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REVIEW

CONTRIBUTIONS OF THE NATIONAL SCIENCE FOUNDATION TO AGRICULTURAL RESERCH IN SRI LANKA

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Summary: Agricultural Science is one of the fifteen fields receiving support for research by the National Science Foundation (NSF). Since the inception of the research grant scheme in 1970 by the then National Science Council (NSC) and its successors the Natural Resources, Energy and Science Authority (NARESA) and the National Science Foundation (NSF[**]), a total of 115 grants in the field of agricultural science have been awarded at a cost of Rs. 15.9 million in local funds up to 1997. Of the grants awarded in agriculture-related fields, the highest funding has been on fruit crops (26.5%) followed by cereals (19.9%), plantation crops (13.1%), vegetable crops(5.50%), grain legumes (4.4%), tuber crops (4.0%) and export agricultural crops (2.6%). Other categories of crops received less than 2% funding. In terms of disciplines, Post-harvest Technology, Biotechnology, Genetics & Plant Breeding, Soil Science, Agricultural Engineering & Machinery and Agronomy have received relatively high funding and have respectively accounted for 30.6, 16.4, 16.1, 9.0, 6.3 and 4.6 % of funds. Of the 115 grants funded, only 8 (6.9%) were related to animal science.

In terms of institutions, the Faculties of Agriculture in the Universities have received about 75% of funding while the National Agricultural Research System (NARS) has received about 25%. Since the Faculties of Agriculture receive only a nominal sum for research through their regular budgetary allocation, the NSF has been a very important source of funding for research in the faculties of Agriculture in the country, which have about 250 staff members or about 40% of the agricultural scientists in the country. The NSF has been the principal source of funding for agricultural research in the country until the establishment of the Council for Agricultural Research Policy (CARP) in 1987. As opposed to the NSF, the CARP funding has been mainly (i.e.>80%) to the NARS.

The research grant scheme of the NSF and the activities connected thereto have contributed substantially to the promotion of scientific and intellectual activities among agricultural scientists, advancement and dissemination of knowledge, development of human resources/postgraduate training, establishment of professional contacts and reinforcement of research capabilities and laboratory facilities of institutions. Thus the NSF has made a singular contribution not only in supporting and advancing agricultural research in the country, but also in strengthening research capabilities and laboratory facilities of the NARS

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** In all future references to "NSF" no distinction is made between NSF and its predecessors, NARESA & NSC

and the Faculties of Agriculture. With the advent of globalization, the agriculture sector will face formidable challenges and threats. Hence, the NSF research grant scheme will become still more relevant and important in the future. Therefore the NSF may augment its research funding for basic, applied and adaptive research related to agricultural issues in order to meet challenges in the agriculture sector of the country in the twenty first century.

Key words: Agricultural Sciencies, Council for Agricultural Reserch Policy, National Science Foundation, Research grants

INTRODUCTION

Sri Lanka covers an area of 65,611 square kilometers (6.5 million ha) of which about 22,400 square kilometers (2.3 million ha) are agricultural lands. Agriculture is still the mainstay of the economy as well as the main source of employment in Sri Lanka. But, the contribution of the agriculture sector to GDP has gradually declined from 38% in 1960 to 28% in 1984 and to 18.8% in 1997, showing the diversification of the economy. Similarly the employment in agriculture which accounted for 53% in 1960, declined to 45% in 1980 and to about 38% in 1997.[1]

During the past 30 years or so, the domestic agriculture sector has grown faster than the plantation sector. The paddy sector has grown by 2.3 per cent per annum achieving near self-sufficiency. The subsidiary food crops and minor export crops sub-sectors have grown by 4.4 per cent. During this period, the tea sector has grown by 1.3 per cent per annum, rubber output declined by 0.6 per cent per annum and coconut increased by 1.6 per cent per annum.[1] However, about 75 per cent of the Sri Lankan population still live in rural areas. Therefore improvement of productivity in the agriculture sector is vital to achieving faster economic growth and raising the living standards of the rural folk in the country.

