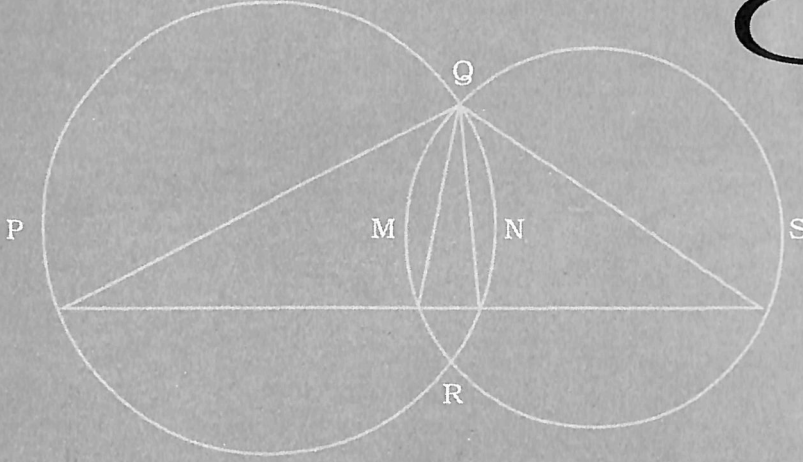


‘मत्स्य’ (प्रत्येकात्मा) हवं स्वातंत्र्य... पण मनमानी नकी ! जबाबदारी कळली तरच स्वातंत्र्य उपभोगायला अर्थ आहे. मुक्तता हवी निर्बंधापासून... पण बद्धतेची व्यथा नकी ! आंतरिक निर्बंधांची सवय झाल्यावर बाह्य निर्बंधाची गरज उरत नसते. अनुभवातून शैली घडते तशी, वृत्तीतून प्रवृत्ती... काळातून परंपरा बनते तशी सवयीतून सक्ती... ! मानसिकतेनुसार, व्यक्तीगणिक शब्द बदलत जातात; पण बदल शब्दात नकी, विचारात हवा... विचार ‘त्या’ चा किंवा ‘ती’चा नकी, ‘विचार’ माझा हवा... !



अर्थव्यवस्थेचे टप्प्याटप्प्याने हीणारे स्वांतर भांडवलशाहीकडे नेणारे आहे. स्वासग्नी क्षेत्राळा मीठ्या संधी दिल्या जात आहेत. औद्योगिक व सेवाक्षेत्रांचा वृद्धी वर वाढत आहे. मात्र शैतीक्षेत्राचा विकासदर १ ते २ यामध्येच अडकून पडला आहे. जागतिक व्यापार संघटनेत अनेक वाटाघाटी हीत आहेत. भारतीय शेतकऱ्यांकडून अमेरिका, युरोप या देशांच्या शेतकऱ्यांबरोबर स्पर्धा करण्याची अपेक्षा केली जात आहे; पण त्यासाठी पायाभूत सुविधांचा मात्र कसलाच विचार केला जात नाही !

Calyx

2006-07

After 24 years, India once again conducted three nuclear tests on May 11, 1998—the Buddha Purnima. One was a plutonium type similar to the 1974 test. Another was a thermonuclear or hydrogen bomb, and the third was a low-yield device with a wider application—primarily a tactical weapon. All three devices were triggered by one pull.

A Study Circle Activity
S. P. College
Pune

Are you bored of buying goods from the same old traditional *kirana* store? Would you like to buy them from lavish malls, and do this without increasing your budget? Now this is possible as our government is welcoming foreign direct investment in the retail sector.

They are considered to be Shudras, so they are not supposed to collect wealth. They are always in search of their daily living, therefore they cannot settle down in one place. They are not poor by nature but made poor by the social norms and customs, the religious authority and the caste system.



The Study Circle (2006-07)

*(From left to right) teachers: Vice-Principal (Science) Dr. U. M. Sholapurkar,
Principal Dr. M. A. Pendse, Vice-Principal (Commerce) Dr. C. Abnave
and Vice-Principal (Arts) Dr. S. Khandagale;*

*students: Bakul Sathaye, Manasi Joshi, Mugdha Sabale, Kaushika Draavid, Pallavi Ranade,
Bhavana Balte, Vijay Chokhar, Jivan Biradar, Siddharth Bhalerao and Suyash Kulkarni.*

Calyx

A STUDY CIRCLE ACTIVITY
(2006-07)

SIR PARASHURAMBHAU COLLEGE, PUNE.

calyx n. tech. (pl. calyxes or calyces) a ring of leaves (sepals) which protects a flower before it opens and later supports the opened flower.

Calyx will always remain a base upon which beautiful thoughts and ideas blossom.

Editorial

Dear Readers,

It is with a sense of deep pleasure and personal contentment that I present to you the third issue of the students' magazine 'Calyx'. It goes without saying that a lot of time and effort have gone into its making. I sincerely hope that its perusal produces a commensurate amount of pleasure in the readers.

The magazine this year holds an interesting medley of articles. Also, barring two articles which can be said to be purely theoretical, all of them show a concern with policy, action and application. Even a cursory look at the articles from the humanities reveals that some of the most potent (and often mutually conflicting) ideologies and issues of our time have been juxtaposed through them. You have feminism, nationalism, ultra-nationalism, state social and economic policy for the poor and the marginalized, and FDI all cohabiting happily in the same space. Surely, the irony of this is not to be missed. But it should also be seen as a pointer to the true nature of the experience and thought of the youth in today's world. All young people do not think alike. Their collective experience is by no means homogeneous. Furthermore, even their individual experiences are by no means harmonious and free from contradictions in themselves. This is a truth which, I believe, has been reflected in the articles.

'Calyx' is a students' magazine in a broad sense. All academic, artistic and editorial efforts needed for its creation come from the students. So, it is truly *by* the students. It is also *for* the students, within that it offers them a space to express themselves freely and creatively on any secular, academic subject of their liking. The end result, however, is not intended for students alone, but for all interested folks.

I hope and believe that 'Calyx' will grow and improve with every passing year and be constantly enriched with fresher ideas and newer innovations. I hope also that the coming years will see the Study Circle becoming more active and foraying into many more fields of learning and doing.

Kaushika Draavid

Foreword

I am delighted to present the *third* issue of the students' magazine 'Calyx'. The first two issues received special attention, applause and appreciation from all those interested in student-centered activities. This issue, like the first two, is a result of the sustained, committed and creative efforts of students of the study circle of our college. I have a deep sense of contentment in expressing my heartfelt appreciation for this amazing work. Well Done!

The publication of 'Calyx' is an experiment; an experiment designed to promote original thinking, to provide an opportunity to intelligent students for self-learning, to instil a research mentality in bright young minds and ultimately to make students realize their infinite potential. 'Calyx' is a modest attempt at initiating a learning process outside the walls of a classroom. I am sure that students enjoy this 'academic space' and that they meaningfully use it to widen their horizons.

The students of the study circle enjoy freedom of selection and presentation of the topics for the articles. They also carry out all editorial responsibilities. The chief editor and the leader of the group Miss Kaushika Draavid worked very hard. Her meticulous and dedicated editorial work deserves a special mention. I wish the members of the study circle all success in their future endeavours. The interaction with the group has been a very memorable and fruitful experience. Besides, I learned a lot from them.

The articles are written on a variety of topics ranging from Farmers' Suicides to Nuclear Tests and from Feminist Movements to Paradoxes in Mathematics. Students have, to the best of their capacity and time available, explored the literature and expressed their views. Suggestions for improvements are most welcome!

I take this opportunity to thank Principal M. A. Pendse for his constant encouragement and support in bringing out the magazine. I gratefully acknowledge the help from all the teaching and non-teaching members of our college. It is a pleasure to place on record my sincere thanks to Mr. Madhav Nagpurkar for his interest, innovative suggestions and excellent printing.

V. M. Sholapurkar
Vice-Principal

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प्रांजळ

मानसी जोशी

तृ.व.सा. (तत्त्वज्ञान विभाग)

१९७५ साली, आंतरराष्ट्रीय स्त्रीवर्ष जाहीर झाले, त्यामुळे जगभर त्यापूर्वीपासून सुरू असलेल्या स्त्री-स्वातंत्र्याच्या प्रयत्नांना आणि चळवळींना एक नेमकी ओळख सांगता यायला लागली. भारतात 'म. जोतिबा फुल्यांना' स्त्रीमुक्ती चळवळीचे जनक मानले जाते. तथा स्त्री-मुक्ती चळवळीची वाटचाल इतक्या वर्षांची आहे, काळानुसार ती अधिकाधिक प्रगल्भ होते आहे आणि तरीही... 'स्त्री'चा, स्त्री-मुक्तीचा खरा अर्थ अनेकांनी अजूनही समजूनच घेतलेला नाही...

काळानुसार इतिहास घडत गेला. उदारमतवाद, समाजवाद, जहालवाद... वादावादातून, देशादेशांतून स्त्री-मुक्तीचे विचार मांडले जात होते. पडसाद उमटत होते. एकोणिसाव्या शतकातील उदारमतवादाने स्त्रीला एक स्वतंत्र व्यक्तिमान दिले. या आत्मभानामुळे एक व्यक्ती म्हणून स्त्री सजग झाली. सार्वजनिक जीवनात आपल्या हक्कांसाठी ती झगडू लागली. तिने शिक्षणाचा हक्क मागितला. मताधिकार मागितला, संपत्तीचा अधिकार मागितला, नागरिकत्वाच्या हक्कांचा आग्रह धरला आणि त्यातून स्त्री-पुरुष समानतेचा विचार पुढे आणला. विवाहसंस्थेत सुधारणा सुचवल्या, स्वतःला विचारशील जीव म्हणून मान्यता मिळविण्याचा आग्रह धरला, राजकारणासह विविध क्षेत्रांत शिरकाव केला, स्वयंभू व स्वतंत्र व्यक्ती म्हणून आपली ओळख घायला तिने प्रारंभ केला... याच एकोणिसाव्या शतकात भारतात (ही) ब्रिटिशांचा विस्तार होत होता... राज्यकर्ते व ख्रिस्ती मिशनऱ्यांनी सुरू केलेल्या शिक्षणप्रसारामुळे तसेच ख्रिस्ती धर्मप्रचाराच्या निमित्ताने झालेल्या धर्मविषयक चर्चेमुळे धर्माने स्त्रीला दिलेले दुय्यम स्थान, धर्माच्या व धार्मिक रूढीच्या नावाने स्त्रीचे होणारे आर्थिक, सामाजिक, शारीरिक व लैंगिक शोषण इ. विषयांना सार्वजनिक चर्चाविश्वात वाचा फुटली. धार्मिक तसेच सामाजिक सुधारणेचे युग अवतरले... स्त्रीच्या व्यक्तिमत्त्वाचा उपमर्द करणाऱ्या प्रथांविरुद्ध - राजा राममोहन रॉय, ईश्वरचंद्र विद्यासागर, लोकहितवादी, म. जोतिबा फुले, सावित्रीबाई फुले, महात्मा गांधी, पंडिता रमाबाई, न्या. रानडे, आगरकर यांनी लढा सुरू केला. सन १८८२ च्या काळात ताराबाई शिंदे या एका 'स्त्री'ने स्त्री-पुरुष तुलना जितकी स्पष्ट तितक्याच सहजपणे मांडली आहे. तर्कशुद्ध प्रतिपादन, प्रखर मतप्रदर्शन, विवेकनिष्ठ युक्तिवादकौशल्य आणि उपहास-उपरोधप्रचुर भाषाशैली या वैशिष्ट्यांनी संपन्न अशी स्त्रियांच्या दुःखस्थितीची मीमांसा म्हणजे ताराबाई शिंदे लिखित 'स्त्री-पुरुष तुलना' होय.

समाजसुधारक आणि उदारमतवादी विचारवंतांनी केलेल्या अथक प्रयत्नांमुळे स्त्री-जीवनाशी संबंधित अशा अनेक प्रश्नांसंबंधी सुधारणावादी कायदे होऊ लागले. स्त्रीबंदी, विधवापुनर्विवाह, बालविवाह - संमती वयमर्यादा, केशवपन... पुढे जाऊन गर्भपात इ. संबंधी कायदे होऊ लागले. परिणामतः 'स्त्री' ला स्वातंत्र्य मिळू लागले. म्हणजेच एका अर्थाने तिला शिक्षण मिळू लागले, अधिकार मिळाला, न्याय मिळत गेला, दृष्टी मिळाली, अर्थ मिळाला... अंशतः तिने समान स्थानही मिळविले...

इतिहाससाक्षीने अनेक चळवळी झाल्या, कायदा झाला, आधुनिकतेनुसार जगसुद्धा बदलले... पण प्रत्येक व्यक्तिगत आयुष्यात असे नवीन काय घडले ? इतके होऊन सुद्धा आजही स्त्रीला समाधान का नाही मिळाले ?

