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ECONOMIC ASSESMENT OF SOME WEEDING METHODS IN THE PRODUCTION OF SOYBEAN (*Glycine max* (L.) Merr.) AT LAPAI, SOUTHERN GUINEA SAVANNA, NIGERIA

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ABSTRACT

A field trial was carried out in the 2006 and 2007 rainy seasons at the Teaching and Research farm of Ibrahim Badamasi Babangida University, Lapai, Niger State to carry out an economic assessment of some weeding methods in the production of soybean (*Glycine max* (L.) Merr.) at Lapai in the Southern Guinea savanna zone of Nigeria. Treatments consisted of three weeding methods (chemical, hoe, and no - weeding) in a randomized complete block design. Paraquat (N,N′-dimethyl-4,4′-bipyridinium dichloride) was used for the chemical weeding and the hoe-weeding was done two times (at 3 and 5 weeks after sowing (WAS) and three times (at 3, 5 and 7 WAS). In 2006 and 2007 as well as the combined analysis, hoe weeding three times at 3, 5 and 7 WAS produced the highest grain yields, and, on the average, the highest net benefit and marginal rate of return. It is recommended that soybean farmers at Lapai should employ hoe-weeding at 3, 5 and 7 WAS.

KEYWORDS : *Glycine max*, Weeding Method, Nigeria

Soybean (*Glycine max* (L.) Merril) is one of the most important legumes in the world. FAO (2005) reported that the total land area under soybean in the world was 95.2 million ha and the total production was 212.6 million tones. In Africa, soybean was grown on an average of 1.16 million ha with an average production of 1.26 million tones. Nigeria is the highest producer of soybean in Africa, with an average 6-year (2000 to 2005) production of 486,000 tons on an area of 553.26 ha, followed by South Africa with 205.270 tons from 122, 870 ha and Uganda with 155,500 tons from 139,500 ha. In 2009, Nigerian soybean producers harvested an estimated 500,000 tones of soybean (Brader, 2010). It has been estimated that 1.6 million metric tones are needed annually to satisfy Nigerian domestic and industrial needs (Mamman, 1990).

Among the legumes, soybean is pre-eminent for its high protein as well as its high oil content. The protein and oil content together account for about 60% of dry soybean by weight: protein at 40% and oil at 20% (Sodangi et al., 2006). Gesimba and Langat (2005) reported that, among seed oils, soybeans has had an extra-ordinary growth due to rising consumption of livestock products and concurrent rapid growth in meal demand; as well as the fact that it is a cheap source of proteins especially in developing nations.

Soybean is an important food crop for human consumption whose yield up to 80% is lost due to weed competition in many parts of the world (Daugovish et. al., 2003). Sodangi et al. (2006) also reported a soybean yield loss of 90% due to weed infestation in the Sudan Savanna zone of Nigeria. Weeds also cause economic loss in soybean production from the cost of herbicides and/or cultural methods of control that must be used. Soybeans are not strong competitors (Gesimba and Langat, 2005) and therefore the most critical period of weed competition in soybean is the early stage of growth (Sodangi et al., 2007). Sodangi et al. (2007) reported that the critical period of infestation in Sudan Savanna is 3 to 6 weeks after sowing.

In peasant agriculture, weed control is usually achieved by hand-pulling, or hoe-weeding. Manual removal of weeds is the major traditional method of weed control in the tropics (Akobundu, 1987). This is usually done 2 or 3 times for effective weed control (Akobundu and Poku, 1987). Manual weed removal needs proper timing but many farmers do not adhere to this. Thus, the benefits from manual weeding are not fully realized. Apart from the fact that hoe weeding is very laborious and inappropriate for large farms, it makes farming unattractive. Ikuenobe et al. (2005) in their survey found that the use of herbicides, especially non-selective ones by farmers in Nigeria is fast gaining acceptability and is on the increase. Paraquat is a

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non-selective, broad spectrum, contact herbicide used to control a very broad range of weeds in more than 100 crops, including cereals, oilseeds, fruits, and vegetable growing in all climates (www.weedscience.org).

This study was conducted to assess the economic implications of the number of hoe weeding, and to compare paraquat with hoe weeding in controlling weeds in soybean at Lapai in the Southern Guinea savanna of Nigeria.

MATERIALS AND METHODS

The experiment was conducted in the rainy seasons of 2006 and 2007 at the Teaching and Research farm of Ibrahim Badamasi Babangida University, Lapai, Niger state. Soybean cultivar TGX 1830 20E was obtained from the Department of Agronomy, International Institute of Tropical Agriculture (IITA), Ibadan.

Treatments consisted of three weeding methods (chemical weeding, hoe weeding and no weeding). Paraquat (N,N′-dimethyl-4,4′-bipyridinium dichloride) (at the rate of 2.0 a.i. kg ha-1) was applied pre-emergence to the soybean crop for the chemical weed control, using knapsack sprayer. In the hoe weeding treatment, weeding was done twice (at 3 and 5 WAS) and thrice (at 3, 5 and 7 WAS). These treatments were laid out in a randomized complete block design (RCBD). Plots measuring 4 m x 4 m were laid out after ploughing, harrowing and leveling the experimental field. At planting, the seeds were treated with Apron star at the rate of 5 g of chemical to 1 kg of seeds. 4-5 seeds were planted per hole at about 3 cm deep and spaced at 30 cm within rows and 50 cm between rows. Seedlings were thinned to 2 per stand at 2 weeks after sowing (WAS).