Agricultural research in Sri Lanka

Agricultural research in Sri Lanka is carried out by 22 institutions and departments coming under eight Ministries[2] (Table 1). Thus the institutions carrying out agricultural research in Sri Lanka are 'scattered' over many Ministries, rendering co-ordination difficult. As a result, the research activities in the country have been conducted in a very uncoordinated manner resulting in fragmented research with inadequate linkages within the Ministries and between the Ministries and the research institutions. A major constraint in the agriculture research system has been the absence of a mechanism for coordinating and consolidating research efforts, identifying national research needs and establishing priorities consistent with the needs. Besides, until recently, research information has not been collected, analyzed and interpreted in a manner that enables it to reach the levels where decisions are made on priorities and appropriation of funds.[4] These issues are now being addressed by the Council

for Agricultural Research Policy (CARP) since its establishment in 1987. However, the agricultural researches conducted in the University system are still mainly individual-driven with little or hardly any focus on national priorities.

Table 1: Ministries and Departments/ Institutions undertaking research in Agricultural Science (Gunasena and Marambe, 1998, adapted from Senanayake,1990)

Ministries	Departments/Institutions
Agriculture and Lands	Department of Agriculture, Department of Export Agriculture, HectorKobbekaduwa Agrarian Research & Training Institute
Plantation Industries	Tea, Rubber, Coconut and Sugar cane Research Institutes, Department of Wildlife Conservation
Livestock Development and Estate Infrastructure	Department of Animal Production & Health, Veterinary Research Institute
Environment and Forestry	Forest Department
Fisheries and Aquatic Resources Development	National Aquatic Resources Reserarch and Development Agency (NARA)
Irrigation, Power and Energy	Irrigation Department
Science and Technology	Industrial Technology Institute (former CISIR)
Education and Higher Education	Faculties of Agriculture at Peradeniya, Ruhuna, Eastern, Jaffna,Wayamba and Rahangala Faculty of Veterinary Medicine & Animal Science, Postgraduate Institute of Agriculture

Besides, the interaction between the Secretaries to the Ministries and the Directors of research institutions or departments is still mainly concerned with financial and administrative matters and little time is spent on review of research programmes and priorities. Poor research infrastructure and inadequacy of operating funds are also major constraints for research.

Until recently, research programmes have been concentrated mainly on rice, tea, rubber and coconut. Research effort on rice has produced tangible results, achieving near self-sufficiency. There have been many noteworthy achievements in research on major agricultural crops, which have been reviewed in detail.[5-7] During the last decade or so, the yields of the major agricultural crops have not been increasing and the productivity has been stagnant.

Contribution of NSF in supporting agricultural research in Sri Lanka

Before the establishment of the National Science Council (NSC) in 1968, there was no institution in the country that provided funds for agricultural research. Thus the staff in the agricultural institutions had to totally depend on the funds received from the Treasury for agricultural research. The staff of the Faculty of Agriculture, University of Peradeniya, the only Faculty of Agriculture that existed in the country until 1978, had no source of funding for research. As a result, their research activities had been seriously constrained.

In such circumstances, the establishment of the NSC in 1968, *inter alia*, to provide funds for research has administered a fillip to conducting agricultural research in the country. Information on the number of applications received, the number and value of grants awarded in the field of agriculture and animal husbandry by the NSF during the period of 1982 to 1999 is given in Table 2. This field has accounted for 17% of the total applications received and 10% of the total funds disbursed for research by the NSF during the above period. Due to poor quality of the research proposals received, no research grants were awarded in 1993 and 1994. Recognizing this issue, the then Steering Committee on Agriculture and Animal husbandry organized a series of seminars for the young scientists and researchers on "Preparation of project proposals and final reports." The highest number of applications (i.e. 26) has been received in 1988 after which it has shown a declining trend, and in 1999, this has reduced to three. This has been in spite of the fact that the strength of research officers and scientists in agriculture-related fields in the country has increased since 1987. With the advent of the research grant scheme of CARP following its establishment in 1987, agricultural scientists have submitted a large number of research proposals to CARP which exclusively funds agricultural-research that fall in line with national priorities. This has resulted in a low number of applications being received by the NSF after 1987.