का आजही आकडेमोडीत पुरुषांच्या तुलनेत स्त्रियांचे प्रमाण कमी ? का आजही अनेक ठिकाणी स्त्री ही शिक्षणापासून वंचित ? आज कायदा होऊन, केवळ पुरुषांच्या परंपरेच्या भीतीपुढे मुलीची गर्भहत्या करायला एका 'आई'चे मातृत्वही कसे आणि का कमी पडते ? का वारसा म्हणून मुलाचाच हट्ट धरला जातो ? का आजही स्त्रीला शेवटी अन्न वाढले जाते ? 'बाहेरचे काम करणे हे पुरुषाचे कर्तव्य' हा अभिमान असेल, तर 'गृहिणीचे घरकामाचे कर्तव्य' तुच्छ कसे ? अशिक्षित, सुशिक्षित असो, गृहिणी किंवा नोकरी करणारी असो, का आजही 'ती'ला स्वखर्चासाठी, आवडीसाठी घरातल्या पुरुषांसमोरच हात पसरवा लागतो ? नवऱ्याला सर्वस्व, देव मानून पूजिलेच तर तिने (अतिशयोक्ती आहे) तरी मग तिला भक्ताचा मान का नाही मिळत ? दासित्वच का पत्करावं लागतं ? का आजही वंशापायी 'आई' होण्यातच लपून राहिलंय 'स्त्री' होण्याचं सार्थक ? नैसर्गिक क्षमतांचा गैर अर्थ, वापर करून भेदभाव, उच्चनीचता ठरविण्यात आणि ती स्वीकारण्यात (ही) कुठली आली माणुसकी ? मग खरी चूक कोणती ?

कुठला धर्म... कुठली परंपरा... कुठला हक्क... कुठला कायदा ? 'समुद्र' पार केला; पण आता 'ओढा' पार होईना... स्वातंत्र्य मिळालं पण मुक्ती आजही मिळेना...

'मुक्त' झाल्याशिवाय माणूस 'व्यक्त' होऊ शकत नाही आणि 'व्यक्त' झाल्याशिवाय तो 'असू' शकत नाही. 'स्त्री-मुक्तीचा इतिहास उलगडताना यशवंत सुमंतांनी हे खूपच सुंदरपणे व्यक्त केले आहे. (१९९९ - 'मिळून साऱ्याजणी' या मासिकातील यशवंत सुमंतांचे सदर)

तथा 'मुक्ती' हे चांगलं ध्येय आहे, असं मानल्यानंतर काही प्रश्न निर्माण होतात.

मुक्ती का ? कशासाठी ? कशापासून ? कोणत्या प्रकारे ? किती प्रमाणात ? कशा तऱ्हेची ? कोणासाठी ?... शेवटच्या प्रश्नाचं उत्तर जास्त सोपं आहे. कोणासाठी-स्त्री, पुरुष, मुलं, मुली... प्रत्येक माणसासाठी ! मुक्ती कशासाठी, तर प्रत्येक व्यक्तीच्या सर्वांगीण व्यक्तिमत्व विकासासाठी, प्रगती, आत्मोन्नतीसाठी, जीवन अर्थपूर्ण, अधिकाधिक समाधानी, परिपूर्ण करण्यासाठी. नैसर्गिकतया प्रत्येक व्यक्तीमध्ये काही सामर्थ्य, गुण असतातच. या अंगभूत गुणांचा, सुप्त शक्तीचा शक्य असेल तितका, जास्तीत जास्त विकास व्हावा म्हणून मुक्ती. म्हणजेच, मोकळं वातावरण, समान संधी, सुविधा, उत्तेजन असणं आणि 'कृत्रिम' बंधनांचा अडथळा नसणं. इथे मुद्दामच 'कृत्रिम' या शब्दावर भर दिलेला आहे. कारण नेमके इथेच आपण चुकतो आणि चूक कळूनही सुधारू शकत नाही.(आणि) यामागचे महत्त्वाचे कारण म्हणजे आपण स्वीकारलेली 'परंपरा' ! तिचा आपल्यावर असलेला प्रभाव, आपल्यावर असलेली पकड !

मध्यंतरी याच संदर्भात डॉ. नंदिनी दिवाण यांचे मानसशास्त्रीय दृष्टिकोनातून लिहिलेले पुस्तक वाचण्यात आले. खरं तर, याच पुस्तकाद्वारे मला माझे विचार स्पष्ट करता आले, हे इथे प्रामाणिकपणे नमूद करावेसे वाटते. तर त्यातलेच एक उदाहरण - अगदी सहज, साधा, सर्वांच्या नसला, तरी बऱ्याच घरांत रोज घडणारा संवाद -

‘ए मोनिका, जरा इथे स्वयंपाकघरात ये लवकर ? पोळ्या करत असलेल्या आईची, बाहेरच्या खोलीतल्या मुलीला हाक. ‘पण कशाला ?’ गणितं सोडवत बसलेल्या मोनिकाचा (वय १०-१२ वर्षे) त्रासिक, उलट प्रश्न. ‘कशाला काय, मी बोलावते आहे म्हणून ! लगेचच ये बघू !’ मोनिका वैतागून, ‘पण मी अभ्यास करतेय, हा रोहन इथे रिमोट घेऊन टीव्हीशी खेळत बसलाय, त्याला का नाही बोलावत ?’ ‘पण मी तुला बोलावतेय ना ? मोठ्या माणसांचं ऐकावं. त्यांनी काय करावं, हे त्यांना शिकवू नये. ऊठ पटकन आणि आत ये !’

मोनिका तणतणत उठते. स्वयंपाकघरात जाते. आईला हवी असलेली छोटी-मोठी कामे करते आणि पुन्हा बाहेरच्या खोलीत येते. रोहनच्या कार्यात बदल नसतो, तो हसतो. मोनिकाचा मूडच जातो. गणितं सोडविण्याचा आवडता अभ्यास नकोसा वाटतो. मनात राग, वैताग, दुःख-संमिश्र भावना उमटतात आणि तिला प्रश्न पडतो, ‘दरवेळी मीच का म्हणून ?’... तिकडे स्वयंपाकघरातल्या आईला वाटायला लागतं, ‘मुलीला साध्या कामात मदत करायला बोलावलं, त्यात आपलं काय चुकलं ? मुद्दाम नाही केलं, पण मुलाला हाक मारायचं लक्षातच नाही आलं... !’

म्हणजेच कळतं पण वळत नाही... किती साधी, सरळ, सोपी गोष्ट; पण ‘परंपरेचा’ हा इतकासा ‘ओढा’ आपल्याला पार करता येत नाही... माणसाच्या मानसिकतेतून, बाह्य-आंतरव्यक्तिगत संबंधातून समाज निर्माण झाला. पुढे विशिष्ट अशी समाजव्यवस्था आकाराला येत गेली. वागण्या-वागण्यातून पितृसत्ताक सत्तासंबंध प्रस्थापित झाला. काही वळणे आपोआप सवयीची होत गेली... १५ वर्षांपूर्वी त्या मोनिकाला ‘नेहमी मीच का ?’ हा प्रश्नही पडला नसता कदाचित.... कारण, तेंव्हा ‘काळ’ आणि ‘परंपरा’ बरोबरीने चालत होती; पण आज आधुनिकतेचे युग आहे. आज मुलाबरोबर मुलीही शाळेत जाऊन, अभ्यास करून, इतर क्लासेसही मॅनेज करतात. तरुणांसमवेत तरुणीही गाड्या मारतात, पुरुषांच्या बरोबरीने स्त्रियाही पैसा कमावतात... आणि म्हणूनच आजच्या मोनिकाला हा प्रश्न पडणे साहजिकच आहे. कारण, आज काळ पुढे गेला तरी आपण अंशतः अजूनही ‘परंपरेचंच’ बोट पकडून चालतो आहोत...

म्हणूनच मुक्ती / स्वातंत्र्याचा विचार ‘अमूकपासून स्वातंत्र्य’, ‘कायद्याने स्वातंत्र्य’ एवढ्यापुरता सीमित नसून, त्याला असलेले आंतरिक अंग प्रकर्षाने ध्यानात घ्यावे लागते. बाह्यनिर्बंध नाहीत; पण जर प्रत्येक सामान्य स्त्रीलाच त्या स्वातंत्र्याचा एहसास नसेल, तर त्याला ‘स्वातंत्र्य’ म्हणता येईल का ? असा प्रश्न विचारावासा वाटतो.

म्हणजेच, बाह्यव्यवस्था, परंपरेचा प्रभाव याच्या जोडीला ‘स्त्री’ने स्वतःने या संदर्भात केलेला विचार, तिची जाणीव-जागृती, तसेच तिने जाणीवपूर्वक केलेले प्रयत्नही तितकेच महत्त्वाचे ठरतात. तेंव्हा प्रतिकूल परिस्थितीतही ‘स्त्री’ ला आत्मस्वातंत्र्य जपता आले पाहिजे. ‘विनोबांनी वर्णिलेली ‘मीराबाई’ (त्या स्तराचे संतत्व) होता येणार नाही. कदाचित... पण निदान ‘मीरा’ बनता आले पाहिजे...’

लिंग, जात, धर्म, भाषा, नागरिकत्व इ. अशा बऱ्याच गोष्टी अपघाताने आपल्या होतात; पण ‘माणूसपण’ हे आपले स्वतःचे असते. खरोखर माणूस होणं, स्वतःचं आणि शहरांचं माणूसपण जपणं असा मुक्तीचा एक अर्थ लावता येईल. समता, विश्वबंधुत्व ही उच्च, आदर्श वैश्विक मूल्ये रुजविण्यासाठी आवश्यक, पूरक परिस्थिती म्हणजे मुक्ती, व्यक्तिस्वातंत्र्य !

आपलं पहिलं, छोटंसं ते विश्व असतं - आपलं कुटुंब - तिथे ही मूल्यं रुजविणं नक्कीच आपल्या हातात आहे !

इंग्रजी भाषेत एक छान वाक्य आहे, 'Freedom is never a bequest; it is always a conquest !'

‘स्वातंत्र्य हे कधीच, कोणीच, कोणालाही ‘देत’ नसतं, ते नेहमीच जिंकून घ्यावं लागतं !’ तेंव्हा स्वातंत्र्य, मुक्ती कशापासून ? आपल्या शत्रूंपासून ! ‘त्या’ आणि ‘ते’ हे आपल्या प्रत्येकाचेच कट्टर शत्रू असतात... ‘त्या’ म्हणजेच काही पारंपरिक, संकुचित मनोवृत्ती आणि ‘ते’ म्हणजेच काही पूर्वग्रहदूषित, पक्षपाती दृष्टिकोन !

तथा, माणसांना इच्छास्वातंत्र्य (freedom of will) खरोखरच असतं का, याबाबत तत्त्वज्ञानात, मानसशास्त्रात बरेच वादविवाद आहेत; पण आता जरी असं मानलं की, आपल्या सर्वांना इच्छास्वातंत्र्य आहे, तरी खरा प्रश्न असा आहे की, ‘स्वातंत्र्याची इच्छा (will of freedom) आपल्यापैकी कितीजणांना आहे...?... !

‘मला’ (प्रत्येकाला) हवं स्वातंत्र्य... पण मनमानी नको ! जबाबदारी कळली तरच स्वातंत्र्य उपभोगायला अर्थ आहे. समानता हवी, पण विध्वंसक स्पर्धा नको ! मुक्तता हवी निर्बंधापासून, पण बद्धतेची व्यथा नको ! आंतरिक निर्बंधांची सवय झाल्यावर बाह्य निर्बंधांची गरज उरत नसते. कुठलीच वेल अशी लगेचच उमलत नसते ! अनुभवातून शैली घडते तशी, वृत्तीतून प्रवृत्ती... काळातून परंपरा बनते तशी सवयीतून सक्ती... ! मानसिकतेनुसार, व्यक्तीगणिक शब्द बदलत जातात... पण बदल शब्दात नको, विचारात हवा... विचार ‘त्या’ चा किंवा ‘ती’चा नको, ‘विचार’ माझा हवा... !

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या संशोधनात्मक निबंधासाठी अभ्यासलेली, वाचलेली पुस्तके -

- १) स्त्री-पुरुष तुलना - ताराबाई शिंदे.
- २) स्त्री-शक्ति - विनोबा भावे.
- ३) मिळून साऱ्याजणी या मासिकातील यशवंत सुमंत यांचे सदर.
- ४) बदलत्या मनोभूमिका - नंदिनी दिवाण.
- ५) भारतीय स्त्री - मीना केळकर.
- ६) तिसऱ्या बिंदूच्या शोधात - तारा भवाळकर.

Human, Yet Treated as Inhuman

Vijay Chokhar
T. Y. B. A. (Sociology)

The Nomadic and Denotified Tribes (DNT-NT) constitute about 5 million of the population in Maharashtra and about 60 million all over India. There are 313 Nomadic Tribes and 198 Denotified Tribes. Due to the wandering traditions over hundreds of years and without any ostensible means of livelihood under the influence of the caste system, they have been forced to live under sub-human conditions. A large section of these tribes is known as 'Vimukta Jatis' or the Ex-Criminal Tribes because they were branded as criminals by birth under the Criminal Tribes Act, 1871, enacted by the British Government.

Even today, after 60 years of independence, they face discrimination, abuse, and social and economic marginalisation. The Government has not done much for these tribes. They are still not united. They don't know about their rights. The Pardhis or Phase Pardhis are known as criminals even today. They are considered to be Shudras, therefore they are not supposed to collect wealth. These people are always in search of their daily living, therefore they don't get settled in one place. They are not poor by nature but made poor by the social norms and customs, such as religious authority and the caste system.

These people have no land and no right to live in any village. They are considered to be criminals. Therefore, in order to save themselves from the police, they run away to the forests, out of the village to the valleys. They are not afraid of wild animals, but afraid of human beings—i.e. the police. If they have to stay in any village for a few days, they first have to take permission from the Sarpanch of the village. Also every day, all members of the group are required to register at a specific time and place with the local magistrate. Anyone failing to register would be charged with a crime.

