COST OF DOING A RESEARCH: COMPARING PARTICIPATORY AND CONVENTIONAL SILVICULTURE RESEARCH IN NEPAL

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Acronyms

CF	Community Forestry
CFD	Community Forestry Division
CFUGs	Community Forestry User Group
CFF	Community Forestry Fund
DFRS	Department of Forest Research and Survey
MFSC	Ministry of Forest and Soil Conservation
NRs	Nepalese Rupees
PAR	Participatory Action Research

Abstract: Participatory forestry known as community forestry is now widely adopted as a means to develop sustainable rural livelihoods. It is focused on forest management and improved access to multiple forest products. The diverse needs of communities living in different climatic and ecological zones and under different socio-economic conditions have imposed a pattern of a multitude of localized forestry research studies in Nepal. The increasing demand for forestry products can only be met through the development, adoption and implementation of innovative technologies in managing forest resources. Thus, forestry research in Nepal has the responsibility for providing useful and updated information for the management of declining forest resources both to local users and to centrally located policy makers.

The traditional research has largely failed to provide this information and respond to the challenges of sustainable forestry development in Nepal and has largely been constrained with the lack of financial resources. The Department of Forest Research and Survey under the Ministry of Forest and Soil Conservation has initiated participatory research approach in mid 90's with a view to develop methodologies suitable to address multiple demands of people living in heterogeneous conditions. The vision is of an effective and powerful partnership of civil and government stakeholders agreeing a research programme, providing resources, executing and evaluating it continuously and effectively.

The paper presents the costs evaluation of two research sites on forest silviculture and management for a period of 6 years from two research sites. The first study is a conventional silviculture research established by the department seeking appropriate management options for Sal (*Shorea robusta*) forest. Similarly, the focus of the second plot is to explore the management potential of Sal forests in the mid hills of Nepal. The second research is a participatory carried out in partnerships with a forest user group in a community forests.

The paper analyses nature of the costs, magnitude, structure, and temporal behaviors of the costs at various stages of research planning and management process. In addition, nature and share of these costs among the department and the participant forest users group is compared. There is considerable variation in the structure and magnitude of the costs in participatory and conventional research. The result clearly provides evidences that participatory research is significantly cheaper compared to conventional forestry research. The research establishment, protection and maintenance costs are drastically lower in participatory research. The information provides evidences for research manager to justify its existence by providing the results and answers required by its clients in the fight against poverty, forest degradation and environmental deterioration. The cost evaluation and adoption of participatory research can justify the use of scarce resources and demonstrate researchers ability to provide the information needed by clients and make the research institution effective and functional.

Key words: Nepal, forestry, conventional research, and participatory research and costs evaluation

Introduction and background

Forestry research is needed in the development and management of the forest resources in developing countries. Forestry research in Nepal has the responsibility for providing useful and updated information for the management of declining forest resources both to local users and to centrally located policy makers. In Nepal, the majority of the population being subsistence farmers are heavily dependent on forests to meet a significant proportion of their livelihood needs. This has resulted in increasing pressure over forest resources (Gilmour and Fisher 1991, MFSC 2000). The situation demands from forestry research an effective and useful information for forestry sector development. On the other hand, because of the geographical position of Nepal, there exists a great climatic variation resulting in a complex flora and fauna that increases the challenges to forestry research in Nepal.

Forestry research in Nepal started with the planting of tropical pines in the early 60's. It has largely failed to provide the required information and respond to the challenges of sustainable forestry development in Nepal (Acharya 2004; Amatya 1999). The key focus of ongoing forestry research activities is on biophysical aspects of resource management mainly through traditional approach. The main activities undertaken are silviculture of natural and plantation forest, generation of growth and yield information, soil analysis and tree-crop interactions study.

Participatory forestry known as Community Forestry (CF) is now widely adopted as a means to develop sustainable rural livelihoods; it is focussed on forest management and improved access to rural people for multiple forest products. There are about 14,000 Community Forest User Groups (CFUGs) managing about 1.2 million ha of forest in Nepal. There is a great diversity among these CFUGs in terms of size of the forest; number of users; forest condition; ecological zone; social and ethnic make-up; geographical location; level of interest, skill and experience; and management objectives for their forest; and range in size from five to 4000 households each - managing forest areas of 0.08-4,000 ha (CFD 2005).

From a position about few years ago when few forests in Nepal were under any kind of active management, there are now many CFUGs beginning to identify a diverse range of forest management issues and problems for which external support is required. Along with this shift, there is an increasing demand to forest technicians from CFUGs asking, “How can we better manage our forests?” This is an issue, which can be best answered through innovative forestry research in community forestry. However, in contrast with the dynamic nature of community forestry development in Nepal, forestry research has been slower to respond to the requirements of the CFUGs. In view of the limitations of more "conventional research" and the desire to empower and support the user group institution it was felt that an

approach was needed which would focus on site specific problem identification and the local solution of such problems. Realizing this, the Department of Forest Research and Survey (DFRS) initiated Participatory Action Research (PAR) since the 90's focusing on problems related to the local-level forest management issues through the integration of socio-economic aspects with technical forestry issues.

Why participatory research in CF?

With the dynamic change within the forest management approach, there is a corresponding need to support new forest management research issues. Traditional research approaches may not enough flexible to respond changing external circumstances and learning processes to forest researchers. The participatory research can generate solutions to local level forest management issues through learning processes, which will generate site-specific solutions to the particular socio-economic and physical problems.

The varied needs caused due to heterogeneous socio-economic and ecological factors associated with different forest management modes have forced for more localized study for forestry research in Nepal. Nepal has very little experiences of scientific forest management especially field staff working to support community forestry lack confidence in providing technical advice how forest can be better managed. The implementation of participatory research will provide an opportunity to develop confidence among foresters.

The participatory research implies the broad development of an action research process as part of the normal processes by which a CFUG learns to manage their forest and address their forest management problems based in research for development than traditional research and development approach described by Ashaby (2003). It blurs the traditional dividing line between research and the implementation of research findings and between researchers and forest managers. The participatory research material can be regarded as an extension material to promote CFUGs for more active forest management. Such material would have more demonstration effect than traditional extension media such as leaflets or reports. Effective dissemination of results is the most critical part of forestry research (Birot et al 2002) and demands a functioning relationship with training, development and extension agencies. However, in Nepal, research, development and extension agencies are separate - as is common elsewhere including many developing countries in Africa (Temu and Kowero, 2001), and limited attention has been paid to this issue.

