International Journal of Chemical Studies

P-ISSN: 2349–8528
E-ISSN: 2321–4902
IJCS 2019; 7(1): 1570-1575

Received: 15-11-2018
Accepted: 20-12-2018

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Effect of different bio-intensive cropping systems on yield, economics and soil properties of vertisol in Marathwada region of Maharashtra

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Abstract
A field experiment was conducted during 2013-14 to 2015-16 at AICRP on Integrated Farming Systems, Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani to study the effect of different bio-intensive cropping systems on productivity, economics and post harvest soil nutrient status in central plateau zone of Maharashtra. The experiment was laid out in randomized block design with three replications and eight different cropping system treatments on same site with same randomization. Among the different cropping systems treatments planted on broad bed furrow at 1.5m the Maize (*Zea mays* L.) + Soybean (*Glycine max* L.) in furrow sesbania (*Sesbania rostrata* L.) (F) – Chickpea (*Cicer arietinum* L.) (B) + Wheat (*Triticum aestivum* L.) (F) – Cowpea (*Vigna unguiculata* L.) (residue) (B) + Okra (*Abelmoschus esculentus* L.) (F) recorded the higher Soybean Equivalent Yield (6559 kg/ha), and was found at par with planted on narrow bed of 90 cm Maize (F) + Soybean (B) – Chickpea (B) + Rabi Sorghum (F)- Cowpea (B) + Okra (F) (6333 kg/ha). Maize + Soybean in furrow sesbania (F) – Chickpea (B) + Wheat (F) – Cowpea (residue) (B) + Okra (F) recorded highest gross monetary returns (Rs.227.2x10^3), net monetary returns (Rs.152.6 x10^3) and B: C ratio (2.89). The higher system production efficiency (25.18 kg/ha/day) was registered in Cotton (*Gossypium hirsutum* L.) (F) + Soybean (B) - Green gram (*Vigna mungo* L. Wilczek) (B) + Amaranthus (*Amaranthus*) (F) Broad bed furrow at 1.5 m and the lowest was recorded in soybean –wheat cropping sequence (17.33 kg/ha/day). The residual availability of nitrogen, phosphorus and potassium was improved by the incorporation of sesbania before flowering in Pigeon pea (*Cajanus cajan* L.) (B) + Soybean (B) (in furrow Sesbania) - Green gram (B) + Cluster bean (*Cyamopsis tetragonoloba* L.)(F) Broad bed furrow at 1.5 m over the other bio intensive cropping systems during experimentation.

Keywords: bio-intensive cropping systems, economic efficiency, production efficiency

Introduction
The adoption of suitable cropping system plays important role for ensuring the rational use of land and increasing productivity per unit area per unit time. It is possible to enhance the production potential and remuneration with adoption of alternate productive and profitable cropping systems. The Evolution of large number of high yielding short duration varieties has led to substitution of traditional crops with a various crops including vegetables which may generate employment, provide nutrition, security and additional income (Sharma *et al*., 2004) [7]. Most of the conventional cropping system followed in agriculture is not only less remunerative but is also an exhaustive cropping system which warrants the inclusion of legume in the system. Green revolution is the need of enhancing total food grain production; emphasis was given on increasing the cropping intensity and crop productivity. In long term perspective, this approach digressed from the principles of crop production, where the basics of crop rotation and crop sequences played an important role. Under such conditions, introduction of bio-intensive complementary cropping systems is very important which focuses on maximum yields from the minimum area of land, while simultaneously improving and maintaining the fertility of the soil. Increasing cost of cultivation because of linear increase in almost all the inputs and reducing factor productivity due to deterioration of soil has led to low economic returns. The income of the farmers can be increased through inclusion of legumes and high value crops in the cropping systems. In this context, a research project has been conducted to study the feasibility of introduction of bio-intensive alternative crops for the diversification and intensification of the cropping system. In the era of shrinking resource base of land, water and energy, resource use efficiency is an important aspect for considering the

suitability of a cropping system (Yadav, 2002) [11]. Hence, selection of component crops needs to be suitability planned to harvest the synergism and among them towards efficient utilization of resource base and to increase overall productivity. Therefore, the present experiment was carried out to evaluate the most suitable cropping system with respect to high productivity levels and rational use of resources, soil nutrient status at harvest and to test the feasibility and economics of different cropping system.