A sharp increase in the value of grants awarded is evident from 1995 onwards which has been as a result of the NSF receiving more funds for research from the Treasury. For instance, the NSF received a sum of Rs. 4.9 million for research in 1994 which was increased to 21.8 million in 1995 and to Rs. 32.0 million in 1999. Out of 248 proposals received in the field of agriculture and animal husbandry from 1982 to 1999 only 67 proposals, about 27 per cent of the proposals

Table 2: Applications received and number and value of grants awarded by the NSF in the field of agriculture and animal husbandry from 1982-1999[a]

Year	No. of applications received in agriculture and animal husbandry	Total number of applications received in all fields	No. of research grants awarded in agricultural & animal husbandry	Total number of grants awarded in all fields	Value of the grants awarded in agriculture & animal husbandry (Rs.)	Total value of the grants in all fields (Rs.)
1982	20 (35.7)	56	04 (6.6)[b]	61	112,390 (10.8)	1,032,689
1983	17 (18.1)	94	10(12.4)	81	331,330 (9.8)	3,391006
1984	15 (15.0)	100	07(11.9)	59	175,000 (14.6)	1,201,675
1985	21 (22.1)	95	05 (8.3)	60	342,850 (12.8)	2,672,579
1986	13 (15.5)	84	05(11.9)	42	331,370 (13.5)	2447,101
1987	25 (17.2)	145	02 (4.9)	41	213,700 (7.4)	2,924,301
1988	26 (19.7)	132	08(13.6)	59	1,226,570 (25.8)	4,748,309
1989	20 (18.7)	107	02 (4.4)	46	223,325 (7.3)	3,050,038
1990	16 (20.0)	80	03 (6.5)	46	559,380 (16.2)	3,456,863
1991	6 (11.1)	54	02 (4.4)	45	132,000 (6.2)	2,135,890
1992	15 (24.6)	61	04 (6.4)	63	443,049 (26.2)	1,694,089
1993	11 (22.9)	48	00 (0.0)	19	0	2,149,550
1994	7 (10.6)	66	00 (0.0)	22	0	1,439.540
1995	8 (13.6)	59	04 (4.9)	81	1,971,000 (7.9)	24,983,294
1996	10 (15.6)	64	03 (6.8)	44	1,367,000 (7.1)	19,393,751
1997	9 (12.5)	72	04(12.1)	33	5,108,550 (34.8)	14,698,356
1998	6 (6.3)	96	03 (6.8)	44	1,688,618 (7.3)	23,059,453
1999	3 (7.9)	38	01 (1.9)	53	342,000 (1.5)	22,262,425
Total	248 (17.09)	1451	67 (7.5)	899	14,568,132 (10.5)	136,739,909

a- Although the research grant scheme was established in 1970, no records have been maintained fieldwise by the NSF until 1982. Thus it was difficult to retrieve relevant information for the period of 1970-1981

b- value in parenthesis show the percentage of the total

submitted, have been funded. Poor formulation of research proposals, lack of scientific merit, lack of relevance to national priorities, non-submission of revised proposals taking into account the referees' comments etc. have been the major causes for rejection of research proposals. Since the inception of the research grant scheme in 1970, the NSF has awarded a total of 115 research grants in the field of Agriculture up to 1997, amounting to a total sum of Rs. 15,981,471 (Table 3).

(a) Commodity-wise funding

Breakdown of the NSF-funded research on major categories of crops and livestock during the period of 1970-1997 is given in Table 3. As evident therefrom, major funding in terms of the number of grants has been on cereals (18), legumes (15), plantation crops (11), export agricultural crops (8), vegetables crops (7) and fruit crops (6). They accounted for 15.7, 13.0, 9.6, 7.0, 6.1 and 5.2 per cent of the total number of grants awarded, respectively. Of the 18 grants on cereals, 16 have been on rice, thus only two grants have been awarded on other cereals. Thus as a single crop, rice has received the highest number of grants accounting for 13.9 per cent of the total grants awarded by the NSF up to 1997. The number of grants on other individual crops has been few.

As regards the amount of funds provided, the highest was for fruit crops (26.5%) followed by cereals (19.9%), plantation crops (13.1%), vegetable crops (5.5%), grain legumes (4.4%), tuber crops (4.0%), export agricultural crops (2.6%), medicinal plants (1.3%) and sugarcane (0.2%).