The selection of research approaches also depends on various factors. One of the most important issues being the cost required completing the research. However, systematic reporting on costs of using participatory and conventional researches are rare (Nancy et al 2001) and there are no rigorous reporting on costs and its evaluation in forestry research from Nepal. The paper aims to document, compare and evaluate the costs of two ongoing researches on forest silviculture and management for a period of 6 years from two research sites. The first study is a conventional silviculture research established by the DFRS seeking appropriate management options for Sal (*Shorea robusta*) forest in Butwal of Rupandehi district here after called DFRS study. Similarly, the focus of the second plot is to explore the management potential of Sal forests in the mid hills of Nepal. The second research is a Participatory Action Research (PAR) carried out in partnerships with a CFUG in a community forests in Parbat district of Western Nepal (figure 1) hereafter called PAR site.

Figure 1. Location of the research plots

Research questions

It will contribute in developing understanding in answering the following pertinent questions related to efficiency of two different research approaches known as PAR and the DFRS conventional forestry research in terms of financial resources.

Do the conventional forestry research and participatory action research varies in costs in doing a research?
If so what is the nature of variation of costs?
What are the underlying causes for making costs difference?
What is the nature of sharing of costs in Participatory Action Research (PAR) between the DFRS and the CFUG?

Hypothesis

#1: There is variation in the costs and its structure between conventional and Participatory Action Research.

#2: The Participatory Action Research is cheaper compared to the conventional forestry research.

Case studies:

1. DFRS- forest management research at Butwal

The natural forest management and silviculture research programme in the country was initiated in the 1980's to investigate management options for degraded forests of terai of Nepal. The research plot was established in Sal (*Shorea robusta*) forest types in at Butwal of Rupandehi district in Western Nepal (Figure 1). The objectives of the research were:

- To investigate best management practice to establish the natural regeneration through coppice management.
- To identify best management options that can maximise fodder and firewood production from degraded Terai forests of Nepal.

Research Design

The forest area has been divided into four different treatment prescriptions: i) simple coppice, ii) high forest, iii) coppice with standards 50% and iv) coppice with standards 25% (Figure 2). Each of these management prescriptions has four sub-treatments. The details of these treatments are described in various reports such as Acharya et al 2002.

Figure 2: Layout of the DFRS research plots*

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									Treatment block
	1		2		3		4		Simple Coppice
	8		7		6		5		Coppice with Standard 25%
	9		10		11		12		Coppice with Standard 50%
	16		15		14		13		High Forest

* Shaded treatments are compared for the cost. Figure within the plot represent treatment numbers.

2. Participatory Action Research (PAR) in Bharkhore CFUG, Parbat

The Bharkhore forest is located in Siwalaya VDC, ward number 1 of Parbat District in Western Development region. The forest was handed over to community in 1993 and covers an area of 57.5 ha. The forest is predominantly Sal (*Shorea robusta*) forest. In 1997, the

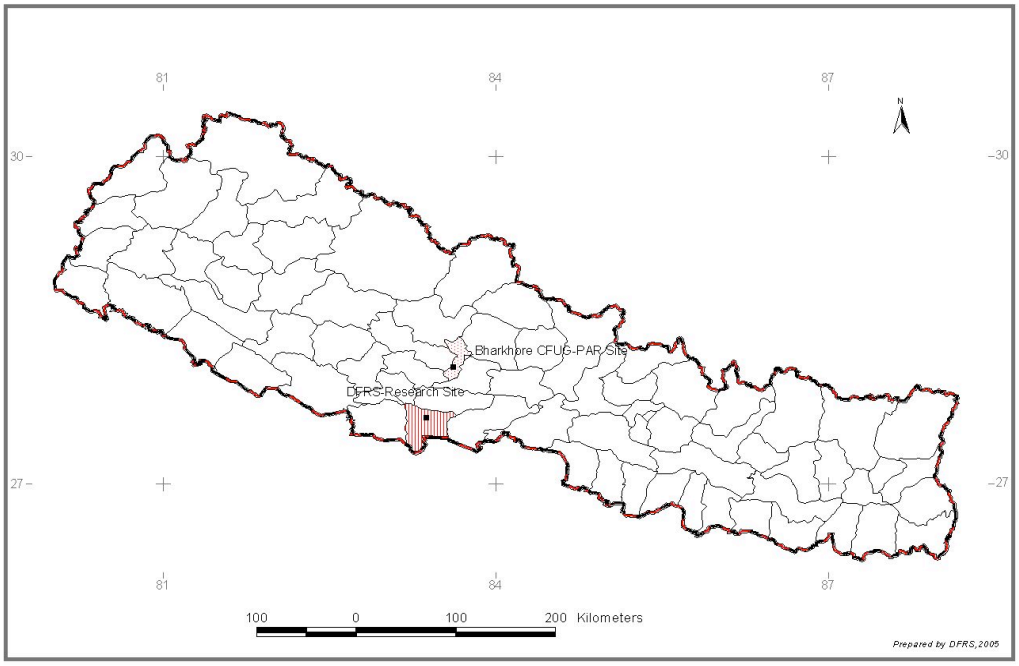


Figure 1: Map of Nepal showing the location of the study area

CFUG realized that yearly production of fuel wood is in diminishing trends. The CFUG records verified that the amount of annual firewood harvested from block 1 fell from 96 tons in 1993/94 to 92 tons in 1998/99. And it is quite possible that supply of firewood may decrease further from the forest in the following years. The users were persuaded that the amount of forest products they are presently receiving would not be sustainable in future, if the present block harvesting system of five years' rotation is continued. They decided to establish a research plot to identify appropriate silvicultural regime to meet the demand of fuel wood. They discussed within the group and developed innovative treatment design and the final proposal was jointly developed by the CFUG and the DFRS (Table 1). The harvesting activities are scheduled by the CFUG and DFRS arranges resources accordingly to provide technical inputs as required. All annual assessments and measurement records are maintained by the CFUG.

Research Design

The research design consists of six treatments occupying 25mx20m = 0.05 hectare size, for each treatment. Moreover, the location of the research plot was changed to establish in more homogenous forest condition on the suggestions of the DFRS.