Material and Methods

A field experiment was carried out during *Kharif, Rabi* and Summer seasons of 2013-14 and 2015-16 at AICRP on Integrated Farming Systems, Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani to study the effect of different bio-intensive cropping systems on yield, economics and soil properties of Vertisol in Marathwada region of Maharashtra. The experiment was laid out in randomized block design with eight treatments and three replications .The eight cropping systems *viz.*, T_0: Soybean- Sorghum, T_1: Cotton - Ground nut, T_2: Soybean – Wheat – Cowpea (veg.), T_3: Cotton (F) + Soybean (B) - Green gram (B) + Amaranthus (F) Broad bed furrow at 1.5 m, T_4: Pigeon pea (B) + Soybean (B) (in furrow Sesbania) - Green gram (B) + Cluster bean (F) Broad bed furrow at 1.5 m, T_5: Maize + Soybean in furrow - Sesbania (F) - Chick pea (B) + Wheat (F) – Cowpea (residue) (B) + Okra veg. (F) Broad bed furrow at 1.5 m, T_6: Pearl millet (F) + Soybean (B) - Chick pea (B) + Mustard (F) - Cowpea (veg.) Broad bed furrow at 1.5 m, T_7: Maize (F) + Soybean (B) - Chick pea (B) + Rabi Sorghum (F) – Cowpea fodder (B) + Okra veg. (F) Narrow Bed Furrow at 90 cm in *kharif, rabi* and summer season respectively. The crop was raised under irrigated condition with the recommended package of practices for respective crops. The details of package of practices are given in Table 1. The soil of the experimental site was clayey in texture pH was 8.1, low in available Nitrogen (169.7 kg/ha), medium in Phosphorus (11.58 kg/ha) and high in potassium (354.65 kg/ha). The prevailing market prices of different commodities were used to work out the economics of different cropping systems, to compare the different crop sequences the yield of all the crops was converted into soybean equivalent yield on price basis. The production efficiency values were obtained by dividing soybean equivalent yield in a sequence by total duration of crop in that sequence (Tomar and Tiwari, 1990) [9] and economic efficiency values (monetary advantage) by dividing gross returns in a sequence by total duration of crop in that sequence (Patil *et al.*, 1995) [6]. The soil samples taken for analysis from 0-15 cm soil layer were analyzed in the laboratory using standard procedures. Available N, P and K were determined by the methods described by Dalal *et al.*, (1984) [1]; Subbiah and Asija (1956) [8]; Olsen *et al.*, (1954) [5], respectively.

Table 1: Treatment details

Treatment No.	Crop Sequence	Season						
		Kharif			*Rabi*		Summer	
		Main crop	Inter crop	Green manuring crop	Main crop	Inter crop	Main crop	Inter crop
T_0	Soybean - Sorghum	Soybean	-		Sorghum	-	-	-
T_1	Cotton - Ground nut	Cotton	-		Cont.	-	Ground nut	-
T_2	Soybean – Wheat – Cowpea (veg.)	Soybean	-		Wheat	-	Cow pea	-
T_3	*Cotton (F) + Soybean (B) - Green gram (B) + Amaranthus (F) Broad bed furrow at 1.5 m	Cotton	Soybean		-	-	Green gram	Ama-ranthus
T_4	*Pigeon pea (B) + Soybean (B) (in furrow Sesbania) - Green gram (B) + Cluster bean (F) Broad bed furrow at 1.5 m	Pigeon pea	Soybean	Sesbania	Pigeon pea		Green gram	Cluster bean
T_5	*Maize + Soybean in furrow - Sesbania (F) - Chick pea (B) + Wheat (F) – Cowpea (residue) (B) + Okra veg. (F) Broad bed furrow at 1.5 m	Maize	Soybean	Sesbania	Chick pea	Wheat	Cow pea	Okra
T_6	*Pearl millet (F) + Soybean (B) - Chick pea (B) + Mustard (F) - Cowpea (veg.) Broad bed furrow at 1.5 m	Pearl millet	Soybean		Chick pea	Mustard	Cow pea	-
T_7	**Maize (F) + Soybean (B) - Chick pea (B) + Rabi Sorghum (F) – Cowpea fodder (B) + Okra veg. (F) Narrow Bed Furrow at 90 cm	Maize	Soybean		Chick pea	Rabi Sorghum	Cow pea	Okra