With regard to crops such as tea, rubber, coconut, sugar cane and cashew, there are separate research institutes mandated to carrying out relevant research on their production, processing and marketing aspects. Funds for these purposes are provided by the respective institutes, though it may not be adequate. However, when other agricultural crops are concerned, they mainly come under the Department of Agriculture and Department of Export Agriculture where each department has a large number of mandatory crops with the former dealing with over 60. In such situations, these departments may not be able to provide funds for necessary research even on some high priority crops. For example, though it is claimed that Sri Lanka is almost self-sufficient in rice, it has a huge cereal deficit and imports wheat and maize at a cost of about Rs.10 billion annually, which currently accounts for about 20% of the total cost of food imports. But as indicated above, of the 18 grants awarded by the NSF on cereals during the period of 1970 - 1997, 16 have been on rice. Thus there has been hardly any research funding on other cereals such as maize, finger millet etc., which prove very important in import substitution, saving foreign exchange and ensuring food security. Of the 115 grants awarded only 8 (7%) have been on livestock (Table 3). Given the economic, social and nutritional importance of the livestock sector, the number of research grants in this sector has been disturbingly low.

Table 3: NSF research grants categorised into commodities during the period of 1970-1997

Commodity	Grants awarded		Value of grants awarded	
	(No)	(%)	(Rs.)	(%)
Crops				
Plantation crops	11	9.6	2,088,500	13.1
Cereals	18	15.7	3,178,473	19.9
Paddy	16	13.9	2,985,473	18.7
Other cereals	2	1.7	192,810	1.2
Tuber crops	3	2.6	644,700	4.0
Grain legumes	15	13.0	703,605	4.4
Vegetable crops	7	6.1	881,762	5.5
Export agricultural crops	8	7.0	416,168	2.6
Sugar cane	4	3.5	29,200	0.2
Medicinal plants	1	0.9	202,000	1.3
Fruit crops	6	5.2	4,238,279	26.5
Livestock				
Dairy	1	0.9	9,940	0.1
Rabbit	1	0.9	113,000	0.7
Pigs	2	1.7	286,700	1.8
Buffalo	1	0.9	143,700	0.9
Fish	1	0.9	127,000	0.8
Other	2	1.7	109,273	0.7
Non-commodity	34	29.6	2,809,170	17.6
Total	115	100.0	15,981,471	100.0

(b) Discipline-wise funding

Breakdown of the NSF- funded research grants awarded during the period of 1970-1997 in terms of major disciplines, is given in Table 4. Both in terms of the number of grants awarded as well as the level of funding, the highest was in agronomy which accounted for 27% of the grants awarded. Genetics & plant breeding, post-harvest technology, entomology, pathology, agricultural engineering and soil science have been the other major disciplines that received relatively high funding.

Table 4: NSF research grants categorised into disciplines during the period of 1970-1997

Discipline	Grants awarded (No.)	(%)	Value of grants awarded (Rs.)	(%)
Agronomy	31	27.0	729,325	4.6
Genetics & Breeding	13	11.3	2,577,550	16.1
Entomology	7	6.1	579,535	3.6
Pathology	7	6.1	328,996	2.1
Post harvest technology	10	8.7	4,889,420	30.6
Extension & marketing	2	1.7	35,200	0.2
Agricultural Engineering & machinery	7	6.1	1,003,652	6.3
Soil Science	6	5.2	1,431,384	9.0
Biotechnology	3	2.6	2,622,912	16.4
animal Science	8	7.0	1,101,315	6.9
Other	21	18.3	682,181	4.3
Total	115	100.0	15,981,471	100.0

Recipient institutions of NSF-funded research grants

The number and value of research grants awarded by the NSF to the Universities and National Agricultural Research System (NARS) from 1970-1997 in agriculture-related fields are given in Table 5. Of the total of 115 grants awarded, the Universities-mainly Faculties of Agriculture, have received 85 (73.3%) while other institutes/NARS have received only 31 grants (26.7%). Thus the Universities have received about 75% of the total funds disbursed while the NARS receiving around 25%.