In spite of the repeal of the Criminal Tribes Act in 1952, the Pardhis are still treated as criminals by birth and subjected to harassment and persecution at the hands of the police and the state machinery. However, they have been deprived of the status of Scheduled Tribes provided by the Constitution due to certain historical circumstances and the acts of omission and commission on part of the Government and the society.

The DNT-NT communities must have looked forward to an independent India that afforded them protection under the fundamental rights section of the Indian Constitution. However, the promises of Articles 14 (equality before the law), Article 15 (prohibition of discrimination), and Article 21 (protection of life and personal liberty) have yet to extend their full reach over DNT-NTs.

For generations, these tribes have had wandering traditions and they have hardly been integrated into the society. In fact, the society has always looked at them with mistrust and suspicion due to the stigma of criminality attached to them. In that sense they have been living a life of isolation from the rest of the society. Some of these tribes still prefer to stay near the jungle, away from the villages. Their temporary settlements are known as 'pal' or 'pada'.

Many cruel and inhuman incidents have taken place in the past and they continue to even today, which pierces the heart. In Latur there was a woman named Hirabai Kale who had just delivered a child in her tent. She had nothing to eat because her husband was under custody. For the sake of two hundred rupees, Hirabai underwent a family planning surgery. With that money she bought half a sack of 'jowar'. On the same day, in the village, one of the farmers' grains were stolen and innocent Hirabai was arrested with her newborn baby.

Whenever the police jeep comes to raid their tents, the male members of the family run away to the forests, because they know that the police will catch them and put them in jail on false charges. In order to catch them, the police destroys their tents and takes their wives and young daughters in custody. They beat them and sometime they even rape them in front of their family members.

Due to the fear of the police and the leaders of the village, the Pardhis can never get settled in one place. In various incidents these innocent people were caught and taken into custody for no reason at all, except that they belonged to the so-called criminal tribes. Their 'pals' were destroyed and the policemen took their women. In some cases the male members of the family were shot dead on the spot.

At present there are many social workers as well as NGOs that are working for the rights of these people. They are endeavouring to unite these tribes, and make them aware of their rights and of the fact that they are also citizens of this country and have full freedom to live like other human beings. But this is not enough. There is still plenty more to do.

Unless and until they settle at one place, and are provided with opportunities of education and employment, they will never be in a position to integrate themselves in the society and avail of the benefits of modern civil life. Girish Prabhune, a social worker, has made significant efforts in this direction. He has spent a lot of time to unite the Pardhis and convince them of their rights. He has even started 'ashram shalas' for their children.

Recently, a survey was conducted in Shrigonde Taluka by an NGO based in Ahmednagar. In this survey 215 Pardhi families were found in 15 villages. In all 102 people had their ration cards. In the survey it was found also that the mindset up of these people is changing. They would like to get settled in the villages or in places nearby. There is a desire in them to change their lifestyle. However the stigma of criminality does not leave them. Sixty per cent of these people earn their livelihood by begging

Photographs of the Pardhi Community



and others are daily wage earners. Only two to four per cent of them earn their living by theft and robbery. People from 11 villages go for begging to Mumbai. They beg in trains. The most prominent problem is that of education and hygiene. Hardly two per cent among these people have received basic education. They want to get their children educated but not in the same village. They want them to go to school somewhere far away from the village, so that the stigma of the criminal tribe does not affect the education of their children. The NGO that conducted this survey is trying to get in place some government schemes for them, so that they can have their own houses as well education for their children.

The Nomadic and Denotified Tribes are National tribes. As already mentioned, these tribes have wandering traditions. In the absence of any means of survival and lack of education which could enable them to fit into the settled society, they are forced to continue with these traditions for bare survival in the most degrading and sub-human conditions. Thousands of families belonging to these tribes wander from place to place and stay in temporary structures rarely fit for human beings.

Hitherto, their life has been a long tale of suffering and persecution due to the absence of a means of livelihood and the stigma of criminality attached to them by the society. While it may take years and years to remove this stigma, the injustice meted out to them due to the act of omission and neglect could well be corrected without any further delay. It will be impossible for these tribes to enjoy the human rights or the civil rights that are available to the other citizens of India unless there is a positive intervention of the government in the form of some Constitutional safeguards. It is imperative that the civil society as well as the state stops treating the Pardhis as a criminal tribe, and allows them to have opportunities of education and employment so that they are in a position to integrate themselves into the society and avail of the benefits of modern civil life.

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Foreign Direct Investment in the Retail Sector: Pros and Cons

Shilpa Bhide and Pallavi Ranade
T. Y. B. A. (Economics)

Are you bored of buying goods from the same old traditional *kirana* store? Would you like to buy them from lavish malls, and do this without increasing your budget? Now this is possible as our government is welcoming foreign direct investment in the retail sector.

What is Foreign Direct Investment (FDI)?

FDI simply means investment in various sectors by foreigners in host countries. It basically works in two ways: Either the foreigners directly set up plants in the host countries; or they invest in the existing industries or financial institutions.

In previous times, foreign investment was restricted to the big industrial sector alone. But now the Indian government has allowed it in the retail sector also.

What is the Retail Sector?

The retail sector in an economy basically includes all the goods for livelihood such as cloth, food material, fruits, vegetables, stationery, hardware etc. In India, in the retail sector trade, the organized sector was only 2%, and a whopping 98% was unorganised.

Indian Retail Market	Estimates
* The current Indian retail market	\$300 bn. (about 15% of the GDP).
* The expected growth by 2015	\$600 bn.
* The expected investment of big companies till 2010.	\$60 bn.

The Indian retail sector employs 21 million people, which is about 7% of our total labour force.

Why the Retail Sector Needs Foreign Direct Investment?

There is need for foreign direct investment in the retail sector for a number of reasons. First, the deficiencies of the agricultural marketing system in India are too well known to be reiterated here. Post harvest, there is no effective agency to take care of storing, processing, trading and exporting of farm products. There are intermediaries who do little value addition.

Second, there are at present no standards or facilities for farmers to even make a preliminary assessment of the quality of their produce.

Third, the Indian retailer is in no position to compete with her/his counterparts from other countries.

Fourth, India, being a developing country, is low on capital and technological know-how. The role of foreign direct investment will be an effective and risk-free way to augment investment resources and to remove the problems of poverty and unemployment. FDI will bring in a large amount of capital and sophisticated skills of a high calibre, which will stimulate development.

So, the Indian government has taken the decision to allow FDI in the retail sector. The government policy regarding this is as follows. The government is planning to open a small window for FDI in the retail sector by initially allowing some investments in the trade of single brand goods only. Single brand retailing literally means availability of different products of the same brand. This ensures that new retailers do not replace the existing retailers.

There is an urgent need to step up investment in food processing and to foster backward linkages, including marketing, particularly since 40% of the food and vegetable produced in the country rot every year for want of modern preservation technology. That is why the government has looked into different models of FDI in retail and has shown openness to one that would not displace the existing employment in this sector. What this means is that foreigners, if they want to enter, will have to take local partners, and will be allowed to invest only up to 51%. Once the local partners and other players have learnt by doing, the FDI cap can be raised gradually.

Big foreign retail corporations like Walmart and Tesco Plc are knocking on India's doors. But, within the country, there is a raging debate on whether FDI should be allowed in the retail sector or not. Different political parties have their different opinions on FDI in the retail sector. The Bhartiya Janata Party is opposed to it. It recommends in its place other domestic policies to bring improvement in the retail sector. The left parties in the present government would also oppose any decision that permits the opening up of the retail sector to foreigners.

The retail industry is expected to grow up to \$427 billion in the next four years. The organized sector will grow up to \$23 billion by 2010. The main reasons for this growth are:

1. A healthy economic growth of 7% to 8%.
2. Increasing disposable incomes among the middle class.
3. The improving standard of living, mainly due to the booming information technology sector.
4. A young population with a propensity to consume because of the hefty salaries they receive.

The sheer potential in the organized sector with a population of over 1 billion and a 300-million-strong middle class, makes an attractive market for foreign retailers. This is precisely why the big retail corporations like Walmart (the biggest retailer in the world), Carrefour SA (Europe's largest retailer), and Tesco Plc (the UK's largest retailer) are keen to enter the Indian retail market.

In July 2006, it was reported that Walmart, the world's largest retailer with an annual income of \$312.4 billion had received permission from the Indian government to enter the retail market. In November 2006, it chose Bharati enterprises as its domestic partner in India. Bharati's current investment in the retail sector is \$2.5 billion. Their terms of contract are as follows. Walmart is trying to enter into contracts with farmers and will supply products to Bharati. It will also provide backward linkages, like storage systems and transport systems. Bharati will basically take care of the retail business. It has approached Walmart for advanced technology and management skills. But there is no official contract between them as yet due to strong protests made on various levels when Vice Chairman of Walmart was on his formal visit to India.

When the biggest retailer in the world evinced an interest in the Indian retail sector, the big business houses in India also woke up to the potential in this sector. Subsequently, the Reliance Future Group Industries announced an initial investment of \$750 million, that is Rs 3,350 crore, and immediately started with six grocery malls in Hyderabad. It has planned to set up about 200 plants in the country. The Tatas, Birlas and Godrejs, and Subhiksha are also interested in investing.

The response from the unorganised sector in retail, which employs approximately 5 crore people, is not so enthusiastic. The small retailers are afraid of being unable to continue their traditional business further. The malls sell products at wholesale prices. As a result, customers are weaned away from the small retailers, who are no longer able to extract the maximum profits. Not surprisingly, this class has been the most vociferous in protesting FDI in the retail sector. But representatives of Walmart International argue that *kirana* stores have unique advantages such as understanding of local needs and superior service in the form of home delivery, which will help them to retain their edge over the large supermarkets, both of India and of foreign companies. Also, the credit system is a plus point of *kirana* stores. Long-standing personal contacts with consumers also work to their advantage.

Disadvantages

The people lobbying against FDI include trade associations, political parties, and the unorganised retailers. Their argument runs as follows.

One, the entry of large global retailers will kill the local shops and render millions of people jobless. The government will have to ensure jobs for this displaced workforce.

Two, the global retailers would exercise monopolistic power in controlling the prices received by the suppliers. They will also suppress the domestic suppliers and engage in wiping out competition.

Third, the organised retailers feel that it is too early to allow FDI in retail. They feel the need to be given some time to gain critical mass, so that they can hold their own against foreign retailers.

Advantages

Those who want to promote foreign direct investment present their case thus. They argue, one, that only FDI can quicken the pace of organised retailing. The example given is that of China, where the organised sector constitutes nearly 20% because of foreign investment, as against India, where it is a paltry 2% at present.

Two, if the retailers have to succeed, they have to invest substantially in backward linkages and in the training of the farmers who supply goods to them. Hitherto, this has not been possible due to a shortage of capital. Foreign investment can definitely be of help here.

Three, FDI will encourage competition in the retail sector and eventually prepare the retailers to compete in the international market.

And four, as foreign retailers grow familiar with the Indian products, they are also likely to increase purchase from India for their international operations.

Conclusions

Why really is the unorganised sector opposing foreign direct investment in retail? One has to understand that the fight is not so much between foreign investment and domestic investment, as between the 'big' and the 'small'.

Certainly, the rich middle-class consumers will shift to these malls and supermarkets. But the poor-class consumers will still prefer to go to the *kirana* stores; and in our country this poor class constitutes a large part of the total population. So, the *kirana* stores will not lose much of their business in the long run.

The main advantage of foreign investment is the superior backward linkages that will come with it. These will include advanced technology, and better managerial skills, storage facilities and other infrastructure facilities. FDI is important for the development of the Indian retail market.

The government should make some policies to prevent foreigners from becoming monopolistic. Here are some suggestions:

1. Before allowing foreign direct investment in the retail sector, the government should ensure more privileges and encouragement to the domestic organised sector so that they can compete with the foreign companies.

2. The government should actually create a place for unemployed people in the new retail markets through innovative and useful steps.
3. The foreign retailers should be suggested to cooperate with the small traders and assimilate them in the new process.

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पायाभूत सुविधांचा विकास करा, आत्महत्या थांबतील ...

जीवन बिरादार
एम.ए. ॥ (अर्थशास्त्र)

हा लेख संपूर्णपणे द्वितीय तथ्यावर (secondary data) आधारित आहे. विदर्भातील पायाभूत सुविधांचा विकास पर्याप्त केला, तर शेतकऱ्यांच्या उत्पन्नात निश्चितता येईल. यातून त्यांना जाणवणारा असहाय्यपणा व पसरलेला निराशावाद कमी होईल व आत्महत्या थांबतील !