Planting on Broad bed furrow at 1.5 ** Planting on Narrow Bed Furrow at 90 cm

Results and Discussion

Grain yield:

The results obtained from the pooled data are incorporated in table 2 revealed that during *kharif* season, higher yield of 4166.2 + 778.6 was recorded in Maize + soybean planted in broad bed furrow at 1.5m followed by maize (F) + soybean (B) (4116.6+839.6). The lower yield was recorded in pearl millet (F) + soybean (B) (1648.6+1177.1). During *Rabi*, wheat crop outperformed other crops. With regard to summer season crops, cowpea recorded higher yield of 4561.3 kg/ha and lower yield of 513.2kg/ha was recorded in green gram. In all the seasons maize, wheat and cowpea registered higher yields indicating the profitable nature.

Table 2: Grain yield (kg/ha) of the different crop sequences for the year 2013-14, 2014-15 and 2015-16

Tr. No.	Crop Sequence	2013-14							2014-15							2015-16						
		Grain yield (kg/ha)																				
		Kharif			Rabi		Summer		Kharif			Rabi		Summer		Kharif			Rabi		Summer	
		Main crop	Inter crop	GM	Main crop	Inter crop	Main crop	Inter crop	Main crop	Inter crop	GM	Main crop	Inter crop	Main crop	Inter crop	Main crop	Inter crop	GM	Main crop	Inter crop	Main crop	Inter crop
T0	Soybean - Sorghum	2653			3056				2099			3095.24				1832			2909			
T1	Cotton - Ground nut	2667					2049		2397					1995		2044					1853	
T2	Soybean – Wheat – Cowpea (veg.)	2680			3405			6378	2105			3267.20		6348		1772			3208		582	
T3	*Cotton (F) + Soybean (B)- Green gram (B)+ Amaranthus (F) Broad Bed Furrow at 1.5 m	2804	1250				778	443	2167	1052				720	590	1964	906				643	447
T4	*Pigeon pea (B) + Soybean (B) (in furrow Sesbania) - Green gram (B)+ Cluster bean (F) Broad Bed Furrow at 1.5 m	1931	860	4379			652	2239	1802	661	4055			605	2313	1693	725	4101			2829	2155
T5	*Maize+ Soybean in furrow - Sesbania (F) - Chick pea (B) + Wheat (F) – Cowpea (Veg.) (B) + Okra (F) Broad Bed Furrow at 1.5 m	4307	897	4454	1476	1488	6883	3019	4442	698	4032	1497.35	1476	6795	7513	3750	741	4074	1351	1292	6185	6825
T6	*Pearl millet (F) + Soybean (B) - Chick pea (B)+ Mustard (F) - Cowpea(veg.) Broad Bed Furrow at 1.5 m	1537	1524		1458	900	4599		1919	1055		1035.71	898	6274		1490	952		1259	806	2811	
T7	**Maize (F) + Soybean (B) - Chick pea (B) + Rabi Sorghum (F)– Cowpea fodder (B) + Okra (F) Narrow Bed Furrow at 90 cm	4431	1071		1491	1892		3250	4286	646		1056.88	1872		7431	3624	802		1269	1634	2811	6657

Soybean equivalent yield

The pooled data on (table 3) SEY of different cropping systems showed that maize + soybean in furrow - sesbania (F) - chick pea (B) + wheat (F) – cowpea (residue) (B) + okra (F) broad bed furrow at 1.5 m cropping system produced significantly higher soybean equivalent yield of 6559 kg/ha and it was comparable with maize (F) + soybean (B) - chick pea (B) + rabi sorghum (F) – cowpea fodder (B) + okra (F) narrow Bed Furrow at 90 cm at 1.5 m cropping system (6333kg/ha). The higher SEY in maize + soybean in furrow - sesbania (F) - chick pea (B) + wheat (F) – cowpea (residue) (B) + okra (F) broad bed furrow at 1.5 m cropping system,

Okra and cowpea have the high price of the produce. The insertion of maize in the cropping system increased the productivity of respective cropping systems. However inclusion of cowpea as main or intercrop in the cropping system was observed to increase the productivity of system level reflected on the worked out SEY. Whereas, the lower SEY of 3887 kg/ha was recorded in the soybean-sorghum cropping sequence due to low yield and prices. Similar results were reported by Sharma *et al.*, (2004) [7] in the rice- potato-onion system.