Table 1: Firewood production study research plot design.

Plot no.	Treatment design	Area (ha)
1	Maintaining 80% trees	0.05
2	Maintaining 60% trees	0.05
3	Maintaining 40% trees	0.05
4	Maintaining 20% trees	0.05
5	Maintaining 0% trees (Simple coppice)	0.05
6	Control	0.05

The objectives of the research were:

- To identify sustainable way of harvesting the forest to meet the demand of fuel wood;
- To identify the best way of sustainable forest management; and
- To identify the system which improves the forest condition.

The treatments were randomly distributed and lay out of the plots is given in table 2.

Table 2: The lay out of the PAR treatments

20 % maintaining **(3)**	80% maintaining **(2)**	0 % maintaining (simple coppice) **(1)**
40 % maintaining **(4)**	60 % maintaining **(5)**	control **(6)**

*Figure in the plot indicates treatment numbers

Are these two research sites comparable?

There are no identical research plots established with the aim of comparing costs with two different approaches- participatory and conventional. Therefore it is essential to find two

researches having many similarities. The two sites presented in this paper are very similar in their nature and behaviours and hence are comparable. Both of the research sites are established on Sal forests. The two forests are of similar development stages, sizes and structure. The basic objectives of research establishment were similar. They vary in the research block size. The PAR site is relatively smaller. It has 6 (20x25m) plots while DFRS site has 16 similar sized plots. The study has identified actual costs for PAR for the past 6 years. Similarly, the costs for the DFRS plots for 6 treatments resembling PAR sites in terms of treatments were reviewed for the costs analysis. However, some costs were assumed not to be varying for 6six or 16 plots such as travel for the field. The DFRS plots data records were reviewed; similarly the PAR costs information was reviewed/collected form the CFUGs. The table 3 presents how these two research plots can be used to compare the costs for doing a research.

Although the aim of both the sites were to find out the ways of effective management of the forest, there is a need to look on the impacts created by these two different types of research such as demonstration impacts. The adoptability of the research technology by end users is another area to assess the usefulness of the research. In other words, the focus on comparison should be given for not only searching technological options, but facilitating local innovations, dissemination and scaling up.

Table 3: PAR- DFRS treatment equivalent matrix

S.N.	PAR sites treatment		DFRS treatment	
	Plot number	Treatment	Plot number	Treatment
1	1	0 % maintaining	1	simple coppice 3-2-1
2	2	80 % maintaining	13	high forest 70-80 % maintaining
3	3	20 % maintaining	7	25 % maintaining
4	4	40 % maintaining	10	50 % maintaining
5	5	60 % maintaining	9	50 % maintaining
6	6	Control	16	Control

Result and discussions

Participation level

The DFRS site is undoubtedly a case where scientists have made the decisions without the communications to users or stakeholders. The research can be classified as conventional (non-participatory) based on Biggs and Farrington (1991). The farmers are participating in

the research as wage labors. However, it was observed that DFRS gives priority to employee unchanged labour each year to facilitate the research process and techniques. One of the main reasons is to reduce the costs to trained new workers. The PAR site can be categorized as collaborative participatory process. The users initiated the research. However, there has been a strong communication links between the DFRS and the users and have made joint decisions from proposal development to implementation.

Variation in the nature of research design

The DFRS research has four treatments and four sub-treatment with in a treatment totaling to 16 sub treatments. The silviculture base is the application of simple coppice, coppice with standard and high forest systems. Within simple coppice four different sub treatments are designed. In the coppice with main treatment is based on the crown cover of the upper story. The lower canopy is treated with coppice system. The crown canopy is visually estimated. The high forest system, treatment varies with three plots with crown cover of main crop and a control plot. The treatment and their application are not easy to understand and procedure to follow. These treatments are replicated in different parts of the country. The plots have multiple objectives and seeking similar solutions across the country.

The PAR treatment is fairly simple with six treatments in one CFUG. The major objective is to find out the best management approach for fire wood production which is the most important product for the local people. The treatment design is simple to understand and follow. The details of listed activities to be performed each year for both of the plots are presented in the annex 1.

Data collection frequency and intensities

The DFRS follows relatively intensive data collection procedures with pre-developed recording formats. The harvesting treatments have been applied each year since the establishment. Every year a range of information on biomass and growth are collected from the plots. The main parameters recorded includes diameter at breast height (DBH), height, stocking, individual tree biomass, thinning, regeneration counting.

The frequency of harvesting operations is lesser in PAR sites compared to the DFRS sites. The harvesting operations are planned at the interval of 2 to 3 years (annex 1). The frequency seems to be more suitable in a research plots on forestry research with long gestation period in Sal forests and particularly in forestry research maintained by the users.

The frequency of monitoring is higher in PAR compared to the DFRS site. The CFUG committee members regularly visit the forest every month. In addition users visit the forest everyday and report uncommon observations. It may be due to close location of research plots and its users that does not require additional cost. However, every visit in the DFRS sites requires additional costs and the plots and the researcher are located in separate location with considerable distances. The DFRS research site has relatively weak monitoring system. Forest technical staff or scientists generally visit the research site once a year for the annual harvesting operations and additional visits are only for specific situation.

Cost of doing a research

The details of data obtained from the DFRS records and the CFUG records are presented in the annex 2. The summary information for the total cost for the doing of research with two different approaches is presented in the table 4. The table shows that total costs of doing a research largely depends on the approaches of research in regards to people's participation. The cost for the PAR sites for a period of six years is NRs 199,000.00 and for that of DFRS site is NRs 632,148.00.

The table 4 illustrates that conventional research is more than three times expensive compared to participatory research. In addition, the DFRS has contributed more than five times higher amount to accomplish the conventional research comparing the PAR. The total cost was separated into four simplified stages of a research cycle as research development, establishment, maintenance, data analysis and dissemination. The data revealed that the research development costs is slightly higher in PAR site than conventional research including in kind contribution from the users. It is smaller if counted from the fund investment from the Community Forestry Fund (CFF). However, all other three stages required significant higher investment in conventional research approaches including in kind contribution from the CFUG. The ratio of participatory and conventional research costs in establishment, maintenance and dissemination is 3.45, 3.75 and 2.24 times higher than participatory research. The highest cost in maintenance is due to the intensive annual maintenance of research plot and requirement of forest watchers to protect the research site in the DFRS site whereas no such additional cost is required in the PAR site.