I

एकविसाव्या शतकाच्या सुरुवातीला ८% विकासाचा वृद्धीदर कायम राखत विकास करणारी व १०% विकासदर गाठण्याचे स्वप्न बाळगणारी अर्थव्यवस्था म्हणून भारतीय अर्थव्यवस्थेची ओळख आज जगास होत आहे. देशातील अनेक उद्योगपती विदेशी कंपन्यांमध्ये भांडवल गुंतविण्यात आघाडीवर आहेत. अर्थव्यवस्थेचे टप्प्याटप्प्याने होणारे रूपांतर भांडवलशाहीकडे नेणारे आहे. खासगी क्षेत्राला मोठ्या संधी दिल्या जात आहेत. औद्योगिक व सेवाक्षेत्रांचा वृद्धीदर वाढत आहे. मात्र शेतीक्षेत्राचा विकासदर १ ते २% यामध्येच अडकून पडला आहे. जागतिक व्यापार संघटनेत अनेक वाटाघाटी होत आहेत. भारतीय शेतकऱ्यांकडून अमेरिका, युरोप या देशांच्या शेतकऱ्यांबरोबर स्पर्धा करण्याची अपेक्षा केली जात आहे; पण त्यासाठी पायाभूत सुविधांचा मात्र कसलाच विचार केला जात नाही ! आपल्या देशाच्या लोकसंख्येत सर्वांत जास्त असलेला शेतकरीवर्ग असहाय्यतेमुळे व निराशावादामुळे आत्महत्या करत आहे !

भारतीय अर्थव्यवस्थेत जवळपास ७०% पेक्षा जास्त लोकसंख्या ही शेती व शेतीशी संबंधित उद्योगांवर आधारलेली आहे. जवळजवळ ६०% लोकांना शेतीमध्ये रोजगार मिळतो. भारताने १९९१ साली नवे आर्थिक धोरण स्वीकारले असून, आज १५ वर्षांचा कालावधी उलटून गेल्यानंतर अर्थव्यवस्थेत काही गंभीर स्वरूपाचे प्रश्न निर्माण झाले आहेत. जागतिकीकरणामुळे शेतीक्षेत्रातील कमजोरपणाची जाणीव आपल्याला होत आहे. दहाव्या पंचवार्षिक योजनेत ८% एवढा आर्थिक वृद्धीदर कायम राखण्यात भारताला यश मिळाले आहे; पण शेतकऱ्यांना जाणवणारी असहाय्यता आणि त्यांच्यामध्ये पसरलेला निराशावाद यांचे काय ? यातून घडणाऱ्या आत्महत्या आज शेतीक्षेत्राचा वेगळ्या पद्धतीने विचार करण्यास लावणारी एक गंभीर समस्या आहे.

शेतकऱ्यांच्या आत्महत्या या विषयावर प्रसारमाध्यमांनी चांगली जनजागृती निर्माण केली आहे. आज कोणतेही वर्तमानपत्र काढून पाहिले, तर त्यात आत्महत्येची एक तरी बातमी छापलेली असते. या विषयाचा अभ्यास करण्यासाठी महाराष्ट्र शासनाने 'इंदिरा गांधी विकास संशोधन संस्था, मुंबई' यांच्याकडे काम सोपविले होते. (२६ जानेवारी २००६) व 'टाटा सामाजिकशास्त्र संस्था, (१५ मार्च २००५) यांच्याकडे मुंबई उच्च न्यायालयाने काम सोपविले होते. त्यांनी आपला अहवाल सादर केला व त्यात म्हटले की, 'शेतकरी आत्महत्या कर्जबाजारीपणा व नापिकी या दोन मूलभूत कारणांमुळे करतात.' शेतकऱ्यांच्या आत्महत्या फक्त महाराष्ट्रातच नाही, तर केरळसारख्या

आर्थिक विकासात अग्रेसर असलेल्या व हरितक्रांतीची जननी मानल्या जाणाऱ्या राज्यांत सुद्धा होत आहेत. आंध्रप्रदेशामध्ये शेतकऱ्यांनी आत्महत्या करण्याचे कारण : 'असंस्थात्मक कर्जाचे वाढते प्रमाण' हे सांगितले जाते.* एकंदरीत, अनेक राज्यांत शेतकरी आत्महत्या करत असल्याचे आढळून येते.

* के. अंनी निर्मला - २००३.

शेतकरी आत्महत्या का करतात ?

कोणतीही व्यक्ती आत्महत्या का करते याची अनेक कारणे सांगितली जातात - मानसिक कारणे तसेच सामाजिक-आर्थिक कारणे यामध्ये महत्त्वाची आहेत.

शेतकरी आत्महत्या करण्याचे महत्त्वाचे कारण सामाजिक-आर्थिक परिस्थिती हे आहे. ही परिस्थिती अशी निर्माण होते. एखादा शेतकरी बँकेकडून कर्ज घेतो. बी-बियाणे खरेदी करून शेतीमध्ये पेरणी करतो; पण दोन-तीन महिने पाऊस पडत नाही. नंतर जेव्हा पाऊस पडतो तेव्हा शेतकऱ्याला दुसऱ्या वेळी पेरणी करावी लागते. त्यामधून पिकलेले धान्य बाजारात घेऊन जातो, तर त्याला 'किफायतशीर' किंमत मिळत नाही. म्हणजेच उत्पादनखर्च भरून निघेल इतकी सुद्धा किंमत मिळत नाही. मग शेतकरी निराश होतो. तो आपल्या मुलांच्या शिक्षणासाठी खर्च करू शकत नाही. घरामध्ये एखादी आजारी व्यक्ती असेल तर त्याचे औषधपाणी करण्यासाठी खर्च करण्यास असमर्थ असतो. याशिवाय कुटुंबात मुलगी असेल तर समाजप्रथेनुसार मुलीसाठी हुंडा देणे व लग्न करून देणे हे सुद्धा त्याला अवघड होऊन बसते. बँक तर कर्ज देत नाही. कारण, पूर्वीचे कर्ज परत केलेले नसते. मग शेतकरी सावकार, सराफपेढी यांच्याकडे जातो. त्यांच्याकडून कर्ज मिळते; पण त्यावरील व्याजाचे दर खूप असल्याने त्याचे कर्जाची एक-दोन वर्षांत अवाढव्य मोठी रक्कम होऊन बसते. त्यातूनच मानसिक कारणे उद्भवतात. अशा वेळी शेतकरी निराशेमध्ये जगत असतो. त्याला असहाय्य वाटत असते आणि अशा अवस्थेतच तो आत्महत्येसारखे कृत्य करतो. शेतकऱ्यांच्या आत्महत्या ही समस्या अनेक राज्यांमध्ये आहे; पण वेळ आणि अभ्यास यांच्या दृष्टीने आपण फक्त महाराष्ट्रातील सर्वांत जास्त आत्महत्या असलेल्या विदर्भ या भागाचाच विचार करणार आहोत.

विदर्भामध्ये एकूण ११ जिल्ह्यांचा समावेश होतो. त्यामध्ये अमरावती, यवतमाळ व वर्धा या तीन जिल्ह्यांत आत्महत्येचे हे प्रमाण सर्वांत जास्त आहे. राज्यातील जवळजवळ ९०% शेतकऱ्यांच्या आत्महत्या येथे झाल्या आहेत.* म्हणून या तीन जिल्ह्यांचा आपण अभ्यास करू.

* बी. बी. मोहन्ती, श्रॉफ - २००३.

II

महाराष्ट्राच्या ग्रामीण भागात दारिद्र्यरेषेखालील कुटुंबियांची संख्या १९९७-९८ मध्ये ३४.५५% एवढी होती. यवतमाळ व वर्धा जिल्ह्यात अनुक्रमे ४३.६२% , ४४.४२% एवढी लोकसंख्या दारिद्र्य रेषेखाली जगत होती, तर अमरावती जिल्ह्यात याच कालावधीमध्ये ५१.२८% होती. म्हणजेच संपूर्ण महाराष्ट्राचा विचार करता या तीन जिल्ह्यांत दारिद्र्याचे प्रमाण अधिक आहे.

‘मानवी विकास निर्देशांक’ (२०००) यात वर्धा जिल्ह्याचा राज्यात १५ वा क्रमांक होता, तर यवतमाळ जिल्ह्याचा ३३ वा क्रमांक होता. म्हणजेच यवतमाळ जिल्ह्यात मानवी विकासाचा निर्देशांक खूप कमी आहे. हे अल्पविकासाचे चिन्ह आहे.

भारताने स्वातंत्र्यानंतर १९५१-५२ साली नियोजनात्मक विकास साध्य करण्यासाठी पंचवार्षिक योजनेचा स्वीकार केला. पहिल्या पंचवार्षिक योजनेत (१९५१-५२ ते १९५५-५६) शेतीच्या विकासावर भर देण्यात आला होता. दुसऱ्या पंचवार्षिक योजनेच्या शेवटी देशामध्ये अन्नधान्य टंचाईची समस्या निर्माण झाली होती. भारतीय शेतीत नवीन तंत्रज्ञानाचा वापर व अन्नधान्यात स्वयंपूर्णता येण्यासाठी शेतीक्षेत्रात ‘हरितक्रांती’ (१९६७-६८) करण्याचे धोरण आखले गेले. हरितक्रांतीमध्ये ‘उच्च उत्पादन देणाऱ्या बियाण्यांचा कार्यक्रम (HYVP) हाती घेण्यात आला. यामधून शेतीमध्ये अनेक प्रकारच्या सुधारणा करण्यात आल्या. भारतीय शेतकऱ्याला परंपरागत तंत्राकडून आधुनिक कार्यक्षम तंत्राकडे आणण्याचे प्रयत्न सुरू केले गेले. हे तंत्रज्ञान भांडवल-प्रधान तंत्रज्ञान होते, त्यामुळे शेतीवर केल्या जाणाऱ्या खर्चात मोठ्या प्रमाणात वाढ झाली. शेतकरी नगदी पिके घेण्याकडे वळला. या तीन जिल्ह्यांमध्ये कापूस हे नगदी पीक मोठ्या प्रमाणावर घेतले जाते. (तक्ता क्र. १) या तिन्ही जिल्ह्यांत कापूस हे पीक मुख्य पीक मानले जाते. इतर दोन जिल्ह्यांपेक्षा यवतमाळ जिल्ह्यात कापूस उत्पादन मोठ्या प्रमाणावर केले जाते; पण अमरावती व वर्धा जिल्ह्यात अलीकडील काळात तेलबियांचे उत्पादन वाढलेले दिसून येते. १९७२ साली महाराष्ट्र सरकारने राज्यातील कापूस उत्पादकांच्या संरक्षणासाठी व ‘किंमत हमी’ यासाठी ‘कापूस एकाधिकार खरेदी योजना’ सुरू केली; पण या योजनेचा फायदा फक्त मोठ्या शेतकऱ्यांनाच होत आहे. लहान व मध्यम शेतकरी या योजनेचा लाभ घेऊ शकत नाहीत. कारण, यामध्ये हप्ते पद्धतीने पैसे दिले जातात. त्यातही मोठ्या प्रमाणावर भ्रष्टाचार आहे, उत्पादनाच्या प्रमाणीकरणातही फसवणूक केली जाते. मोठ्या शेतकऱ्यांचे तेथे कायमचे वर्चस्व असते. या कारणांमुळे मध्यम व लहान शेतकऱ्यांना या योजनेचा फायदा मिळत नाही. मग असे शेतकरी स्थानिक दलाल, व्यापारी, मध्यस्थांच्या आधारे आपल्या मालाची विक्री करतात. कधी-कधी तर बाजारभावापेक्षा या योजनेअंतर्गत कापसाला कमी किंमत मिळते आणि काही वेळेस कापूस खरेदी उशिरा सुरू केली जाते. तसेच कापूस खरेदीच्या प्रक्रियेस खूप वेळ लावला जातो.*

* फ्रन्टलाईन - २९ डिसें. २००६.

महाराष्ट्र शासनानेसुद्धा शेतीमध्ये सुधारणा करण्यासाठी नवीन तंत्रज्ञानाचा वापर करण्याचे ठरविले. ज्यामुळे शेतकरी सधन झाला खरा; पण यामुळेच तो हळूहळू निराशेत गेला. नगदी पिकांचे उत्पादन मोठ्या प्रमाणावर करण्यासाठी उत्पादनखर्च वाढला. उच्च उत्पादन देणाऱ्या बियाण्यांच्या जातीसाठी मोठ्या प्रमाणावर रासायनिक खते, कीटकनाशके यांचा वापर करावा लागतो. म्हणजेच एकंदरीत उत्पादनखर्चात वाढ झाली. ‘शेतीखर्च आणि किंमत’यासाठी भारत सरकारने नेमलेल्या समितीच्या अहवालात असे आढळून आले की, ‘महाराष्ट्रामध्ये एकूण प्रत्येक हेक्टराी कापूस उत्पादनखर्च १९८१-८२ मध्ये २१४३.७४ रु. होता. त्यात वाढ होऊन १९९५-९६ मध्ये ६३४१.१८ रु. झाला आहे. तसेच ज्वारीचा उत्पादनखर्च १९८१-८२ मध्ये ७१६.३२ रु. होता. त्यात वाढ होऊन १९९५-९६ मध्ये २११८.८७ रु. झाला आहे. म्हणजेच उत्पादनखर्चात मोठ्या प्रमाणात वाढ झाली आहे.

तक्ता क्रमांक १

मुख्य पिकाखालील क्षेत्र (एकूण पिकाखालील क्षेत्रांचे टक्केवारीमध्ये)

वर्ष	अमरावती			यवतमाळ			वर्धा		
	अन्नधान्य	तेलबिया	कापूस	अन्नधान्य	तेलबिया	कापूस	अन्नधान्य	तेलबिया	कापूस
१९८०-८१	४४.००	६.०४	४६.८८	५०.६३	४.८३	४३.३१	४८.८७	५.७८	४३.५८
१९८५-८६	४६.४०	५.००	४४.५३	४३.३५	३.८०	५१.४७	४६.१८	९.६३	४२.२१
१९९०-९१	४५.८६	७.९४	४०.३६	४७.४२	५.१०	४६.६०	४५.८९	१३.५९	३७.६१
१९९५-९६	३९.४८	१३.४०	४१.०३	४३.३२	५.२६	४८.५६	४०.५६	२०.९४	३५.६५
२०००-०१	३८.८०	१९.८५	३०.०४	४.९३	९.४३	४५.८५	३६.९५	३६.९२	३६.५५

स्रोत : Season and Crop Report, Maharashtra state, relevant issues.