Table 3: Soybean equivalent yield, System Productivity (kg/ha) and Production Efficiency (kg/ha/day) as influenced by different cropping systems for the year 2013-14, 2014-15 and 2015-16

Treatment	Crop Sequence	Soybean equivalent yield (Kg/ha)				Production Efficiency (kg/ha/day)			
		2013-14	2014-15	2015-16	Pooled mean	2013-14	2014-15	2015-16	Pooled mean
T_0	Soybean - Sorghum	4360	3924	3678	3987	18.96	17.06	15.99	17.33
T_1	Cotton - Ground nut	6187	5587	5952	5909	22.66	20.47	23.25	22.12
T_2	Soybean – Wheat – Cowpea(veg.)	5570	5242	4787	5200	19.54	18.39	17.10	18.34
T_3	*Cotton (F) + Soybean (B)- Green gram (B)+ Amaranthus (F) Broad Bed Furrow at 1.5 m	6447	5261	5916	5875	27.44	22.39	25.72	25.18
T_4	*Pigeon pea (B) + Soybean (B) (in furrow Sesbania) - Green gram (B)+ Cluster bean (F) Broad Bed Furrow at 1.5 m	4812	4444	6321	5192	16.94	15.65	28.73	20.44
T_5	*Maize+ Soybean in furrow -Sesbania (F) - Chick pea (B) + Wheat (F) – Cowpea (Veg.) (B) + Okra (F) Broad Bed Furrow at 1.5 m	5724	6784	7169	6559	17.89	21.20	22.40	20.49
T_6	*Pearl millet (F) + Soybean (B) - Chick pea (B)+ Mustard (F) - Cowpea(veg.) Broad Bed Furrow at 1.5 m	5791	5687	6339	5939	25.40	24.94	21.49	23.94
T_7	**Maize (F) + Soybean (B) - Chick pea (B) + Rabi Sorghum (F)– Cowpea fodder (B) + Okra (F) Narrow Bed Furrow at 90 cm	6245	6291	6463	6333	19.22	19.36	19.29	19.28
SE ±		112	165	180	311	0.41	0.47	0.65	1.79
C.D.at 5 %		327	354	468	943	1.22	1.44	1.99	5.44
G mean		5642	5402	5828	5624	21.00	19.93	21.74	20.89

Prices of grain and straw (Rs/kg): Soybean Grain : 34.56, Straw :0.59, Cotton Seed :42.98, Straw :0.90, pigeonpea seed :47.33, straw:0.60, Maize seed: 12.78, straw: 1.77, Pearl millet seed: 26.83, straw :0.50, Rabi sorghum seed:15.65, straw :2.62, Wheat seed:16.25, straw :0.67 Chickpea seed :37.87, straw :0.52, Mustard seed :33.50, straw :0.50, Ground nut seed :48.37, straw :2.37, Cowpea seed:7.33, straw :0.567, Green gram seed :62.65, straw :0.48, Amaranthus seed :22.33, straw : 0.47, Cluster bean seed :10, straw :0.50 and okra seed :8.87, straw :0.52.

Production efficiency

The production efficiency was recorded higher in by cotton (F) + soybean (B) - green gram (B) + amaranthus (F) broad bed furrow at 1.5 m (25.18 kg/ha/day) followed pearl millet (F) + soybean (B) - chick pea (B) + mustard (F) - cowpea (veg.) broad bed furrow at 1.5 m (23.94 kg/ha/day). In general, the crop sequences which included vegetable crops recorded higher values of system productivity. Kharub *et al.*, (2003) [2] and Sharma *et al.*, (2004) [7] reported higher production with rice based crop sequences including vegetable and pulse crops. Whereas in economic efficiency, cotton (F) + soybean (B) - green gram (B) + amaranthus (F) Broad bed furrow at 1.5 m. registered higher economic efficiency of Rs.894.6/ha/kg over the other cropping systems, except cotton- groundnut cropping system. The soybean – sorghum registered the lower economic efficiency (620.9 kg/ha/day) among the different cropping systems. Since these systems include crops which are cash ensuring and fetch more returns per unit of area and time. These findings are in close agreement with Walia *et al.*, (2000) [10]