Table 4: Cost of doing a research with two different approaches

S.N.	Cost item	PAR					DFRS
		DFRS	CFUG's contribution in		CFUG total	Total	
			Cash	Kind			
1	Research development	13,760	1,150	5,830	6,890	20,650	17,905
2	Establishment costs	15,170	2,550	21,040	23,590	38,760	1,34,348
3	Maintenance costs	69,750	5,200	35,640	40,840	110,590	4,14,895
4	Data analysis and dissemination	24,000	3,900	1,100	5,000	29,000	65,000
	Total	1,22,680	12,800	63,610	76,320	199,000	6,32,148

Within the PAR site, it shows that major proportion of costs (62 %) is from the DFRS than CFUG's total contribution (38 %). The total cash expense from the CFUGs is about 6 % of the total costs whereas labour contribution is about 32 %. In other words, CFUGs are contributing five times higher in kind contribution through labour input than the cash investment for the research.

Figure 3: Comparing costs by various research stages in two research approaches.

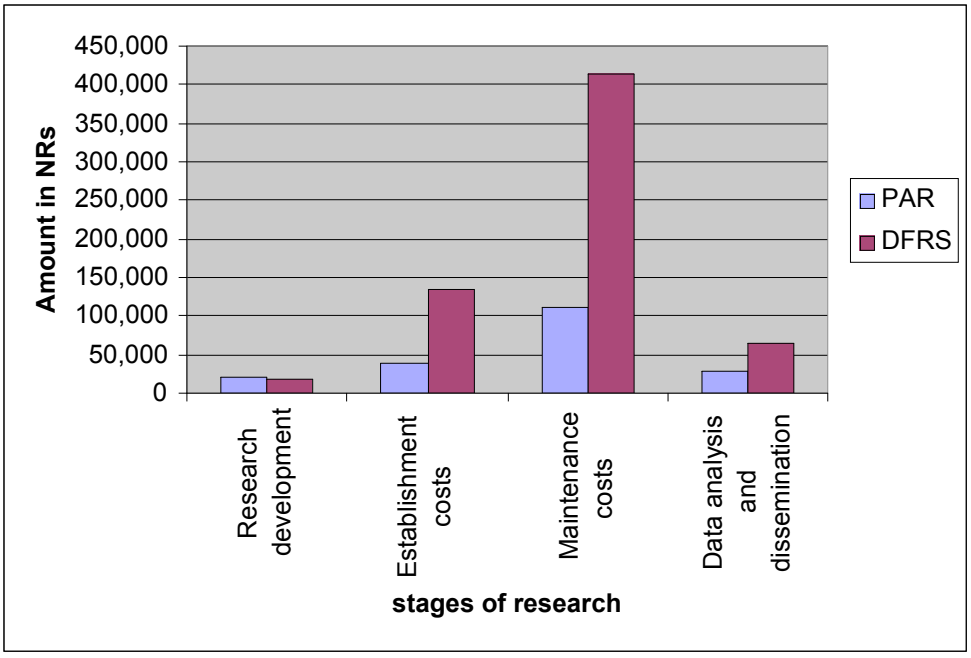
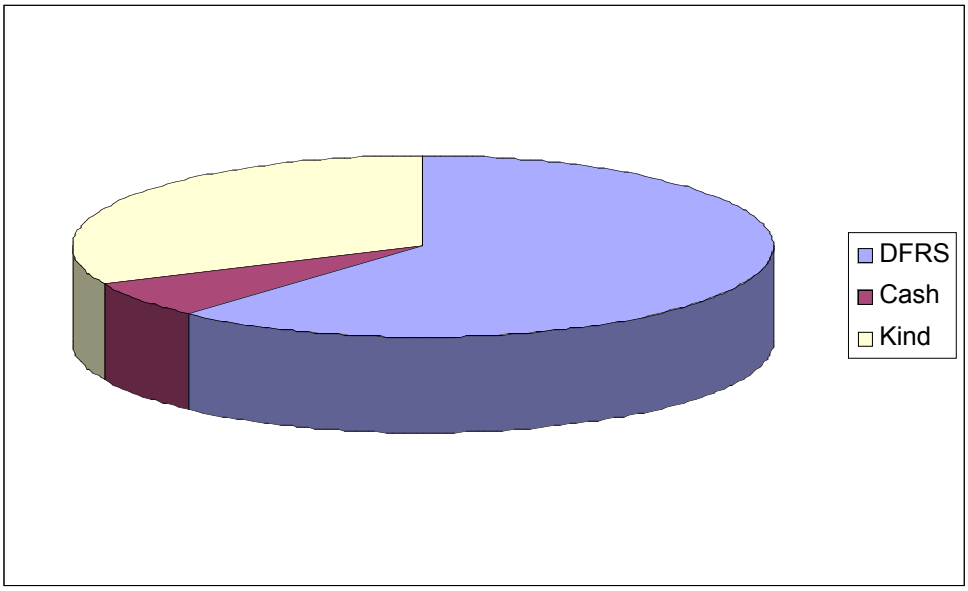