शेतकऱ्यांची आत्महत्या ही समस्या अलीकडच्या काळात गंभीर बनत चालली आहे. १९९०-२००० पासून आत्महत्येचे प्रमाण मोठ्या प्रमाणावर वाढत असलेले दिसून येते. यामध्ये पुरुष शेतकरी आत्महत्येचे प्रमाण जास्त आहे. (तक्ता क्र. २) १९९५ मध्ये राज्यात १०८३ शेतकऱ्यांनी आत्महत्या केली, तर २००४ मध्ये सुमारे ४१४७ शेतकऱ्यांनी आत्महत्या केल्याचे आढळून आले आहे. यामध्ये सर्वात जास्त आत्महत्या (२००१-२००४) अमरावती विभागात झाल्या आहेत. (४४८) (तक्ता क्र. ३)

तक्ता क्रमांक २

महाराष्ट्रातील लिंगानुसार शेतकरी आत्महत्येची आकडेवारी

(१९९५-२००४)

वर्ष	आत्महत्या पुरुष	आत्महत्या स्त्री	एकूण आत्महत्या
१९९५	९७८	१०५	१०८३
१९९६	१५७०	४११	१९८१
१९९७	१६००	३१७	१९७१
१९९८	१९३८	४७१	२४०९
१९९९	२०५०	३७३	२४२३
२०००	२४९२	५७०	३०६२
२००१	२९४५	५९१	३५३६
२००२	३१५५	५४०	३६९५
२००३	३३८१	४५५	३८३६
२००४	३७९९	३४८	४१४७

स्रोत : IGIDR - 2006.

तक्ता क्रमांक ३
विभागानुसार शेतकरी आत्महत्येचे प्रमाण

क्रमांक	प्रशासकीय विभाग	आत्महत्या (मार्च २००१ ते डिसें २००४)	समावेश जिल्हे
१	अमरावती	४४८	यवतमाळ, अमरावती, अकोला, वाशीम, बुलढाणा
२	औरंगाबाद	९०	हिंगोली, जालना, उस्मानाबाद
३	नागपूर	६६	वर्धा आणि नागपूर
४	नाशिक	३८	जळगाव
५	पुणे	१	-----
६	कोल्हापूर	१	-----

स्रोत : TISS - 2005.

सर्वात जास्त आत्महत्या जुलै व ऑगस्ट महिन्यात झाल्याचे निदर्शनास आले आहे. (तक्ता क्र.४) याचे कारण म्हणजे साधारणतः जून - जुलै महिन्यात पाऊस पडतो, शेतकरी पेरणी करतात; पण नंतर ३-४ आठवडे पाऊसच पडत नाही. उभे पीक वाळून चाललेले शेतकऱ्याला पाहवत नाही. तो निराश व हताश होतो व आत्महत्येसारखे कृत्य करतो.

तक्ता क्रमांक ४
महिन्यानुसार शेतकरी आत्महत्येचे विवरण (२००४)

महिने	वारंवारिता	एकूण टक्केवारी (%)
जानेवारी	१३	४.१
फेब्रुवारी	६	१.९
मार्च	६	१.९
एप्रिल	१३	४.१
मे	५	१.६
जून	१२	३.८
जुलै	७१	२२.४
ऑगस्ट	७०	२१.९
सप्टेंबर	४३	१३.४
ऑक्टोबर	३२	१०.०
नोव्हेंबर	२२	६.९
डिसेंबर	२७	८.४
एकूण	३२०	१००.०

स्रोत : देशोन्नती - २००४.

जवळजवळ एकूण आत्महत्यांपैकी (वार्षिक) ४४% आत्महत्या जुलै-ऑगस्ट महिन्यामध्ये होत असलेल्या दिसतात. 'शेतकरी आत्महत्येचे आणखी एक वैशिष्ट्य म्हणजे आत्महत्या करण्याचे प्रमाण शेतीच्या धारणाक्षेत्र आकारानुसार सीमान्त व मध्यमशेतकरी कुटुंबात जास्त आहे. (तक्ता क्र.५) याचे कारण म्हणजे यांच्याकडे शेतीशिवाय दुसरे उत्पन्नाचे साधनच उपलब्ध नसते. जेव्हा शेतीत पीक येत नाही. हे समजते, योग्य उत्पन्न मिळत नाही, याचा अनुभव येतो, तेव्हा हे शेतकरी आत्महत्या करण्यास प्रवृत्त होतात. तसेच शेतकऱ्यांना बँकेकडून कर्ज पण कमी मिळते. कारण, पुरेसे तारण नाही! म्हणून ते मजबुरीने सावकाराकडे जातात. सावकार मोठ्या प्रमाणावर व्याजाचे दर आकारतो आणि कर्जाचा आकडा मोठा होतो. म्हणून आत्महत्यांपैकी जवळजवळ ७३.८% एवढे प्रमाण 'शेतकरी आत्महत्येचे' सीमान्त व मध्यम धारणाक्षेत्र आकाराच्या शेतकऱ्यांमध्ये आढळून आले आहे. असे शेतकरी स्वतःला दुर्बल समजतात. यातून निराशा पसरते व शेतकरी आत्महत्या करतो. या सर्व आत्महत्या घडत असताना, त्यामागील कारणांचा विचार करणे हे अभ्यासाच्या दृष्टीने अत्यंत महत्वाचे आहे. आपण आत्महत्येची सामाजिक-आर्थिक कारणे पाहणार आहोत.

तक्ता क्रमांक ५

जमीनधारणक्षेत्राचा आकार	टक्केवारी (%)	सरासरी जमीन
सीमान्त (०.२.५ : एकर)	१४.४	२.१
लहान (२.५.५ : एकर)	३८.७ } ७३.८	३.९
अर्ध मध्यम (५.१० : एकर)	२०.७	७.४
मध्यम (१०-२० : एकर)	१५.३	१३.१
मोठे (२० + एकर)	३.६	३०.०
उपलब्ध नाही	७.२	-----
एकूण	१००.००	६.९

स्रोत : IGIDR - 2006.

III

शेतकऱ्यांच्या आत्महत्येची कारणे

१) वाढता उत्पादनखर्च

देशामध्ये हरितक्रांतीच्या प्रसारामुळे शेतीक्षेत्रात मोठ्या प्रमाणात आधुनिक बी-बियाण्यांचा वापर वाढला तेव्हा या आधुनिक बी-बियाण्यांसाठी रासायनिक खते, कीटकनाशके, जलसिंचन सुविधा या सर्व घटकांची अत्यंत गरज असते. यासाठी शेतकऱ्याला चालू भांडवली खर्च मोठ्या प्रमाणावर करावा लागतो.

महाराष्ट्रामध्ये २००१-०२ मध्ये ज्वारी, कापूस, तूर, सोयाबीन या मुख्य पिकांसाठी खालीलप्रमाणे उत्पादनखर्च करावा लागतो.

तक्ता क्रमांक ६
महाराष्ट्रातील उत्पादनखर्चाचे प्रमाण (२००१-०२)

घटक	ज्वारी	तूर	सोयाबीन	कापूस
चालू खर्च	७५.७	५७.२	७३.८	७६.८
मानवी श्रम	२९.५	२७.७	२०.३	२६.३
कुटुंब	१४.०	१२.५	७.०	९.५
प्राण्यांचे श्रम	२५.५	१८.४	२२.०	२२.४
स्वतः	१९.८	१३.९	१८.०	२३.५
यांत्रिक श्रम	४.७	१.५	८.२	३.२
मजुरी (Hired)	४.६	१.५	८.२	३.१
बियाणे	२.३	३.१	९.९	५.३
रासायनिक खते	६.५	३.५	०.९	८.२
शेणखत	१.७	०.२	०.८	३.७
कीटकनाशके	०.०	०.१	०.४	३.६
सिंचन	३.७	१.४	०.९	२.०
इतर	१.९	१.४	२.०	२.२
स्थिर खर्च	२४.३	४२.८	२६.२	२३.२
एकूण खर्च	१००.००	१००.००	१००.००	१००.००

स्रोत : IGIDR Mumbai.

वरील तक्त्यावरून असे दिसते की, विदर्भात जे मुख्य पीक (नगदी) कापूस आहे, त्यासाठी भांडवली खर्च (खेळते भांडवल) इतर पिकांची तुलना करता (७६.८) जास्त आहे. यामध्ये सुद्धा बियाणे, रासायनिक खते यासाठी लागणारा खर्च जास्त आहे. त्यामुळे शेतकऱ्याला त्यावर जास्त पैसा खर्च करावा लागतो. तसेच सोयाबीन या पिकासाठी सुद्धा बियाणे (९.९) व रासायनिक खते (९.२) यावर खर्च करावा लागतो. म्हणजे नगदी पिके घेण्यासाठी उत्पादनखर्च जास्त करावा लागतो, हे एक आत्महत्येचे कारण आहे.

२) कर्जबाजारीपणात वाढ

शेतकऱ्यांचा भांडवली खर्च वाढल्यामुळे तो कर्ज काढून त्याची गरज पूर्ण करतो. ग्रामीण भागात कर्जपुरवठ्यासाठी आपल्या देशात व विशेषतः महाराष्ट्रात सहकारी कर्जपुरवठा ही 'त्रिस्तरीय' पद्धत फार पूर्वीपासूनच चालू आहे; पण अलीकडच्या काळात यामध्ये काही दोष निर्माण झाले आहेत. ज्यामुळे शेतकरी असंस्थात्मक कर्जपुरवठ्याच्या साधनांकडे वळतो आहे. ही साधने म्हणजे

सावकार, दलाल, मित्र-नातेवाईक, व्यापारी, डॉक्टर-वकील इ. प्रकारचे लोक. यांचा व्याजाचा दर हा जास्त असतो. त्यामुळे शेतकरी ते कर्ज परत करण्यास असमर्थ ठरतो व शेतकरी कर्जबाजारीपणामध्ये अडकून पडतो. आंध्रप्रदेशमध्ये होणाऱ्या आत्महत्यांचे कारण, वाढता असंस्थात्मक कर्जबाजारीपणा हे एकमेव कारण मानले जात आहे. शेतकऱ्यांच्या कर्जबाजारीपणाची माहिती खालील तक्त्यात दिली आहे.

तक्ता क्रमांक ७
शेतकरी कुटुंबाचे कर्जबाजारीपण

	निर्देशांक	महाराष्ट्र	आंध्रप्रदेश	केरळ	पंजाब	भारत
१.	ग्रामीण कुटुंबात शेतकरी कुटुंबाची टक्केवारी (%)	५५.७	४२.३	४३.९	६१.८	६०.४
२.	कर्जबाजारी शेतकरी कुटुंबाची टक्केवारी (%)	५४.८	८२.८	६४.४	६५.४	४८.६
३.	उत्पन्नाचे मुख्य साधन शेती असलेले कुटुंबाची (%)	५७.९	५३.७	१६.८	४५.६	५७.२
४.	उत्पन्नाचे मुख्य साधन शेती असलेल्या कर्ज बाजारी कुटुंबाची टक्केवारी (%)	६२.६	५४.४	१४.४	५२.७	५६.९
५.	१ हेक्टर जमीनीपेक्षा कमी जमीन असलेल्या शेतकरी कुटुंबाची कर्जबाजारीपणाची टक्केवारी	३६.०	६६.७	८७.७	५३.३	६१.०
६.	१-२ हेक्टर जमीन असलेल्या कुटुंबाची कर्जबाजारीपणाची टक्केवारी (%)	२६.२	२१.८	९.१	१५.८	१८.९
७.	२ हेक्टरपेक्षा जास्त जमीन असलेल्या शेतकऱ्यांच्या कुटुंबाची कर्जबाजारीपणाची (%)	३७.९	२२.४	३.२	३१.०	२०.१

स्रोत : IGIDR Mumbai - 2006.