The total strength of the academic staff in Faculties of Agriculture in the University System, including the Postgraduate Institute of Agriculture is about 250, of which 123 have Ph Ds and 53 have Master's degrees.[2] On the other hand, the NARS has a total of 116 Ph D degree holders and about 180 Master's degree holders. Therefore the Faculties of Agriculture in the University system constitute a vast trained human resource base in the agriculture sector of Sri Lanka. The NARS is funded through the Treasury and its total allocation for research exceeds Rs. 80-85 million per year. However, the University staff gets very little funds from the University for research. For instance, the Faculty of Agriculture at the University of Peradeniya with a total staff strenth of over

Table 5: NSF Research grants to Universities and NARS* from 1970-1997 in agriculture-related fields

Time period	No. of grants awarded**			Value of grants awarded (Rs. 000')		
	Universities	NARS	Total	Universities	NARS	Total
1970-1974	10 (83.3) ***	02 (16.7) ***	12	105 (64.8)***	57 (35.2)***	162
1970-1974	22 (73.3)	08 (26.7)	29	830 (72.7)	311 (27.3)	1,141
1981-1984	16 (61.5)	10 (38.5)	26	542 (83.4)	108 (16.6)	650
1985-1990	20 (71.4)	08 (28.6)	28	2,178 (62.7)	1,295 (37.3)	3,473
1991-1997	17 (85.0)	03 (15.0)	20	7,670 (80.1)	1,908 (19.9)	9,578
Total	85 (73.3)	31 (26.7)	115	11,325 (75.5)	3,679 (24.5)	15,004

* This includes Department of Agriculture , Department of Export Agriculture, Tea Research Institute, Rubber Research Institute, Coconut Research Institute, Sugar cane Research Institute, Department of Animal Production & Health, Veterinary Research Institute, National Aquatic Resources Research & Development Agency and Forest Department

** Excluding research grants funded by the CIDA, USAID administrated by the NSF

*** Values in parenthesis show the percentage of the total

100 receives about Rs. 500,000 annually for staff research, and the Faculty of Agriculture at the University of Ruhuna with about 30 staff members gets about Rs. 250,000 per year. This amounts to only about Rs. 5,000-8,000 per head per year which is hardly adequate to do any useful research. Thus NSF has been a very important source of funding for research for the University staff. These grants, besides addressing issues in agriculture, have greatly helped to enhance the research capabilities, training including post-graduate studies of the University staff and to imporve infrastructure/ laboratory facilities in the Faculties of Agriculture in the country.

Table 6: Relative contributions of the NSF and CARP to funding agricultural research from 1990-1998

Year	NSF Funding (Rs.)	(%)	CARP Funding (Rs.)	(%)	Total (Rs.)
1990	559,380	3.7	14,605,567	96.0	15,164,947
1991	309,660	0.9	35,512,149	99.1	35,821,809
1992	556,049	1.8	30,541,578	98.2	31,097,627
1993	-	-	16,793,260	100.0	16,793,260
1994	-	-	24,746,865	100.0	24,746,865
1995	1,971,000	15.9	10,440,296	84.1	12,411,296
1996	1,367,000	10.0	12,341,321	99.0	13,708,321
1997	5,108,550	29.0	12,441,400	70.9	17,549,950
1998	1,522,118	7.0	20,771,670	93.2	22,293,788
Total	11,393,757	6.0*	178,194,106	94.0*	189,587,863

* average

Support for agricultural research from sources other than NSF

In addition to the NSF, CARP and the other foreign institutions have also made a significant contribution in supporting agricultural research in the country. Until 1987, the NSF was the only national institution that provided funds for agriculture research. With the establishment of CARP in 1987, it has provided a substantial amount of funds for need-based and problem-focused agricultural research in the country. Though the research funding of the NSF has mainly gone to the Faculties of Agriculture, the CARP funding has been mainly in the NARS. Of the total research funding by CARP from 1990-98, over 80% has been in the NARS whereas the Faculties of Agriculture have received less than 20%.