Figure 4: Shares of the costs of participating organization in PAR



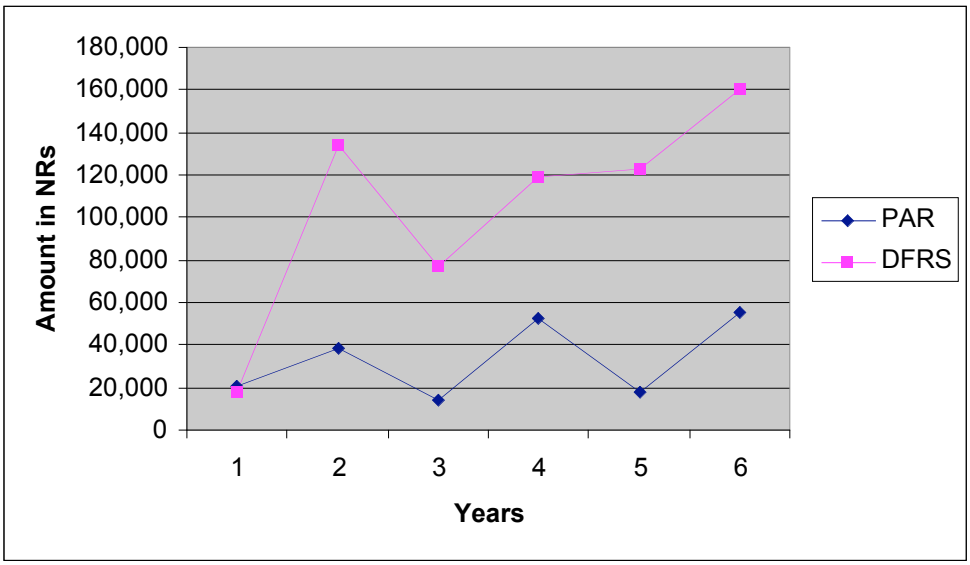
Year wise cost assessment

The cost data for both of the research sites were segregated for the past six years (table 5 and figure 5). The data set revealed that except for the first year, all five years required higher costs to maintain the DFRS site. The DFRS has contributed higher cash investment for all six years in PAR site although it is smaller than the costs incurred in managing the conventional research.

Table 5: Comparing costs by years in two research approaches

Years	PAR					DFRS
	DFRS	CFUG's contribution in		CFUG total	Total	
		Cash	Kind			
1	13,760	1,150	5,740	6,890	20,652	17,905
2	15,170	2,550	21,040	23,590	38,764	1,34,348
3	12,370	650	1,080	1,730	14,106	77,260
4	29,360	2,450	20,280	22,730	52,098	1,19,510
5	16,430	550	1,080	1,630	18,065	1,22,923
6	35,590	5450	14300	19,750	55,346	1,60,202
Total	1,22,680	12,800	63,520	76,320	1,99,000	6,32,148

Figure 6: year wise expenditure of the costs in two approaches



The figure clearly indicates that for each year the DFRS site has higher cost compared to PAR site. In addition, the DFRS expenditure for both of the researches is almost homogenous throughout the research period where as the share from the CFUG is fluctuating year to year. The higher cost in the establishment year in DFRS sites is due to fencing expenditure for protection of the sites whereas there is no such cost required for the PAR site.

Human resource requirements

The human resources requirement in terms of man-days for doing the research was analyzed year wise and research stages wise. The human resources were categories as skilled (technical staff) and semi-skilled (CFUG members and wage labors). The result is presented in the table 6. The table shows that total human resources required for the DFRS site is 3,931 which is 4.23 times higher compared to the PAR site. In addition, each year the DFRS site requires higher man-days than the PAR. Out of the total requirements, the PAR site requires 15 % technical staff support and the users contribute 85 %. However, in DFRS sites technical input is lower than the PAR site requiring about half (8%) than that of PAR. The DFRS site required almost homogenous input of human resources for the last five years, while in the PAR sites there is variation according to the harvesting proposal. The relatively higher cost is incurred in terms of human resources due to provision of collective action whereas all households have to come and contribute.

The table 7 presents human resources requirements for the completion of the research according to various research stages. It shows that the largest human resource is consumed

during the maintenance and protection of the research site. The information would be valuable to re-organize efficiency of fund disbursement in forestry research.

Table 6: Year wise human resource requirements in two different approaches

Years	PAR			DFRS		
	DFRS (skill)	CFUG's (semi-skilled-non-skilled	Total	DFRS	Semi-skilled-hired labor	Total
1	30	82	112	13	0	13
2	26	287	317	62	597	661
3	8	12	26	55	510	565
4	32	246	286	62	860	922
5	16	12	33	55	850	905
6	30	148	184	50	814	865
Total	142	787	929	297	3,631	3,931

Table 7: Research planning stages wise human resources required in two different approaches

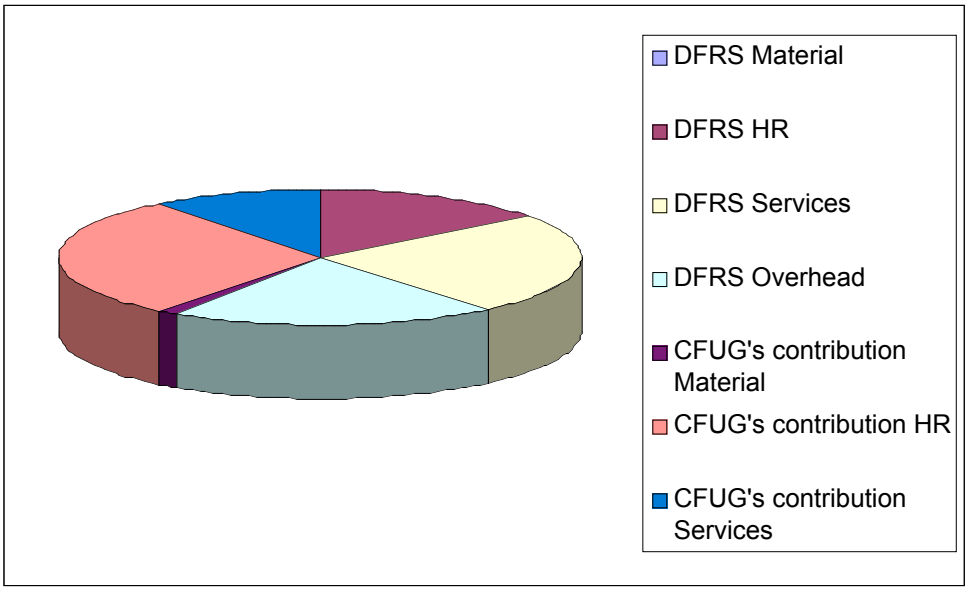
S.N.	Research heading	PAR			DFRS		
		DFRS	CFUG's	CFUG total	Skilled	Unskilled	Total
1	Research development	30	82	112	13	0	13
2	Establishment costs	26	287	313	62	597	659
3	Maintenance costs	66	544	610	172	3037	3209
4	Data analysis and dissemination	20	16	36	50	0	50
	Total	142	929	1071	297	3632	3931

Nature of costs disbursement

The total cost investment was categorized for each year in terms of material, human resources, services and DFRS overhead. The details of data are presented in the annex 3 and figure 7, 8 and 9 illustrate the disbursement of the costs.