Economics

Considering the economics among the different cropping systems (Table 4), resulted that the highest gross returns 227.2x 10^3 ₹/ha)) were recorded with maize + soybean in furrow - sesbania (F) - chick pea (B) + wheat (F) – cowpea (residue) (B) + okra (F) broad bed furrow at 1.5 m followed by maize (F) + soybean (B) - chick pea (B) + rabi sorghum (F) – cowpea fodder (B) + okra (F) narrow bed furrow at 90 cm with 218.8 x 10^3 ₹/ha). Maize + soybean in furrow - sesbania (F) - chick pea (B) + wheat (F) – cowpea (residue) (B) + okra (F) broad bed furrow at 1.5 m cropping system recorded the highest annual net return of 152.6x 10^3 ₹/ha) with the B:C ratio of 3.18. The next best system was cotton (F) + soybean (B) - green gram (B) + amaranthus (F) broad bed furrow at 1.5 m which registered an annual net returns of 139.2 x 10^3 ₹/ha) and B: C ratio of 3.05 followed by maize (F) + soybean (B) - chick pea (B) + rabi sorghum (F) – cowpea fodder (B) + okra veg. (F) narrow bed furrow at 90 cm with Rs.139.1x 10^3 ₹/ha) and B: C ratio of 2.59. Whereas, pearl millet (F) + soybean (B) - chick pea (B) + mustard (F) - cowpea (veg.) broad bed furrow at 1.5 m cropping system registered 136.6x 10^3 ₹/ha) as annual net returns with the B: C ratio of 3.00. Mandal *et al.* (2011) [4] reported that diversified cropping systems (peanut- brinjal –brinjal, rice-potato – pumpkin and cucumber-cabbage-basella) required higher cost of cultivation but also produced higher rice equivalent yield, higher net return and higher net return per rupee invested.

Table 4: Individual GMR, COC, NMR and pooled mean of the different crop sequences for the year 2013-14, 2014-15 and 2015-16

Treatment	Crop sequences	GMR (x 10^3 ₹/ha)				NMR(x 10^3 ₹/ha)				B:C ratio on GMR			
		2013-14	2014-15	2015-16	Pooled mean	2013-14	2014-15	2015-16	Pooled mean	2013-14	2014-15	2015-16	mean
T_0	Soybean - Sorghum	144.2	139.3	129.0	137.5	54.3	56.8	59.5	56.9	1.74	2.45	2.17	2.12
T_1	Cotton - Ground nut	204.6	198.3	208.8	203.9	67.1	68.5	68.9	68.2	2.30	2.89	3.03	2.74
T_2	Soybean – Wheat –	184.2	186.0	167.9	179.4	58.5	61.1	62.1	60.6	2.06	3.04	2.70	2.60

	Cowpea (veg.)												
T_3	*Cotton (F) + Soybean (B)- Green gram (B)+ Amaranthus (F) Broad Bed Furrow at 1.5 m	213.2	186.7	207.6	202.5	61.6	64.0	64.3	63.3	3.00	2.92	3.23	3.05
T_4	*Pigeon pea (B) + Soybean (B) (in furrow Sesbania) - Green gram (B) + Cluster bean (F) Broad Bed Furrow at 1.5 m	159.1	157.7	221.7	179.5	74.6	74.1	75.1	74.6	1.89	2.13	2.95	2.32
T_5	*Maize+ Soybean in furrow -Sesbania (F) - Chick pea (B) + Wheat (F) – Cowpea (Veg.) (B) + Okra (F) Broad Bed Furrow at 1.5 m	189.3	240.8	251.5	227.2	72.3	75.6	75.9	74.6	2.17	3.18	3.31	2.89
T_6	*Pearl millet (F) + Soybean (B) - Chick pea (B)+ Mustard (F) - Cowpea(veg.) Broad Bed Furrow at 1.5 m	191.5	201.8	222.4	205.2	66.3	69.5	70.2	68.6	2.94	2.90	3.17	3.00
T_7	**Maize (F) + Soybean (B) - Chick pea (B) + Rabi Sorghum (F)– Cowpea fodder (B) + Okra (F) Narrow Bed Furrow at 90 cm	206.5	223.3	226.7	218.8	77.7	80.2	81.2	79.7	2.21	2.78	2.79	2.59
SE ±		3.56	4.14	5.41	10.93	3.56	4.14	5.41	10.93				
C.D.at 5 %		10.82	12.57	16.42	33.12	10.82	12.57	16.42	33.12				