The economic assessment was based on the grain yield obtained. Partial budgets involving the analysis of variable input costs and benefits were drawn for all the treatments. Items considered were the gross benefit (N/ha) calculated as yield of soybean (kg/ha) multiplied by market price (N/ha), total cost (N/ha) of all inputs and labour used, and the net benefit (N/ha) calculated as gross benefit less total cost. The marginal rate of return (MRR) was the net benefit divided by total cost. All data collected were subjected to analysis of variance (ANOVA) and differences between means were tested with Duncan Multiple Range Test (DMRT) at 5% level of significance.

RESULTS AND DISCUSSION

In both years and the mean of the 2 years, weed dry matter was significantly higher in the unweeded check than the weeded plots (Table 1). Similarly, in both years and mean, the weed cover score of the check was significantly higher than other treatments. The 2 hoe-weeding and 3 hoe-weeding regimes had statistically similar weed cover scores (Table 1). In this study, the weed control treatments were quite effective in suppressing the weeds and reducing their density and dry weight. The mean figures of the 2 years indicated that hoe weeding three times reduced weed dry weight and weed cover by about 95% and 73% , respectively while hoe weeding two times reduced weed dry weight and weed cover by about 90% and 68% , respectively when compared to the no-weeding treatment. This result is similar to that obtained by Rajput et al. (1993) who reported that application of hand hoeing twice decreased dry weight of weeds associated with Indian

Table 1: Effect of Weeding Methods on Weed Dry Weight And Weed Cover Score In Soybean At Lapai In 2006, 2007 And The Mean of The 2 Years

	Weed dry weight @ 12WAS			Weed score @ 12WAS		
Weeding method	**2006**	**2007**	**Mean**	**2006**	**2007**	**Mean**
Paraquat	164.25	143.00	153.83	3.25	3.25	3.25
Hoe weeding at 3 and 5 WAS	23.0	40.25	31.83	2.25	2.25	2.25
Hoe weeding at 3, 5 and 7 WAS	16.00	16.25	16.13	1.75	2.00	1.88
No weeding	306.50	305.00	305.75	7.00	7.00	7.00
LSD (0.05)	16.12	10.75	11.06	0.67	0.88	0.48

Table 2: Effect of Weeding Methods on Grain Yield of Soybean At Lapai In 2006, 2007 And The Mean of The 2 Years

Weeding method	Grain yield (kg/ha)		
	2006	2007	Mean
Paraquat	805.00	765.00	785.00
Hoe weeding at 3 and 5 WAS	610.00	950.00	780.00
Hoe weeding at 3, 5 and 7 WAS	892.50	1022.50	957.50
No weeding	57.50	72.50	65.00
LSD (0.05)	61.53	153.70	126.40

WAS = weeks after sowing

mustard plants. Similar results were also obtained by Nadeem et al. (2011). Sharm and Jain (2002) also declared that weed management treatments decreased the weed population and weed dry weight and consequently increased the weed control efficiency.

The effect of weeding methods on grain yield in both years and the mean was significant, with hoe-weeding at 3, 5 and 7WAS producing the highest grain yield compared to other treatments (Table, 2). The highest yield obtained by hoe weeding thrice maybe attributed to lower dry matter accumulation by weeds and decrease in their population that helped in increasing the yield attributes which ultimately led to higher yield. This result is similar to those obtained by Mekki et al., (2010). Some workers reported that there was a linear relationship between above-ground weed biomass and crop yield, so weed suppression translated directly in to yield.

In the 2006 planting, paraquat had net benefit and marginal rate of return that were higher than the other treatments (Table, 3). Every N1 expended in this treatment yielded N0.26 as profit. In the 2007 panting, the highest net benefit and marginal rate of return was recorded in the hoe-weeding twice at 3 and 5 WAS treatment. For every N1 expended in this treatment, N0.37 was gained. On the average, hoe-weeding three times at 3, 5 and 7 WAS gave the highest net benefit and marginal rate of return (Table, 3). The net benefits and marginal rates of return were generally low for all the treatments. This was probably due to the fact that the selling price that was used to determine the gross benefits was obtained at harvest. In the unweeded plots, there were losses of N0.82, N0.77 and N0.80 in 2006, 2007 and the mean respectively, for every N1 spent. Findings

Table 3. Grain Yield And Economic Assessment of Weeding Methods on Soybean at Lapai In 2006, 2007 And The Mean of The 2 Years