Table 7: Foreign-funded research projects in agriculture and animal science administered by the NSF and their output in terms of postgraduate degrees and scientific publications from 1970-1999

Foreign Agency	No. of projects	Total value	Recipient institutions	Output/ achievements*
USAID	05	324,452 (U$)	Dept. of Agriculture Univ. of Peradeniya Univ. of Ruhuna	02 publications
CIDA (related to use of potash fertilizer in agriculture)	29	1,300,000 (C$)	Dept. of Agriculture Univ. of Peradeniya Univ. of Ruhuna TRI, RRI, CRI	19 publications 01 Ph D 04 M Phil
ACIAR** (related to biological control of salvinia)	03	75,400 (A$)	Dept. Agriculture Univ. of Kelaniya	03 publications
SAREC** (related to water buffaloes)	85	19,300,000 (RS)	Univ. of Peradeniya Univ. of Ruhuna Univ. of Kelaniya VRI	92 publications 06 Ph D 07 M Phil

* Number of research publications given may not reflect the actual number due to research papers being published even much after the completion of the projects

** Not included in the 115 grants referred in the text as they were monitored by special committees other than the Working Committee on Agricultural Science & Forestry.
TRI (Tea Research Institute), RRI (Rubber Research Institute), CRI (Coconut Research Institute), VRI (Veterinary Research Institute)

Agricultural Science is only one of the fifteen or more fields receiving research funds from the NSF. Funding of agricultural research by the NSF has varied from 1.5 to 35% of the total funds disbursed during the period of 1982 to 1999 (Table 2). On the other hand, CARP is funding for research only in the agriculture-related fields. Thus, the total value of research grants provided for agriculture during the period of 1990- 1998 by the NSF has been Rs.11, 393,757.00 as against Rs. 178,194,106.00 by CARP (Table 6).

Scientists, especially in the Universities/Faculties of Agriculture have been successful in attracting a considerable amount of research funds from foreign sources such as PSTC/USAID, BOSTID/NAS, IDRC, NORAD, CIDA, SIDA, IFS of Sweden, SAREC etc. Information on the total quantum of funds so received is not available, but it has undoubtedly been a significant source of funding for agriculture research in the country. Though the number of grants thus received may not be high, the average value of such grants is much higher than that provided by the NSF (Table 7).

Benefits and achievements of NSF-funded research projects in agriculture and animal science

From the foregoing, it was evident that the NSF has funded a total of 115 grants at a cost of Rs. 15,981,470 during the period of 1970 to 1997. Of these grants less than 6 % (both in terms of number and value) has been in the field of animal husbandry, thus most of the projects have been related to agricultural crops, which mainly included fruit crops, cereals, plantation crops, export agricultural crops, and oil crops. Of the 115 grants awarded, all have been completed except 5 which have been withdrawn, or terminated due to reasons such as unsatisfactory progress, technical limitations etc.

The success and achievements of a given grant depends on a multitude of factors. Given the number of grants awarded by the NSF, the nature of issues and problems addressed, the commodity crop types involved, the large variations in the amount and value of the grants awarded and the varying circumstances under which they have been carried out, it is not only difficult, but also not fair and sensible to categorize them in terms of success or the impact they have made. But on the whole, the grants have been well executed, addressing important research issues in agriculture.

However, it should be mentioned that the ACIAR (Australian Centre for International Agricultural Research) project on "Biological control of *Salvinia*" administered by the NSF has been one of the most successful projects and the findings thereof have led to the control of *Salvinia* in water bodies, canals etc., yielding substantial economic and environmental benefits. In recognition of the noteworthy contribution made by the NSF in supporting this environmentally

important research project and thereby helping resolve some major environmental issues in the country, the NSF received the "*Soba Cineru*" award from the Sri Lanka Environmental Journalist Forum (SLEJF) in 1998.