यामध्ये भारतातील एकूण शेतकऱ्यांपैकी ४८.६ शेतकरी कर्जबाजारी आहेत. आंध्रप्रदेशात सर्वात जास्त शेतकरी (८२.०८%) कर्जबाजारी आहेत. महाराष्ट्रात हे प्रमाण ५४.८% आहे. भारतातील इतर राज्यांशी तुलना करता हे प्रमाण जास्त असलेले आढळून येते. तसेच शेती हे उत्पन्नाचे एकमेव साधन असलेले शेतकरी सर्वात जास्त महाराष्ट्रात (६२.६%) आहेत, तर भारतात हेच प्रमाण ५६.९% आहे. म्हणजेच भारतातील इतर राज्यांशी तुलना करता महाराष्ट्रात उत्पन्नासाठी शेतीवर अवलंबून असलेली लोकसंख्या जास्त आहे. कर्जबाजारीपणाचे प्रमाण हे धारणाक्षेत्राच्या या आकारानुसार

लहान व मध्यम शेतकऱ्यांमध्ये जास्त (६१.०) आहे. यामध्ये मुख्यतः असंस्थात्मक कर्जाचे प्रमाण जास्त असते. कारण, बँकजवळ किंवा पतसंस्थेकडे ठेवण्यास त्यांच्याजवळ पुरेसे 'तारण' नसते आणि त्यामुळे त्यांना नाईलाजाने असंस्थात्मक साधनांकडे जावे लागते. यातून कर्जबाजारीपणा वाढतो. शेतकऱ्यांच्या आत्महत्येच्या प्रमाणात सुद्धा त्या शेतकऱ्यांचे प्रमाण जास्त असलेले आढळते. (तक्ता क्र. ५)

३) जलसिंचन सुविधांचा अभाव

भारतात एकूण जमिनीपैकी फक्त ३०% जमीन ही जलसिंचनाखाली आहे. म्हणजे आजसुद्धा ७०% जमीन निसर्गावर, पावसावर अवलंबून आहे. 'सिझन आणि क्रॉप रिपोर्ट '२०००-२००१' च्या नुसार अमरावतीमध्ये एकूण पेरणीयोग्य क्षेत्राच्या फक्त ८% जमीन जलसिंचनाखाली आहे, तर यवतमाळ आणि वर्धा येथे अनुक्रमे ६% आणि ७% एवढी जमीन जलसिंचनाखाली आहे. म्हणजे जलसिंचन सुविधांचा विकास या जिल्ह्यांमध्ये पुरेसा झालेला नाही.

कर्जबाजारीपणाच्या कारणांमध्ये अनुत्पादक कार्यासाठी कर्जाचा वापर हे एक कारण सांगितले जाते; पण शेतकरी अनुत्पादक कार्यासाठी या कर्जाचा वापर का करतात याचा मात्र विचार केला जात नाही. जेव्हा एखाद्या व्यवसायात उत्पन्न मिळण्याची निश्चितता आहे, तेव्हा व्यक्ती त्यामध्ये गुंतवणूक करते; पण जेथे शेतीव्यवसाय नैसर्गिक पावसाचा जुगार आहे तेथे शेतकरी अनिश्चिततेमध्ये अडकतो व तो अनुत्पादक कारणासाठी-म्हणजेच मुलीचे लग्न, सण, उत्सव, घरखर्च यासाठी कर्ज वापरतो. जर समजा, शेतकऱ्याने शेतीमध्ये काही सुधारणा करण्यासाठी हे कर्ज वापरले; पण त्यावर्षी पाऊस चांगला पडला नाही, पीकच व्यवस्थित आले नाही तर काय करणार ? म्हणजेच जलसिंचन सुविधांचा पुरेशा प्रमाणात विकास झाला नसल्यामुळे येथील शेती हा आज सुद्धा निसर्गाचा जुगार झाला आहे. हा जुगार खेळून शेतकरी सतत हारतच आल्यामुळे तो आता निराश अवस्थेत जगतो आहे व त्यातूनच आत्महत्या घडत आहेत.

४) बाजारपेठेची अपूर्णता

मालाचे उत्पादन करून शेतकरी तो माल बाजारपेठेत घेऊन जातो; पण बाजाराच्या वास्तविक परिस्थितीची माहिती अज्ञानी शेतकऱ्याला नसते. तेव्हा अडते, दलाल व इतर मध्यस्थ लोक हस्तक्षेप करतात आणि शेतकऱ्याला कमी किंमतीला आपला माल विकावा लागतो.

शेतमालाच्या खरेदी-विक्रीसाठी नियंत्रित बाजारपेठांची स्थापना करण्यात आली; पण या तीन जिल्ह्यांमध्ये पुरेशा बाजारपेठांचा विकास झालेला नाही. (तक्ता क्रं. ८ पुढील पानावर आहे)

तक्ता क्रमांक ८
नियंत्रित बाजारपेठांची स्थिती

जिल्हे	१९८२-८३		१९८७-८८		१९९४-९५	
	प्रत्येकी नियंत्रित बाजारपेठेच्या अंतर्गत येणाऱ्या गावांची संख्या	प्रत्येकी नियंत्रित बाजारपेठेच्या अंतर्गत येणारे क्षेत्र (कि.मी.)	प्रत्येकी नियंत्रित बाजारपेठेच्या अंतर्गत येणाऱ्या गावांची संख्या	प्रत्येकी नियंत्रित बाजारपेठेच्या अंतर्गत येणारे क्षेत्र (कि.मी.)	प्रत्येकी नियंत्रित बाजारपेठेच्या अंतर्गत येणाऱ्या गावांची संख्या	प्रत्येकी नियंत्रित बाजारपेठेच्या अंतर्गत येणारे क्षेत्र (कि.मी.)
अमरावती	१८९	१३५७	१३१	१३९	१८६९	१२०.८६
यवतमाळ	१४६	११३२	१३५	१०४५	१९८१	१०७.६०
वर्धा	१४५	९०१	१६९	१०५२	१०४०	३.४८

स्रोत : बी. बी. मोहन्ती, संगीता श्रॉफ - २००४.

१९९४-९५ च्या आकडेवारीनुसार अमरावती आणि यवतमाळ येथे फक्त ६ बाजारपेठांची सुविधा उपलब्ध होती. म्हणजेच वर्धा जिल्ह्यात ४४ कि.मी. अंतर एका नियंत्रित बाजारपेठेच्या अंतर्गत होते, तर अमरावती व यवतमाळ येथे अनुक्रमे सुमारे १०८ कि.मी. आणि १२१ कि.मी. अंतर (क्षेत्र) एका बाजारपेठेच्या अंतर्गत होते, ही नियंत्रित बाजारपेठ संख्या अपुरी आहे. त्यामुळे शेतकरी आपला माल स्थानिक व्यापाऱ्यांना अत्यंत कमी किंमतीला विकत असल्याचे दिसून येते. तसेच या बाजारपेठांमध्ये पायाभूत सुविधांची परिस्थिती अत्यंत खालावलेल्या दर्जाची आहे.

कापूस उत्पादक शेतकऱ्यांच्या माल विक्रीतील मध्यस्थांचे महत्त्व कमी करण्यासाठी महाराष्ट्र सरकारने १९७२ साली 'कापूस एकाधिकार योजना' अमलात आणली; पण यामध्ये अनेक दोष निर्माण झाल्यामुळे तसेच त्यांच्या कामात दिरंगाई असल्यामुळे शेतकरी बेकायदेशीरपणे व्यापाऱ्यांना कापूस विकू लागले आहेत. १९९३-९४ मधील अंदाजित कापूस उत्पादन २६.२५ लाख बेल्स होते; पण कापूस एकाधिकार योजनेत फक्त १३.७५ लाख बेल्स कापूस विक्री केला गेला. म्हणजेच जवळजवळ ५०% कापूस महाराष्ट्राच्या बाहेर बेकायदेशीर विकण्यात येतो. अमरावतीमध्ये ६२% कापूस तर यवतमाळ जिल्ह्यात ६६% कापूस महाराष्ट्राबाहेर विकण्यात आला होता. (Sanstha Committee Report - 2001) म्हणजेच बाजारपेठेची अपूर्णता ही शेतकऱ्यांसमोरील सर्वात मोठी समस्या आहे.

५) विस्तारक्षेत्राची अपुरी सेवा

भारतीय शेतीमध्ये हरितक्रांतीमुळे आधुनिक तंत्रज्ञान आले. चांगल्या जातीच्या बियाण्यांचा वापर शेतीमध्ये होऊ लागला. शेतीची उत्पादकता वाढली; पण हे चित्र फक्त पंजाब, हरियाणा यांसारख्या राज्यांसाठीच मर्यादित राहिले. कारण, आधुनिक तंत्रज्ञान, बियाणे व इतर संबंधित घटकांचे ज्ञान अन्य राज्यातील लोकांना उपलब्ध होत नाही. म्हणजेच एखादा शेतकरी आधुनिक

बियाणे आपल्या शेतीमध्ये लावतो; पण त्यासाठी लागणारे खत कोणते, पाण्याचे प्रमाण, हवामान, जमिनीचा प्रकार, कीटकनाशके इ. गोष्टींबाबत त्याला कसलीच माहिती उपलब्ध नसते. अशी माहिती ग्रामीण भागातील शेतकऱ्यांना दुकानदार, व्यापारी व अडते यांच्याकडून दिली जाते; पण ही माहिती चुकीची असते व शेतकरी उलट अडचणीमध्ये सापडतो. काही ठिकाणी तर बियाणे व रासायनिक खतांमध्ये भेसळ केली जाते. कीटकनाशकांच्या डब्यांवर जास्त किंमतीचे 'लेबल' लावले जाते व यातून शेतकऱ्यांनी मोठी फसवणूक होते.

अशा कृत्याचा फटका सर्वांत जास्त लहान व मध्यम शेतकऱ्याला मोठ्या प्रमाणावर बसतो. म्हणून सुद्धा या गटामध्ये आत्महत्येचे प्रमाण जास्त आहे. नवीन माहितीसाठी सर्वप्रकारच्या शेतकऱ्यांना स्थानिक विक्रेते व खासगी संस्था यांच्यावर अवलंबून राहावे लागते.

६) सामाजिक मूलभूत सुविधांचा अपुरा विकास

शिक्षण व आरोग्य या सामाजिक मूलभूत सुविधा आहेत. यांचा विकास हा अर्थव्यवस्थेतील सर्वच घटकांसाठी अत्यंत महत्त्वाचा असतो. विकसित देशात या दोन घटकांवर मोठ्या प्रमाणात खर्च केला जातो; पण भारतात मात्र याकडे दुर्लक्ष केले जाते. व्यक्तीला चांगले जीवन जगण्यासाठी आरोग्य लागते व विकास करण्यासाठी शिक्षण ही अत्यंत महत्त्वाची गरज आहे. जवळजवळ २४% शेतकऱ्यांच्या आत्महत्या 'आजारपणा' या कारणामुळे झाल्या आहेत. तसेच १६.६७% आत्महत्या शेतीच्या उत्पन्नात तोटा झाल्यामुळे झाल्या आहेत. तर त्याच वेळी १६.६७% आत्महत्येचे कारण हे दारू पिणे व जुगार खेळणे हे आहे. म्हणजेच शेतीच्या उत्पन्नात तोटा झाल्यामुळे शेतकरी निराश होतो. तो व्यसनाधीन होतो व कर्जबाजारीपणामध्ये बुडत जातो. (तक्ता क्र. ९) यासाठी शेतकरी सुशिक्षित होणे अत्यंत गरजेचे आहे. तसेच सततचे आजारपण कमी करण्यासाठी शासनाने आरोग्याच्या चांगल्या सुविधांचा पुरवठा करणे गरजेचे आहे.

तक्ता क्रमांक ९

कारणांनुसार आत्महत्येचे विवरण

कारणे	जमिनीचा आकारानुसार वर्ग			
	लहान	मध्यम	मोठे	सर्व
शेतीच्या उत्पन्नात तोटा	२७.२७	८.३३	१४.२९	१६.६७
कर्जबाजारीपणा समस्या	९.१०	१६.६७	-----	१०.००
कौटुंबिक समस्या	१८.१८	१६.६७	२८.५७	२०.००
वयोवृद्धत्व आणि आजारपणा	१८.१८	२५.००	२८.५७	२३.३३
व्यसनाधीनता (दारू व जुगार)	१८.१८	१६.६७	१४.२९	१६.६७
इतर	९.१०	१६.६७	१४.२९	१३.३३
एकूण	१००.००	१००.००	१००.००	१००.००

स्रोत : बी. बी. मोहन्ती, संगीता श्रॉफ - २००४.

आत्महत्या रोखण्याचे उपाय

१) जलसिंचन सुविधांचा विकास

जेव्हा उत्पन्नात अनिश्चितता असते तेव्हा व्यक्तीमध्ये असुरक्षिततेची व असहाय्यपणाची भावना निर्माण होते. शेतकऱ्यांवर निसर्गाच्या लहरीपणाचा मोठा परिणाम होत आहे. हे कमी करण्यासाठी जलसिंचन सुविधांचा विकास करणे अत्यंत गरजेचे व महत्त्वाचे आहे. यामुळे शेतकरी आपल्या शेतीत उत्पादन योग्य प्रकारे काढून उत्पन्न मिळवेल. यातून अनिश्चितता व असहाय्यता कमी होईल व आत्महत्या होणार नाहीत.

२) सूक्ष्म वित्तपुरवठा

बांगलादेशात सूक्ष्म वित्तपुरवठा (Micro-finance) करण्याचे व त्यातून गरिबी कमी करण्याचे कार्य गेल्या २० वर्षांपासून यशस्वीपणे पार पडत आहे. यामधील ग्रामीण बँक ही संकल्पना जगभर पसरली आहे. पाच व्यक्तींचा गट करून गरजू व्यक्तींना कर्जाचा पुरवठा केला जातो. या बँकेतर्फे तारण नसलेल्या व्यक्तींनासुद्धा कर्जपुरवठा केला जातो, तर शेतकऱ्यांच्या आत्महत्या सीमान्त व मध्यम शेतकऱ्यांमध्ये अधिक होत आहेत. कारण बँक, तारण नाही म्हणून कर्ज देत नाही. तर अशा शेतकऱ्यांना अल्पबचत गटाद्वारे व सूक्ष्म वित्तपुरवठा केला गेला, तर आत्महत्येचे हे पर्व आपणाला रोखता येऊ शकते.