	2006					2007					Mean				
Weeding method	Grain yield (kg ha^{-1})	Total cost (N/ha)	Gross benefit (N/ha)	Net benefit (N/ha)	MRR[1]	Grain yield (kg ha^{-1})	Total cost (N/ha)	Gross benefit (N/ha)	Net benefit (N/ha)	MRR	Grain yield (kg ha^{-1})	Total cost (N/ha)	Gross benefit (N/ha)	Net benefit (N/ha)	MRR
Paraquat	805.00	48,000.00	60,375.00	12,375.00	0.26	765.00	48,000.00	57,375.00	9,375.00	0.20	785.00	48,000.00	58,875.00	10,875.00	0.23
Hoe weeding at 3 and 5 WAS	610.00	52,094.00	45,750.00	-6,344.00	-0.12	950.00	52,094.00	71,250.00	19,156.00	0.37	780.00	52,094.00	58,500.00	6,406.00	0.12
Hoe weeding at 3, 5 and 7 WAS	892.50	59,141.00	66,937.50	7,796.50	0.13	1022.50	59,141.00	76,687.50	17,546.00	0.30	957.50	59,141.00	74,062.50	14,921.50	0.25
No weeding	57.50	24,086.00	4,312.50	-19,773.5	-0.82	72.50	24,086.00	5,437.50	-18,648.50	-0.77	65.00	24,086.00	4,875.00	-19,211.00	-0.80

Abbreviation: N = Nigerian currency, Naira; WAS = weeks after sowing; 1MRR = marginal rate of return

from this study agree with those of several workers (Sodangi et al., 2006; Sodangi and Gudugi, 2010; Gudugi and Sodangi, (2012) that there are wide ranges in grain yields between weeded and unweeded soybean plots.

CONCLUSION

In 2006 and 2007 as well as the combined analysis, hoe weeding three times at 3, 5 and 7 WAS produced the highest grain yields, and, on the average, the highest net benefit and marginal rate of return. It is recommended that soybean farmers at Lapai should employ hoe-weeding at 3, 5 and 7 WAS.

REFERENCES

Akobundu I. O., 1987. Weed Science in The Tropics. Principles and Practices. Chichester John Wiley and Sons :522.

Akobundu I.O. and Poku J.A., 1987. Weed control in soybean at varying in the tropics. In: soybean For the tropics. Edited by R.S. Singh, K. O. Rachie and K.E. Dashiel, (John Wiley and Sons), New York, U.S.A. : 67-77

Daugovish O., Thil D.C. and Shaft B., 2003. Modeling competition between wild Oat (*Avena fatua* L.) and Yellow Mustard or Canola. Weed Science, **51**: 102-109.

FAO (2005). http/www.fao.org./statistics.

Gesimba R.M. and Langat M.C., 2005. A review on weeds and weed control in oil crops with special reference to soybeans (*Gycine max* L) in Kenya. Agricultura Tropica et subtropica, **32** (2): 56-62.

Gudugi A.S.I. and Sodangi I. A., 2012. Effect of weeding methods on growth and yield of soybean (*Glycine max* (L.) Merr.) in Southern Guinea savanna, Nigeria. International Journal of Food and Agricultural Research, **9**(1): 176-186.

Ikuenobe C.E., Fadayomi O., Adeosun J.O., Gworgwor N.A., Melfonwu A.A. and Ayeni O., 2005. State of adoption of improved weed control technologies by farmers in three agro-ecological zones of Nigeria. Nigerian Journal of Weed Science, **18**:1-19.

Mamman I., 1990. Soybean in Nigeria Agriculture, Paper delivered by the Honourable Minister of Agriculture and Natural Resources at the 3rd Annual conference of Nigeria Soybean Association held at Badeggi, March:26-29.

Mekki B. B., Faida A.A., Sharara K. and El-Rokik G., 2010. Effect of Weed Control Treatments On Yield and Seed Quality of Some Cultivars and Associated Weeds in Newly Reclaimed sandy oils. American-Eurasian Journal of Agriculture and Environmental Science, **7**(2): 202-209.

Nadeem A., Ehsanullah K.J. and Ali M.A., 2011.Weed Management Improves Yield and Quality Of Direct Seeded Rice. Australian Journal of Crop Science. **5** (6):688-694.

Rajput R. L., Gautam D. S. and Verma O. P., 1993. Studies on Cultural and chemical Weed Control In Mustard (*Brassica juncea*). Gujarat Agricultural University, Research Journal,**18**(2):1-5.

Sharma O.L. and Jain N.K., 2002. Effect of Herbicides on Weed Dynamics and Seed Yield of Indian Mustard (*Brassica juncea*). Indian Journal Agricultural Science, **72**(6): 322-324.

Sodangi I.A., Gworgwor N.A. and Joshua, S.D., 2006. Effects of weed interference and inter row spacing on productivity of Soybean (*Glycine max* L.) in Maiduguri, Nigeria. Nigerian Journal of Weed Science, **19**: 33-40.

Sodangi I.A., Gworgwor, N.A. and Joshua, S.D., 2007. Effects of weed interference and narrow row soybean in a semi-arid environment. Production Agriculture and Technology, **3** (2): 117- 123.

Sodangi I. A. and Gudugi A. S. I., 2010. Effects of planting date and weeding method on growth and yield of soybean (*Glycine max* (L.) Merril) at Lapai, Guinea savanna zone of Nigeria. Journal of Arid Agriculture, **19**: 75 - 81

www.weedscience.org