59		

1/ T0 = Traditional (flat cultivation and no fertilizer); T1 = Tied ridges constructed one month after seeding; T2 = 100 kg/ha Volta Phosphate applied in the seed pocket and 50 kg/ha urea applied in pockets 10-15cm from seed pockets two weeks after seeding, tied ridges constructed one month after seeding; T3 = 200 kg/ha volta phosphate and 50 kg/ha urea applied together in a pocket 10-15cm from seed pocket two weeks after seeding; T4 = 100 kg/ha Volta phosphate applied in seed pocket and 50 kg/ha urea applied in pockets 10-15cm from seed pockets two weeks after seeding.

2/ Net revenue = yield gain x grain price (92 CFA/kg) minus fertilizer cost; (25 CFA/kg for Volta Phosphate and 66 CFA/kg for urea), Includes interest charge for six months at rate of 15%.

3/ Net revenue/additonal labor of tied ridging and fertilizer application. Manual traction requires 100 hours of additional labor/ha for tied ridging. Fertilizer application requires 20 additional hours/ha.

S U M M A R Y

The purpose of the trials was to determine the potential of water conservation and fertilization technologies under on-farm, farmer-managed conditions in Burkina. The analysis considered agronomic and economic aspects of using minimal amounts of fertilizer to increase soil fertility and the construction of tied ridges to reduce surface runoff of rainfall.

The agronomic results indicated that significant yield increases of sorghum and millet can be obtained by applying minimal amounts (as described above) of fertilizer and/or construction of tied ridges. Also, maize yields on compound fields can be increased with construction of tied ridges. Yield levels are highest when both fertilizer and tied ridges are utilized indicating that soil fertility and water become constraints in turn.

The return/hr for labor was nearly always greater than the opportunity cost of labor. Tied ridges alone or in combination with fertilizer are more attractive, economically, than using fertilizer alone. However, tied ridges alone do not contribute to improvement of soil fertility. This may not be as serious on maize compound fields as on sorghum and millet fields. The combination of tied ridges and fertilizer results in the largest net returns.

These trials were designed to maximize the use of non-purchased inputs, still using minimal applications of purchased inputs, because most farmers are currently subsistence oriented and they have little cash available for purchased inputs. Indeed, when farmers are asked why they do not use new technologies, the common answers are shortage of labor, credit and fertilizer availability. The problems of credit for fertilizer and availability of fertilizer are also well-documented with recommendations for improving the situation (Tapsoba).

1 Agronomist and Agricultural Economist, FSU, and Agricultural Economist, IBRAZ, Burkina Faso, on part-time assignment to FSU.

The authors wish to acknowledge the indispensible and excellent work of the FSU field staff who live in the study villages, conduct and supervise agronomic trials and conduct interviews with farmers and their families. The professional dedication of this staff and the rapport which they developed with the Burkinabe farmers is a source of great pride to the project. The field staff are as follow : Jean-Marie OUEDRAOGO and Sita OUEDRAOGO at Ouagadougou, who assisted field staff at the five villages; Robert OUEDRAOGO, Seydou OUEDRAOGO at Nedogo; Salifou BOENA and Etienne DIPAMA at Bangassé; Mandea THIMBIANO, Kondja DIABRI, Souglidja TANKOANO and Etienne KOANDE at Diapangou; Charles KARAMBIRI and Bruno SANOU at Dissankuy; and Florent AGOUDIHO and Lee SCHABER who is a U.S. Peace Corps Volunteer, at Poedogo. Lee also assisted in preparation of tables and figures.

and François KABORE

We wish to acknowledge Chris Pardy, Ag. Economist, FSU for his leadership and ideas in the collection of socio-economic information which is important to the interpretation and analysis of technological data. We also wish to thank the FSU/SAFGRAD office staff who generously gave of their time to complete this report on a timely basis.

2 FSU, funded by the U.S. Agency for International Development (USAID), through Purdue University, is a component of the Semi-Arid Food Grains Research and Development (SAFGRAD) projet. The SAFGRAD program of which FSU is a part provides a coordinating role for agricultural research in 25 African countries. Within the SAFGRAD program in Burkina, the flow of research information progresses from the component researchers (IITA, ICRISAT) to FSU to the accelerated crop production officers (ACPO's) to the host country extension system. The role of the ACPO's involves demonstrating and refining technologies obtained from component researchers and FSU which have been proven to be effective under on-farm conditions.

FSU's primary objective is to identify technologies that are agronomically and economically acceptable to and adaptable by farmers. FSU agronomic experiments center on four main technology evaluation areas; 1) water conservation experiments to capture water and reduce rainfall runoff (tied-ridging), 2) soil fertility(manure and moderate amounts of chemical fertilizers), 3) cereal-legume crop associations, and 4) testing of new varieties.

3 The technique of modified tied ridges consists of creating a small depression between the crop rows either by hand tillage or animal traction. If done by hand tillage, depressions (32 cm long x 24 cm wide x 16 cm deep) are made between rows and spaced 11/2 meters apart. If done by animal traction, the cultivator must be equipped with a middle sweep to create a furrow, then followed by hand tillage to make a 16 cm high ridge perpendicular to the furrow every one to two meters.

AFRICAN UNION UNION AFRICAINE

African Union Common Repository **http://archives.au.int**

Department of Rural Economy and Agriculture (DREA) African Union Specialized Technical Office on Research and Developmer

1984

SUMMARY OF FARMER-MANAGED RESEARCH TRIALS, 1984

Ohm, Herbert W.

AU-SAFGRAD

http://archives.au.int/handle/123456789/5758

Downloaded from African Union Common Repository