३) शिक्षण व आरोग्यसेवांमध्ये वाढ

कोणत्याही समाजाच्या चांगल्या स्वास्थ्यासाठी या दोन सेवा अत्यंत महत्त्वाच्या भूमिका बजावत असतात. शिक्षणामुळे शेतकरी सज्जान होईल व तो अनेक गोष्टींबाबत जागृत होईल आणि आरोग्याच्या सेवा मिळाल्या, तर शेतकरी कार्यक्षमपणे शेतीमध्ये काम करेल व औषधपाण्यावर जास्त खर्च न झाल्यामुळे कर्जबाजारी होणार नाही. यासाठी सरकारने ग्रामीण भागात ब्या सुविधांचा विकास करणे अत्यंत महत्त्वाचे आहे.

४) विस्तारक्षेत्राच्या सेवांचा विकास करणे

शासनाच्या नवीन योजनांची माहिती, नवीन तंत्रज्ञानाची माहिती व ओळख तसेच आधुनिक बी - बियाणे, यंत्र-अवजारे, तंत्रज्ञान, व्यवस्थापनपद्धतीची माहिती शेतकऱ्यांना देण्यासाठी विस्तारक्षेत्राच्या सुविधांचा विकास करणे अत्यंत महत्त्वाचे व गरजेचे आहे. ज्यामुळे 'शेतकरी ज्ञान केंद्र' (किसान नॉलेज सेंटर) यांसारख्या उपक्रमांची अंमलबजावणी लवकरात लवकर केली तर आत्महत्या कमी होतील.

५) कार्यक्षम बाजारपेठांची निर्मिती

शेतकऱ्याने मालाचे उत्पादन केल्यानंतर विक्रीच्यावेळी बाजारात मोठ्या प्रमाणावर मध्यस्थ लोकांकडून त्यांची पिळवणूक होते व शेवटी उत्पादनखर्च सुद्धा हाती लागत नाही, हे टाळण्यासाठी शासनाने नियंत्रित बाजारपेठांच्या संख्येत वाढ करावी. तसेच या ठिकाणच्या पायाभूत सुविधांचा विकास करावा आणि कृषी उत्पन्न बाजारसमितीच्या अंतर्गत साठवणूक व्यवस्था, प्रमाणीकरण इ. सुविधांचा विकास या जिल्ह्यामध्ये करण्यात यावा. ज्यामुळे शेतकऱ्यांच्या उत्पादनाला योग्य किंमत मिळेल.

६) पायाभूत सुविधांचा विकास

ग्रामीण भागात पायाभूत सुविधांची परिस्थिती अत्यंत खालावलेली असते. यामध्ये सुधारणा केली पाहिजे. योग्य वाहतुकीसाठी रस्त्यांची सोय करणे, दूरध्वनी व दूरदर्शन संच यांची सुविधा उपलब्ध करून देणे, विजेची उपलब्धता करून देणे इ. सारख्या पायाभूत सुविधांचा विकास ग्रामीण भागात करणे अत्यंत गरजेचे आहे. ज्यामुळे येथील लोकांची कार्यक्षमता वाढेल.

७) शेतीपूरक व्यवसायाला प्रोत्साहन देणे

शेती हे एकमेव उत्पनाचे साधन असेल तर पाऊस चांगला झाला नाही, अशा वर्षात शेतीतून पुरेसे उत्पन्न मिळत नाही. तसेच घरातील अतिरिक्त व्यक्ती इतर रोजगार उपलब्ध नसल्यामुळे शेतीवर भार बनतात. यासाठी शेतीपूरक व्यवसायात-म्हणजेच कुक्कुटपालन, दुग्धव्यवसाय व पशुपालन, भाजीपाला साठवणूक केंद्र, फळांवर प्रक्रिया करणारे उद्योग, तेलबियांपासून तेल काढण्याचे व्यवसाय यांसारख्या लहान व कुटीर उद्योगात वाढ करणे अत्यंत गरजेचे आहे. यामुळे ग्रामीण भागातील शेतकऱ्यांना अधिक उत्पन्न मिळवता येईल व यातून दारिद्र्य कमी होण्यास मदत होईल. तसेच शेतीतील रोजगारावर अवलंबून राहणाऱ्या व्यक्तींचे प्रमाण कमी होईल

V

पॅकेज देऊन आत्महत्या रोखण्याचा प्रयत्न ?

पंतप्रधान मनमोहनसिंग यांनी जुलै २००६ मध्ये विदर्भातील परिस्थितीची स्वतः घटनास्थळी जाऊन पाहणी केली व त्यांनी ३.७५० कोटी रु. चे पॅकेज, ३० लाख प्रभावित शेतकऱ्यांना कर्जमाफी व बँकेच्या कर्जाची परतफेड करण्यासाठी जाहीर केले; पण या पॅकेजमधील बियाणे खरेदीसाठी सवलत, जलसिंचन सुविधांच्या विकासाची कामे पूर्ण करणे व पूरक व्यवसायांना मदत यांसारख्या घटकांचा अपवाद वगळता या पॅकेजमध्ये कसल्याही प्रकारची दीर्घकालीन पायाभूत सुविधानिर्मितीची योजना आपणास आढळत नाही.

पॅकेजमधून कर्ज माफ केले जाते, चालू वर्षामध्ये उत्पादन घेण्यासाठी कर्जपुरवठा केला जातो; पण उत्पादनाला योग्य भाव मिळत नाही. उत्पादनखर्च किंमतीने भरून निघत नाही. बाजारामध्ये शेतकऱ्यांची फसवणूक केली जाते आणि मग शेतकरी परत कर्जबाजारीपणामध्ये अडकून पडतो. पंतप्रधानांनी दिलेल्या पॅकेजमध्ये कार्यक्षम वित्तपुरवठा करण्यासाठी कसलीच तरतूद नाही. आज आत्महत्या जास्त सीमान्त व मध्यम शेतकरी करतात. कारण, त्यांच्याकडे बँकेत ठेवण्यासाठी 'तारण' नाही. म्हणून बँक कर्ज देत नाही. तर ते असंस्थात्मक मार्गाकडे / साधनाकडे जातात. तेंव्हा यांच्यासाठी काहीही तरतूद या पॅकेजमध्ये नाही.

शेतकरी नवीन बी-बियाणे, तंत्रज्ञान आपल्या शेतीमध्ये वापरतो; पण याविषयीचे योग्य ज्ञान देणे अत्यंत आवश्यक आहे. याविषयी पॅकेजमध्ये काहीच तरतूद नाही. विस्तारसेवांचा विकास करण्यासाठी कृषी महाविद्यालयांची भूमिका येथे महत्त्वाची ठरू शकते. तसेच सामाजिक पायाभूत सुविधा (आरोग्य व शिक्षण) यांच्या विकासासाठी कसलीच तरतूद पॅकेजमध्ये नाही. सततच्या आजारपणामुळे आत्महत्या मोठ्या प्रमाणात झाल्या आहेत. म्हणजे शेतकऱ्यांना प्राथमिक आरोग्य-केंद्राची सुविधा शासनाने उपलब्ध करून देणे आवश्यक आहे. दारू पिणे आणि जुगार खेळणे यातून

सुद्धा आत्महत्या घडत आहेत. हे सर्व अशिक्षितपणामुळे घडते. यासाठी शिक्षणाची गरज आहे. सुशिक्षित शेतकरी यांसारख्या गोष्टींपासून दूर असतो. शेतीपूरक व्यवसायांना मदत देण्यापेक्षा त्यासाठी योग्य अशी मार्गदर्शन व प्रशिक्षणाची सुविधा सरकारने उपलब्ध करून द्यावी. अशा उद्योगांना, की कमी व्याजदराने कर्जपुरवठा करावा व त्यांच्या कार्यक्षमतेची सतत तपासणी करावी.

थोडक्यात, पॅकेज हे 'अल्पकाळात मदत' स्वरूपाचे आहे. अशा स्वरूपाचे कितीही पॅकेज विदर्भात दिले, तरी आत्महत्या थांबणार नाहीत, तर त्यासाठी यामध्ये दीर्घकालीन अशा पायाभूत सुविधा निर्माण करणाऱ्या योजनांचा समावेश करणे ही आजची गरज आहे. सकाळ वर्तमानपत्राच्या अभ्यासगटात असे आढळून आले की, यवतमाळ जिल्ह्यातील ५६% शेतकरी म्हणतात की 'उत्पादनाला योग्य भाव द्या', म्हणजेच मदत नको, तर कष्ट केल्याचे योग्य फळ आम्हाला मिळू द्या. आणि ते मिळविण्यासाठी योग्य परिस्थितीची निर्मिती करा ! म्हणून, पॅकेज नुसते देऊन आत्महत्या थांबणार नाहीत, तर विदर्भात पायाभूत सुविधांची निर्मिती केली तर आत्महत्या नक्कीच कमी होतील !

समारोप

व्यक्ती एखाद्या परिस्थितीचा प्रतिसाद म्हणून कोणतेही कृत्य करत असते. ते कृत्य चांगले वा वाईट असू शकते. अशा वेळी त्या समस्यांवर उपाय सुचविले जातात. कोणतेही शास्त्र समाजात घडणाऱ्या गोष्टींचे विश्लेषण करून वास्तविक परिस्थिती प्रकाशात आणण्याचे कार्य करते आणि त्या समस्येवर दीर्घकालीन उपाय सुचविते. शेतकऱ्यांची आत्महत्या ही एक समस्या आहे. या आत्महत्या कमी करण्यासाठी पॅकेज दिले जात आहे; पण हा अल्पकालीन उपाय आहे. यातील वास्तविक परिस्थिती म्हणजे पायाभूत सुविधांची कमतरता किंवा अपुरा विकास होय. कोणतीही व्यक्ती जन्मतः काही अंगभूत गुणसंपन्न असते. त्या गुणाला / कौशल्यासाठी संधी मिळवून देणे गरजेचे असते. त्यातून तिचा आत्मविश्वास वाढत असतो. यासाठी मूलभूत सुविधांचा विकास विदर्भामध्ये करणे गरजेचे आहे. तरच शेतकऱ्यांमध्ये पसरलेला निराशावाद व जाणवणारी असहाय्यता कमी होईल. यातून त्यांच्यात आत्मविश्वास वाढीस लागेल व आत्महत्येसारखी कृत्ये घडणार नाहीत असे मला वाटते.

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Indian Nuclear Strategy: A Perspective for 2020

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As long as the world is constituted as it is, every country will have to devise and use the latest devices for its protection. I have no doubt India will develop her scientific researches and I hope Indian scientists will use atomic force for constructive purposes. But if India is threatened, she will inevitably try to defend herself by all means at her disposal.

-Pandit Jawaharlal Nehru

India is now a nuclear weapon state. We have the capacity for a big bomb now. Ours will never be weapons of aggression.

- Prime Minister Atal Behari Vajpayee
14 May 1998

India demonstrated its nuclear capability on May 18, 1974, when it conducted the first nuclear test in Pokhran—a desert area in Rajasthan, some 350 miles away from New Delhi. Technically, India then became the world's sixth nuclear power. However, because of international pressure, particularly from the United States and Canada, Mrs. Indira Gandhi was then believed to have bitten off more than she could chew regarding nuclear weapons. The Central Intelligence Agency (CIA) of the US was caught unawares of the Indian test. The test was then described as a Peaceful Nuclear Explosion (PNE) by India, but few were willing to buy this explanation. It was also considered as being against the spirit of the Nuclear Non-Proliferation Treaty (NPT); but since India had not signed the NPT, it was not strictly in violation of any international treaties.

After 24 years, India once again conducted three nuclear tests on May 11, 1998—the Buddha Purnima. One was a plutonium type similar to the 1974 test. Another was a thermonuclear or hydrogen bomb, and the third was a low-yield device with a wider application—primarily a tactical weapon. All three devices were triggered by one pull.

Two days later, on May 13, 1998, another two weapons were tested at Pokhran. These tests gave Indian scientists up-to-date knowledge on the latest developments in weaponisation of nuclear technology, including an ability to conduct sub-critical tests or testing by computer simulation in the laboratory.

Prime Minister Atal Behari Vajpayee later said: "India now is a nuclear weapon state." Brijesh Mishra, the Prime Minister's Special Secretary, also said after the May 11 tests: "These tests have established that India has a proven capability for a weaponised nuclear programme." R. Chidambaram,

Chairman, Atomic Energy Commission, stated: "The bombs tested at Pokhran were purely for defensive purposes." This time there was absolutely no reference to any peaceful nature of the nuclear tests.

Western nations in general, and the US in particular, had always considered India's nuclear weapons programme as less advanced. Naturally, scientist in the West began to doubt the claims of Indian scientists, particularly the Indian claim of having tested a thermonuclear device, and the level of sophistication and yield of the tests. But Anil Kakodkar, Director, Bhabha Atomic Research Centre, said that the thermonuclear device was limited in yield to 43 to 45 kilotons, so that seismic disturbances do not affect nearby villages. But the total yield of all the tests was claimed by Indian scientists to be 58 kilotons. This claim also was disputed by the American journal Science which stated that the total yield of the Indian tests was between 9 to 16 kilotons.