The total costs for maintaining the PAR site contributed by the DFRS is 122,680 while the contribution from the users is NRs 76,320.00. The figure shows that DFRS has no material cost contributed for the PAR site. The contribution of the DFRS through services is highest followed by the overhead than human resources. The service cost is mainly contributed as travelling costs. The largest area in the pie is covered by the CFUG's contribution in performing various research management and maintenance activities.

Figure 7: Contribution of the DFRS and CFUG for PAR site.



The following figure 8 presents the nature of various costs incurred by the DFRS in maintaining the conventional research site at Butwal. The information shows that the largest proportion (56 %) is required for the human resources followed by the DFRS overhead (26%). The material costs and the services cost requiring almost equal shares of 9 %. This is very important to note that in both the researches the maintenance and protection costs are higher than others. In addition, it also depends on the duration of the costs, longer the duration higher the costs

Figure 8: Nature of cost disbursement in DFRS at Butwal research site

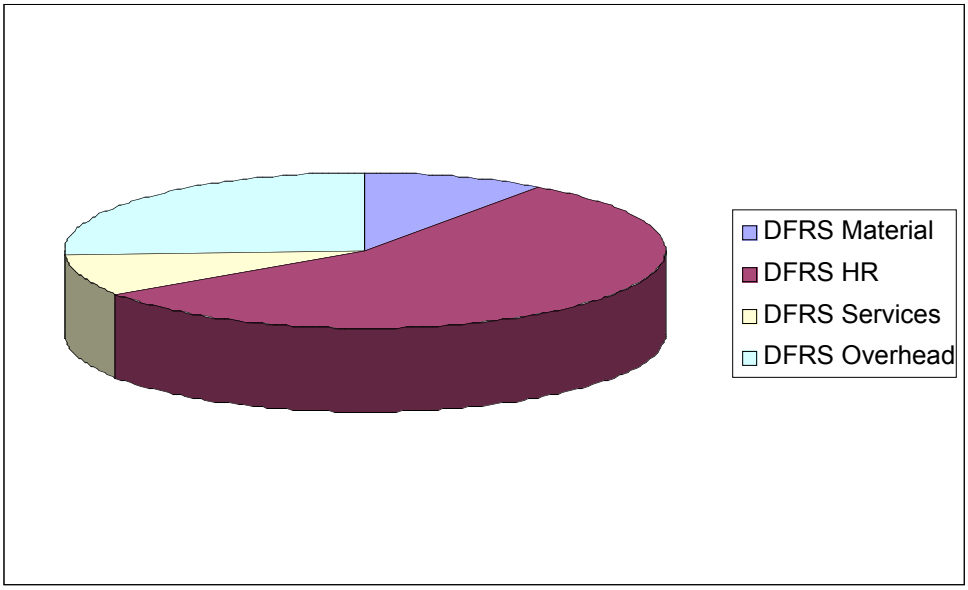
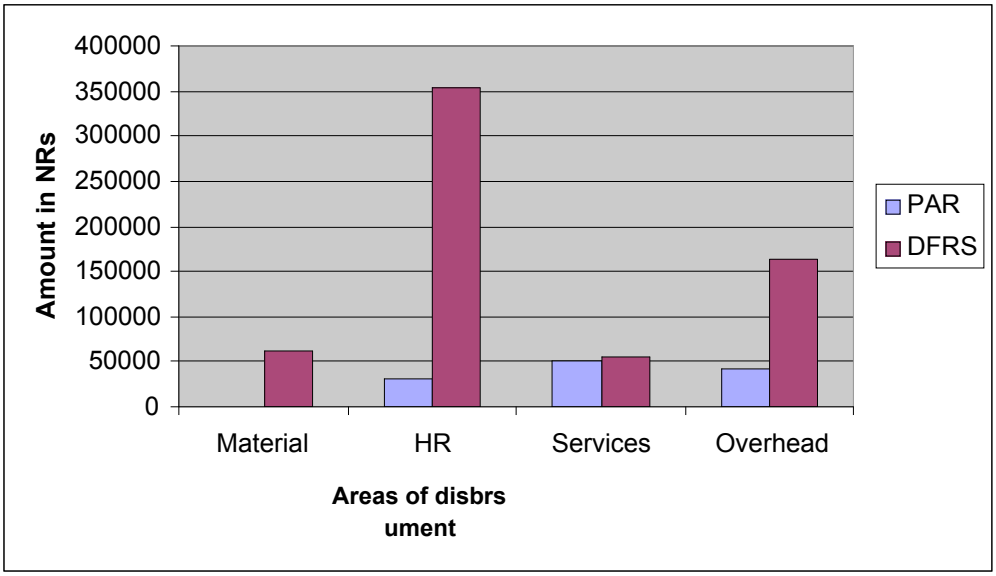


Figure 9: Comparison of areas of disbursement in two research approaches



The total expenditure for both sites was separated into four main areas of costs disbursement (figure 9 and annex 3). The information shows that there is no material cost for the DFRS in PAR sites and the DFRS and the CFUG have contributed almost equal amount for services. However, the overhead costs for the DFRS site is significant higher in DFRS site compared to PAR site. The largest variation (more than 11 times higher in DFRS than PAR) remains in the human resource expenditure between the DFRS sites and the PAR site.

Conclusion

There is considerable variation in the structure and magnitude of the costs in participatory and conventional research. The comparative analysis of two research sites with two different approaches clearly provides evidences that participatory research is significantly cheaper compared to conventional forestry research. The research establishment, protection and maintenance costs are considerably lower in participatory research. The cost evaluation and adoption of participatory research can justify the use of scarce resources and demonstrate researchers' ability to provide the information needed by clients and make the research institution effective and functional.

There exists variation in research development and implementing process between the two approaches contributing in the variation of the costs. The DFRS is adopting more intensive and more frequent data collection procedure than the PAR site. The approaches have varied

in nature and quantity of human resources and services requirements contributing for higher cost. The isolation of peoples in the conventional approach have increased protection cost, which is not required in the PAR. Every activities for the DFRS research site involves direct cash expenditure whereas there are several activities where users have contributed in kind. In addition, use of local resources in PAR has also helped to lower the cost for example DFRS site has used iron/cement pegs to demarcate treatment boundary whereas PAR site, CFUG has used local stones and boulders with no additional cost. The application of government norms and procedure with pre-determined man-days for different activities has also contributed for higher costs. The PAR cost is actual and practical based on performance and requirement.