The NSF-funded projects have also contributed to the advancement and dissemination of knowledge, improvement of laboratory/analytical facilities of the recipient institutions, human resource development/postgraduate training in the country etc. (Table 8). For instance, of the total value of the grants awarded by the NSF during the period of 1970-97, about 21% has been on equipment, thereby contributing significantly to the enhancement of laboratory facilities of recipient institutions. The progress review seminars on ongoing research grants organized by the NSF every year train the researchers in making presentations of their work at public gatherings and sharing their experience with others. They get an opportunity to publisize and disseminate their findings at exhibitions participated by the NSF, by way of models, posters, leaflets etc. It should be emphasized that these grants have also contributed in no small measure to promoting scientific thinking and intellectual activity and establishing professional contacts among the agricultural scientists in the country. The NSF has also established a merit award scheme in 1986 in order to appreciate and recognize the outstanding research contributions by the scientists, which will motivate the researchers to achieve excellence. Under this scheme, two merit awards have been given in 1986 and 1991 in the field of Agriculture.

In addition to the postgraduate training provided under the NSF-funded research projects, the contribution by the NSF in terms of technical training has also been noteworthy. For instance, under the NSF-funded research projects in agriculture and animal science, about 50 technical and research personnel have been given necessary technical training to date and nearly 100 have been trained under foreign-funded research projects administered by the NSF. Besides, their participation in research programmes has helped them acquire new knowledge and skills relevant to their career development and as a matter of fact, some officers have secured better employment consequent to the technical training so received.

The international contacts fund established by the NSF in 1984 with generous funding from Swedish International Development Agency (SIDA) has provided travel support to many scientists to make presentations at international symposia, seminars, workshops, conferences etc. and for short-term overseas training. Under the scheme, the NSF has provided travel grants to 65 agricultural scientists during the period of 1995 to 1999. This scheme, besides enabling local scientists to attend international meetings and training programmes, has helped them to keep abreast of the latest developments and research trends in their respective fields and to establish international contacts. Thus this travel grant scheme has indirectly contributed towards agricultural research through motivating the scientists and enhancing their research capabilities and professional competence.

It is evident from Table 7 and 8 that the number of post-graduates and the publications produced by the foreign-funded projects had far exceeded that produced by the NSF-funded research projects. The higher output from the foreign-funded projects may be attributed to relatively higher allowance paid to research assistants, provision of more funds for equipment and consumables, longer project duration, foreign collaboration, frequent and rigorous monitoring etc.

Table 8: Some basic information on the grants awarded by the NSF during 1970-1997

Item	Amount/Number
Number of grants awarded	115
Total funds allocated (Rs. x 10^3)	15,981
Total expenditure (Rs. x 10^3)	11,304
Expenditure on equipment (Rs.x10^3)	2,410
Percentage of expenditure on equipment as a percentage of the total value of the grants awarded	21
No. of Research Assistants appointed	42
Master degrees completed	12
Ph.D degrees completed	01
Postgraduate degrees produced as a percentage of the total number of grants awarded	12
Publications in international journals	09
Publications in the local journals	24
Other scientific communications	26

In conclusion, the authors wish to make the following recommendations in order to improve the effectiveness of the NSF research grants scheme, so that the outcome of the projects will have a significant impact to the national development.

(1) Indicate as far as possible, the priority crops and livestock and priority research areas as well as the major issues that need to be addressed when the NSF research grants scheme is advertised. Thus, the research proposals will mainly focus on high priority research concerns, thereby helping the NSF to disburse funds more meaningfully.

(2) Promote inter-disciplinary and inter-institutional research. Of the grants awarded, the vast majority did not involve a multi-disciplinary approach. When multi-disciplinary research is done the value of the grants will be naturally higher, so that the number of grants that can be awarded may

be less, but the impact would be grater. The Working Committee on Agricultural Science of the NSF may even play a role of facilitator in identifying relevant multi-disciplinary research and relevant institutes, and encourage them to apply for research grants.

(3) Monitor the progress of the grants awarded through periodic visits to the grantees by the members of the Working Committee. This would enable the Committee not only to better assess the progress of the grantees, but also to ascertain the difficulties and problems faced by them, enabling necessary timely intervention.

(4) Encourage grantees to publish their findings. Though the NSF has funded about 115 agricultural research projects from 1970 to 1997, according to the available records, they have produced only 09 international papers, 24 papers in local journals and about 25 short communications, amounting to nearly a total of 50. This is grossly inadequate. Hence the grantees should be encouraged to publish the results and the NSF journal may give special consideration to research papers resulting from the NSF- funded research projects.

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