Soil fertility

A perusal of data in table 5 showed that the available N, P and K of osil after harvest of different cropping systems differed significantly among each other. the end of the cropping cycle, pigeon pea (B) + soybean (B) (in furrow sesbania) - green gram (B) + cluster bean (F) broad bed furrow at 1.5 m cropping sequence registered higher available N (188.6 kg/ha). The higher P of 13.6 was available in the soybean – wheat – cowpea (veg.) cropping system whereas higher available K is registered in cotton (F) + soybean (B) - green gram (B) + amaranthus (F) Broad bed furrow at 1.5 m with 375.7 kg/ha. the lower available N (167), P (11.8) and K (359.1) were recorded in maize (F) + soybean (B) - chick pea (B) + rabi sorghum (F) – cowpea fodder (B) + okra veg. (F) narrow bed furrow at 90 cm, maize + soybean in furrow - sesbania (F) - chick pea (B) + wheat (F) – cowpea (residue) (B) + okra veg. (F) broad bed furrow at 1.5 m and pearl millet (F) + soybean (B) - chick pea (B) + mustard (F) - cowpea (veg.) broad bed furrow at 1.5 m respectively. Changes in nutrient status of soil under different cropping systems over the years showed that the systems had exhaustive crops which resulted in decrease in available nutrients in the soil. Inclusion of sesbania as green manure in the cropping system increases the availability of N, P and K levels of soil by secretions of organic acids, oxalic acids etc. These observations are in agreement with those of Mahapatra *et al.,* (2002) [3]. The sequences that included legume crops also showed an improvement in nutrients status of soil.

Table 5: Soil fertility status of different crop sequences

Treatment	Crop Sequences	Available N Kg/ha			Mean	Available P Kg/ha			Mean	Available K Kg/ha			Mean
		2013-14	2014-15	2015-16		2013-14	2014-15	2015-16		2013-14	2014-15	2015-16	
T_0	Soybean - Sorghum	173.55	180.80	180.01	178.12	12.35	13.50	13.81	13.22	365.36	366.00	363.71	365.02
T_1	Cotton - Ground nut	180.55	185.50	184.84	183.63	12.65	13.60	14.52	13.59	370.16	371.10	370.41	370.56
T_2	Soybean – Wheat – Cowpea(veg.)	184.68	188.60	182.42	185.23	12.50	13.80	13.34	13.21	368.78	366.60	364.62	366.67
T_3	*Cotton (F) + Soybean (B)- Green gram (B)+ Amaranthus (F) Broad Bed Furrow at 1.5 m	177.15	172.30	180.90	176.78	12.54	13.90	13.41	13.28	368.16	367.80	364.91	366.96
T_4	*Pigeon pea (B) + Soybean (B) (in furrow Sesbania) - Green gram (B)+ Cluster bean (F) Broad Bed Furrow at 1.5 m	186.50	190.60	186.65	187.92	13.08	14.08	14.51	13.89	378.65	372.80	372.51	374.65
T_5	*Maize+ Soybean in furrow -Sesbania (F) - Chick pea (B) +	176.25	175.30	176.51	176.02	11.50	12.00	12.32	11.94	372.58	370.90	366.93	370.14

	Wheat (F) – Cowpea (Veg.) (B) + Okra (F) Broad Bed Furrow at 1.5 m												
T_6	*Pearl millet (F) + Soybean (B) - Chick pea (B)+ Mustard (F) - Cowpea(veg.) Broad Bed Furrow at 1.5 m	174.08	172.60	170.22	172.30	11.70	12.60	13.12	12.47	360.07	358.07	351.15	356.43
T_7	**Maize (F) + Soybean (B) - Chick pea (B) + Rabi Sorghum (F)– Cowpea fodder (B) + Okra (F) Narrow Bed Furrow at 90 cm	168.75	165.20	163.91	165.95	12.70	11.80	11.81	12.10	368.75	366.00	362.51	365.75
SE ±		3.28	1.03	2.84	2.56	0.42	0.31	0.51	0.47	15.30	13.10	10.25	12.36
C. D. at 5%		10.47	3.92	6.20	5.68	1.28	0.95	1.12	1.10	NS	NS	NS	NS
Initial Values		169.75				11.58				354.65			

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