The DFRS has contributed higher amount in PAR sites in terms of human resources and services than CFUG themselves. However, it is significantly smaller compared to the cost required to complete the similar research without people involvement. The information provides evidences for research manager to justify its existence by providing the results and answers required by its clients in the fight against poverty, forest degradation and environmental deterioration. The vision is must be to develop an effective and powerful partnership of civil and government stakeholders agreeing a research programme, providing resources, executing and evaluating it continuously and effectively.

However, there is a need for more studies covering wider variability in socio-economic and topographic conditions people and forests of Nepal. In addition, it would be more reasonable to study beyond cost to adoptability and impacts associated with two different approaches of forestry research.

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Annex 1: Management proposal for the two research plots

Year	PAR		DFRS	
	Management activities	**Remarks**	**Management activities**	**Remarks**
2055 1998/1999	• Research establishment, plot lay-out, numbering of trees, management activities, biomass estimation, measurements, placement of sign board, fireline/path maintenance, cleaning, weeding		• Protection and maintenance, numbering of trees, measurements, sign board maintenance, fireline/path maintenance, cleaning, weeding, thinning and biomass estimation	Year 10
2056 1999/2000	• No treatment • Protection and maintenance	**Year 1**	• Protection and maintenance, numbering of trees, measurements, sign board maintenance, fireline/path maintenance, cleaning, weeding, thinning and biomass estimation	Year 11
2057 2000/2001	• No treatment • Protection and maintenance	**Year 2**	• Protection and maintenance, numbering of trees, measurements, sign board maintenance, fireline/path maintenance, cleaning, , weeding, thinning and biomass estimation • Clear felling of coppice crop	Year 12
2058 2001/2	• Protection and maintenance, numbering of trees, measurements, sign board maintenance, fireline/path maintenance, cleaning, weeding • Maintenance of 3 best shoots in each stump	**Year 3**	• Protection and maintenance, numbering of trees, measurements, sign board maintenance, fireline/path maintenance, cleaning, weeding, thinning and biomass estimation	Year 13
2059 2002/3	• No treatment • Protection and maintenance	**Year 4**	• Protection and maintenance, numbering of trees, measurements, sign board maintenance, fireline/path maintenance, cleaning, , weeding, thinning and biomass estimation	Year 14
2060 2003/4	• Protection and maintenance, numbering of trees, measurements, sign board maintenance, fireline/path maintenance, cleaning, weeding • Maintenance of 2 best shoots in each stump	**Year 5**	• Protection and maintenance, numbering of trees, measurements, sign board maintenance, fireline/path maintenance, cleaning, weeding, thinning and biomass estimation	Year 15
2061 2004/5	• No treatment • Protection and maintenance	**Year 6**	• Protection and maintenance, numbering of trees, measurements, sign board maintenance, fireline/path maintenance, cleaning, weeding, • Clear felling of coppice crop	Year 16 – closed
2062/63 2005/6	• Protection and maintenance, numbering of trees, measurements, sign board maintenance, fireline/path maintenance, cleaning, weeding • Clear felling of coppice crop	**Year 7-8**		

Annex 2: Details of cost in PAR and DFRS sites (NRs)

Annex 2.1 Details of cost in PAR site contributed by the CFUG (NRs)

Particulars	Unit	Rate	Quantity	Amount	Remarks
Year 0					
Rconnaisance survey	md	70	8	560	
Proposal and protocol development	md	70	22	1540	
Proposal and protocol finalization and approval	md	70	52	3640	0.5 of 104 hh
Communication, stationery	LS			300	DIRECT
Sharing meeting (tea/snacks)	LS			850	DIRECT
				6890	
Year 1					
Plot alignment and lay out (semi-skilled)	md	80	8	640	
Fireline/forest path construction	md	70	52	3640	0.5 of 104 hh
Harvesting operations	md	70	104	7280	
Harvesting tools	LS			800	
Peg fixing (Iron/stone)	md	70	4	280	
Measurements (Semi-skilled)	md	80	8	640	
Signboard	No	1000	1	1000	DIRECT
Communication and stationery	LS			350	DIRECT
Transportation of forest products	md	70	104	7280	
Data management	md	80	6	480	
Tea/snacks	LS			1200	DIRECT
				23590	
Year 2					
Communication and stationery	LS			350	DIRECT
Monitoring (Committee)	md	90	12	1080	
Sharing meeting (tea/snacks)	LS			300	DIRECT
				1730	
Year 3					
Harvesting operations and transportation	md	80	112	8960	
Harvesting tools	LS			500	
Fireline maintenance	md	80	20	1600	
Measurements (Semi-skilled)	md	90	4	360	
Communication and stationery	LS			450	DIRECT
Data management	md	90	6	540	
Data analysis	md	80	104	8320	
Mid-term report production and dissemination	LS			1000	DIRECT
Tea/snacks	LS			1000	DIRECT
				22730	
Year 4					
Communication and stationery	LS			250	DIRECT
Monitoring (Committee)	md	90	12	1080	
Sharing meeting (tea/snacks)	LS			300	DIRECT
				1630	
Year 5					
Harvesting operations and transportation	md	100	116	11600	
Harvesting tools	LS			500	
Measurements	md	110	4	440	

Communication and stationery	LS			350	DIRECT
Data management	md	110	6	660	
Final Report Production	md	110	10	1100	
Final Report Production	LS			3900	DIRECT
Tea/snacks	LS			1200	DIRECT
				19750	
Grand Total				**76320**	

CASH CONTRIBUTION **12800**
LABOR CONTRIBUTION **63520**

Annex 2.2 Details of cost in PAR site contributed by the DFRS

Particulars	**Unit**	**Rate**	**Quantity**	**Amount**	**Remarks**
Year 0					
Rconnaisance survey	md	220	10	2200	Personnel cost (Field)
Proposal and protocol development	md	270	8	2160	Personnel cost (Office)
Proposal and protocol finalization and approval	md	350	2	700	Personnel cost (Office)
Communication and stationery	LS			300	
DSA	md	160	10	1600	
Travel	LS			4800	
Overhead			30	2000	
				13760	
Year 1					
Mapping	LS			1000	
Communication and stationery	LS			250	
Data management	md	220	6	1320	Personnel cost (Office)
DSA	md	160	10	1600	
Travel	LS			3800	
Personnel (Field Total)	md	220	10	2200	
Overhead				5000	
				15170	
Year 2					
Communication and stationery	LS			250	
DSA (monitoring)	md	160	4	640	
Travel (monitoring)	LS			3600	
Personnel (Field Total)	md	220	4	880	
Overhead				7000	
				12370	
Year 3					
Communication and stationery	LS			300	
Data management	md	220	6	1320	Personnel cost (Office)
Data analysis	md	270	10	2700	Personnel cost (Office)
Mid-term report production and dissemination	LS			10000	
DSA	md	160	8	1280	
Travel	LS			5000	
Personnel (Field Total)	md	220	8	1760	
Overhead				7000	
				29360	

Year 4					
Communication and stationery	LS			150	
DSA (monitoring)	md	160	8	1280	
Travel (monitoring)	LS			5000	
Personnel (Field Total)	md	250	8	2000	
Overhead				8000	
				16430	
Year 5					
Communication and stationery	LS			250	
Data management	md	250	6	1500	Personnel cost (Office)
DSA	md	160	4	640	
Travel	LS			3800	
Final report preparation	md	270	20	5400	Personnel cost (Office)
Final report production	LS		30	10000	
Overhead				14000	
				35590	
Grand Total				**122680**	

Annex 2.3 Details of cost in PAR site contributed by the DFRS

Particulars	**Unit**	**Rate**	**Quantity**	**Amount**	**Remarks**
Year 0					
Rconnaisance survey	md	220	2.25	495	Personnel cost (field)
Proposal and protocol development	md	270	4.5	3240	Personnel cost (office)
Proposal and protocol finalization and approval	md	350	1.125	1050	Personnel cost (office)
Communication and stationery	LS			400	
DSA	md	160	4.5	720	
Travel	LS			4000	
Overhead				8000	
				17905	
Year 1					
Plot alignment and lay out (semi-skilled)	md	80	2.25	180	
Mapping	LS			375	
Fireline/forest path construction	md	70	86.25	6037.5	
Harvesting operations	md	70	142.5	9975	
Harvesting tools	LS			1500	
Iron pegging	LS			1800	
Fencing	RM	160		50000	
Measurements (Semi-skilled)	md	80	3	240	
Signboard	No	700		3500	
Communication and stationery	LS			400	
Watcher	md	60	365	21900	
Transportation of forest products	md			1950	
Data management	md	220		990	Personnel cost (office)
DSA	md	160	25	3500	
Travel	LS			7000	
Personnel (Field Total)	md	220	25	5000	
Overhead				20000	
				134347.5	
Year 2					
Harvesting operations	md	70	112.5	7875	

Harvesting tools	LS			800	
Fencing maintenance	md	70	8.25	1200	
Fireline maintenance	md	70	22.5	3000	
Measurements (Semi-skilled)	md	80	1.5	120	
Communication and stationery	LS			350	
Transportation of forest products	md			1125	
Watcher	md	60	365	21900	
Data management	md	220	4.5	990	Personnel cost (office)
DSA	md	160	25	4200	
Travel	LS			4500	
Personnel (Field Total)	md	220	25	6200	
Overhead				25000	
				77260	
Year 3					
Harvesting operations	md	80	97.5	7800	
Harvesting tools	LS			800	
Fencing maintenance	md	80	8.25	660	
Fireline maintenance	md	80	22.5	3200	
Measurements (Semi-skilled)	md	90	1.5	135	
Communication and stationery	LS			600	
Transportation of forest products	md			1200	
Watcher	md	70	730	51100	
Data management	md	220	4.5	990	Personnel cost (office)
Data analysis	md	270	7.5	2025	Personnel cost (office)
Mid-term report production and dissemination	LS			10000	
DSA	md	160	25	4500	
Travel	LS			5000	
Personnel (Field Total)	md	220	25	6500	
Overhead				25000	
				119510	
Year 4					
Harvesting operations	md	90	88.125	7931.25	
Harvesting tools	LS			1000	
Fencing maintenance	md	90	8.25	742.5	
Fireline maintenance	md	90	22.5	4000	
Measurements (Semi-skilled)	md	100	1.5	150	
Communication and stationery	LS			500	
Transportation of forest products	md			1200	
Watcher	md	80	730	58400	
Data management	md	250	4.5	2500	Personnel cost (office)
DSA	md	160	25	4000	
Travel	LS			6000	
Personnel (Field Total)	md	250	25	6500	
Overhead				30000	
				122923.75	
Year 5					
Harvesting operations	md	100	84.375	8437.5	
Harvesting tools	LS			1200	
Measurements	md	110	1.5	165	
Communication and stationery	LS			450	
Transportation of forest products	md			1350	
Watcher	md	80	730	58400	
Data management	md	250	4.5	2500	Personnel cost (office)

DSA	md	160	22	4200	
Travel	LS			6000	
Personnel (Field Total)	md	250	20	6000	
Final report preparation	md	270	25	6500	Personnel cost (office)
Final Report production				10000	
Overhead				55000	
				160202.5	
Grand Total				**632148.75**	

Annex 3: Disbursement of costs in various heading under two different approaches of doing a research

S.N.	years	PAR									DFRS				
		DFRS					CFUG's contribution								
		Material	HR	Services	Overhead	Total	Material	HR	Services	Total	Material	HR	Services	Overhead	Total
1	1	0	6660	5100	2000	13760	0	5740	1150	6890	0	5505	4400	8000	17905
2	2	0	5120	5050	5000	15170	1800	20240	1550	23590	57175	49972	7400	20000	134348
3	3	0	1520	3850	7000	12370	0	1080	650	1730	800	46610	4850	25000	77260
4	4	0	7060	18300	7000	29360	500	19780	2450	22730	800	78110	15600	25000	119510
5	5	0	3280	5150	8000	16430	0	1080	550	1630	1000	85423	6500	30000	122924
6	6	0	7540	14050	14000	35590	500	13800	5450	19750	1200	87552	16450	55000	160203
	Total	0	31180	51500	43000	122680	2800	61720	11800	76320	60975	353172	55200	163000	632150