Reaction of Nuclear Weapon States (NWS)

The Indian tests angered world opinion. The US and the other Western nations and their allies were very critical of India. The US State Department spokesman, James Rubin, accused India of lying and conducting a "campaign of duplicity" during nearly 20 high-level meetings between the US and India on their nuclear intentions. The British Foreign Secretary, Robin Cook, stated that the nuclear tests have not, in fact, helped to enhance Indian security. Australia and New Zealand recalled their ambassadors. The Japanese Prime Minister described the Indian tests as "extremely deplorable". Japan suspended the annual grant of \$26 million. Germany also froze all development aid to India but allowed aid to projects in the pipeline to be continued. The US also imposed economic sanctions and withheld \$143 million aid. The punitive intentions are clear from the testimony of a US official: Assistant Secretary of State, Karl Inderfurth, said: "More than \$1 billion worth of loans have been postponed... [This is] having a ripple effect in the Indian economy and is resulting in decreased investor confidence."

India's declaration of itself as a nuclear weapon state was seen by the Western powers as an effort on its part to emerge as a major power. The American policy makers were particularly sharp in advising India that there is no linkage between the major power status and the possession of nuclear weapons. The US President, Clinton, said that with India's democratic traditions, the nuclear path is not a way to "greatness". In the view of his Secretary of State, Madeleine Albright, also, nuclear weapons could not help a country "to enhance its national strength and status".

The examples often cited are of Japan and Germany which are dominant economic powers and are also important players in world politics. These two states are also favoured by the US to occupy permanent seats in the UN Security Council (UNSC) when expanded. They do not possess nuclear weapons. But these commentators conveniently forget two inter-

related facts. First, these two countries, defeated in World War II, have been protected since then by the US nuclear umbrella. Second, even after their economic recovery since the 1960s, they have played a secondary role to NWS within the North Atlantic Treaty Organisation (NATO), i.e. not only the US but even to weaker European powers, like Britain and France.

The point has not been missed amongst the observers of international relations that it is non-possession of nuclear weapons that is responsible for the secondary status of Japan and Germany. As a matter of fact, it is the American fear of the likely nuclear weaponisation by Germany and Japan that made the US, in the first instance, react strongly against the Indian nuclear tests. Japan was against the indefinite extension of the NPT in 1995. It wants a rapid end of nuclear weapons under Article VI of the NPT. Former Japanese PM Sato reportedly told the US Ambassador that "if the other fellow [China] has nuclear weapons, it is only common sense to have them oneself".

China too has been vociferous in advising India to forget about its pursuit of a great-power status. The state-run Chinese media commented soon after the Indian nuclear tests: "A review of Indian history makes two facts clear: India was once a world power. It is obsessed with a desire to be a regional and world power again." Further, it added: "India has a strong armed force, which is out of line with its status as a developing country."

What is interesting, however, is the fact that China is never tired of proclaiming itself as a developing country, and yet, the Chinese official news agency, Xinhua, called China "the regional heavyweight" on the eve of Clinton's visit to Beijing on June 20, 1998, and advised the US that "to maintain regional and global security interests" the Clinton Administration "needs to work with China in safeguarding stability and security on the western side of the Pacific rim".

China also took upon itself the responsibility to mention a need to improve the economic condition of the Indian people rather than expend scarce resources on nuclear weapons. The Chinese Ambassador in India, Zhou Gang, stated publicly that "India will score greater achievements in developing its economy and realising its people's living standards in the 21st century" than in conducting nuclear tests "against the international trend".

Asked why China gave itself the right of nuclear weaponisation while denying it to India, he stated that Beijing's nuclear tests were conducted in an international environment "that was different from the current one in which India has conducted its own tests". The Chinese Ambassador in Delhi stated that "under specific and historical circumstances, China had to take a decision to develop nuclear weapons".

What China refers to as a historical condition in October 1964, when it first conducted a nuclear test, was its threat perceptions, which included, in addition to its historical conflict with the US since the birth of Communist rule in 1948, a growing threat from its own Communist big brother and

neighbour, the Soviet Union. But China conveniently forgets the fact that India is also in a similar international environment, as it was in the 1960s, facing twin national security threats. Though today, seen from the viewpoint of its own national interest, the present international environment is against nuclear proliferation, it cannot force its perceptions on Indian policy makers.

Indian Compulsions

What compelled India to go nuclear against the “international trend”? First, it was China’s growing assertion of power in South and South-East Asia. What China claims was the international environment in which it faced a two-pronged threat to its national security in the 1960s, was similar to the national security environment in the 1990s faced by India. China has been a potential security threat ever since its aggression against India in October 1962. But this threat perception has sharpened since the end of the Cold War.

China’s ambition to emerge as the Asian superpower has made it assert itself in Asia. To this end, China has developed not only its own blue water navy but also sought naval and submarine bases and facilities of electronic surveillance in the Coco Islands of Myanmar. As a result, the Andaman and Nicobar Islands in the Bay of Bengal have come within the range of the Chinese sweep. For that matter, the entire eastern region of India is within the firing range of China.

Second, Pakistan has been a perennial threat to Indian security under its goal of completing the partition process on the basis of religious identity. Thus, it launched war thrice against India over Kashmir—once in 1947-48, the second time in 1965 and finally in 1971. Its defeat in 1971 and the disastrous consequences of the separation of East Pakistan into the independent, sovereign state of Bangladesh, made it think in terms of revenge.

In pursuit of this strategy, Pakistan moved in the direction of a search for a nuclear power status. Zulfikar Ali Bhutto pushed for an “Islamic bomb”. Bhutto, though hanged by Zia-ul-Haq, left his dream of building an “Islamic Bomb” intact and it was pursued vigorously by the military dictator, particularly since 1980, under the cover of the Soviet military presence in Afghanistan.

By 1984, Pakistan had acquired nuclear weapons capability. Pakistan’s nuclear capability has always been India-specific. All its decisions in international relations regarding the nuclear bomb have been related to India. The best illustrations are: “If India signs the NPT, it will sign;” or “If India signs the Comprehensive Test Ban Treaty (CTBT), it too will sign.” For the first time in 1994, the then interim Prime Minister, after the dismissal of Benazir Bhutto as the Prime Minister, admitted to Pakistan’s possession of nuclear weapons.

Third, Sino-Pakistani collusion and collaboration in not only the latter's development of nuclear weapons and missile production, but their general security and diplomatic cooperation was aimed against India. Pakistan was aided by China in its pursuit of nuclear capability on the principle that an enemy's enemy is a friend. This collaboration between the two nations increased after the end of the Cold War. The collaboration was also extended in the development of missile technology. It is a well-confirmed fact that China supplied to Pakistan M-11 missiles capable of carrying nuclear weapons. The US, in August 1993, even imposed partial economic sanctions against China and Pakistan for this very reason.

Fourth, the US—the global policeman—did very little since 1993 to ensure that Pakistan and China adhered to the NPT and its own creation, the Missile Technology Control Regime (MTCR), under which any nation producing its own missile system was expected to restrain from transferring missile technology to another nation. Though in October 1990, the then President of the US, George Bush, had refused to certify that Pakistan is not actively engaged in nuclear weapons development, Bill Clinton, through the Hank Brown Amendment to the Pressler Amendment, saw to it that Pakistan was provided with \$368 million worth of military aid.

Thus, the US, under Bill Clinton, since January 1993, has been very accommodative of China and Pakistan—two of its closest allies in the bygone Cold War era. The US not only lifted partial sanctions imposed by it against China for the supply of M-11 missiles, but looked the other way when the CIA reported the collaboration between the two over missile production.

Fifth, in the worst case scenario, the US nuclear weapons in their Indian Ocean base in Diego Garcia are also a serious threat to Indian security. Alluding to threats to Indian security, I.K. Gujral, while he was the PM, had very elaborately underlined the security environment around India. He had then stated in his talk at the Royal Institute of International Affairs in London, on his way to New York to address the UN General Assembly in September 1996: "In the east, there is China, a full-fledged nuclear power. In the south, there is Diego Garcia, a major American naval base for its nuclear submarines as well as aircraft carriers. In the west, the Gulf region is nuclearised by the United States. Is it possible for any government in India to remain indifferent to this gigantic array of nuclear arms across its eastern, southern and western borders?" This was supported by one congressman in the House of Committee.

Sixth, there was the need to extricate India from the muddled waters of past rhetoric over the CTBT. The Indian insistence from the beginning was nuclear disarmament. India had joined the US in co-sponsoring the CTBT in the UN General Assembly. But the US officials from the beginning had looked at it as another measure towards nuclear non-proliferation.

In view of the Indian refusal to sign the CTBT as passed by the UN General Assembly—as it was discriminatory, non-comprehensive and not a nuclear disarmament measure—India could not wait to decide on the

next step indefinitely, provided it was keen on retaining the nuclear option—something every Prime Minister spoke about since Mrs. Gandhi, but which could not be held up indefinitely.

The proverbial last straw on the Indian camel's back that broke its nuclear abstinence was the test firing of the Ghauri—a medium range missile—by Pakistan in April 1998, which could reach any Indian city with conventional or nuclear warheads. The missile is not an indigenous one but one from North Korea. However, North Korea, being under the influence of China, could not have transferred a missile to Pakistan without its approval.

India is a sovereign republic. It cannot be moulded to suit international needs as the big powers perceive it. India has its own strength of history and culture, and almost a billion people cannot be ordered to forego their nuclear option, particularly when surrounded by powerful nuclear weapon states. As Prime Minister Vajpayee said, "A country of 100 crores cannot be left to the mercy of others... Nuclear weaponisation is in self-defence. Our enemies should know that we have nuclear weapons so that they will not attack us."

Relevance of Nuclear Weapons

The vehemence with which the advice is given by the US and China to India not to tread on the nuclear path, indicates the existence of a close relationship between nuclear weapons and major power status. The US is able to maintain its superpower status despite its relative economic decline, largely on the strength of its nuclear superiority. China, despite being a developing country, is being cultivated by the US not only for its economic power but because it is a full-fledged nuclear weapon state.

Thus, it is necessary for India to conceptualise its strategic policy based on the doctrine of minimum nuclear deterrence. It is no longer possible for Indian policy makers to state that we do have a strategic policy primarily based on nuclear deterrence; but unlike the Western nations, particularly, the US, we do not publicly discuss it. On the other hand, India's adversaries, mainly China and Pakistan, should know the circumstances under which the nuclear weapons will be used.

A 2020 Perspective

What are the main ingredients of Indian strategic policy based on the doctrine of nuclear deterrence for the next two decades? The Prime Minister and others in the government have stated that minimal nuclear deterrence is not negotiable. The question, however, is: what constitutes minimum deterrence? Former Army Chief of Staff General K. Sundarji believes that India needs a minimum of twenty nuclear weapons of 20 kiloton each to deter a small country and about 50 such weapons to provide a credible nuclear deterrence against a large country. But it is next to impossible mathematically to state an accurate figure at any given time.

The security threat perception and its intensity is ultimately a personal judgement of the ultimate decision maker based on his advisors, relative to an adversary at a given time. The number could very easily vary if an adversary raises the ante.

Some important ingredients of strategic policy can be underscored here. To begin with, India will continue to emphasise—in the next twenty years—from a position of strength, global nuclear disarmament. Unlike the US, which till the end of the Cold War believed that a limited nuclear war is thinkable and winnable, India looks at nuclear weapons as the weapons of ultimate defence. Even after acquisition of nuclear weapons, Indian strategy is not based on the use of nuclear weapons. On the other hand, India now sees that it can speak on nuclear disarmament more authoritatively. However, in pursuit of global disarmament, we need to change our approach: instead of total disarmament, in the beginning, we need only move step by step towards that goal.

The first step has to be a global treaty amongst the known nuclear powers and threshold states on no-first use of nuclear weapons. The only obstacle today in this goal is the US and Pakistan which have based their doctrines of nuclear deterrence on the basis of a first strike.

India has already offered to sign such a treaty with Pakistan which has rejected the proposal by declaring it as “self serving”. It sees nuclear weapons as a credible deterrence “in view of India’s conventional superiority”.

Russian Prime Minister Primakov in December 1998 proposed a strategic triangle among Russia, China and India which came into existence in 2005. Therefore, India can persuade Russia to take the lead in bringing India and China together on the issue of signing a no-first use treaty. Later, others can be persuaded to join. Eventually, this will make nuclear weapons merely defensive ones.

The second policy strand relates to halting of production of fissile materials essential for nuclear weapons. India needs to agree on a Fissile Materials Cut-off Treaty (FMCT) with certain precautions. Even on the FMCT, the US could take India for a ride by pressurising it to stop production of fissile materials even before the treaty is negotiated and signed. This again could be a ploy on the part of the US to help Pakistan to achieve parity with India in the possession of fissile material.

Third, India needs to concentrate on making its nuclear weapons invulnerable to a first strike with nuclear weapons either by Pakistan or China or jointly by them. In this respect, not only development of the medium range missile—Agni—is essential, but also it needs to focus on its perfection to the extent that at least half of the missiles fired will hit the target within a radius of a mile or two. To make nuclear weapons invulnerable to a first strike, we will also have to develop nuclear submarines and deploy anti-ballistic missiles. India has, in fact, collaborated with Russia in developing Sagarika, the Indian nuclear submarine, which was inducted in the Navy in 2004.

Fourth, there is the case of deployment versus non-deployment of nuclear weapons that remains to be decided. India will deploy nuclear weapons against China but not against Pakistan. This is because, even if China is our potential security threat in the sense of its threatening ambition to be a superpower and make India play second fiddle to it, it is unlikely to use nuclear weapons against India, as a rational decision maker. However, this does not preclude its using them as a blackmail which can, of course, now be checked because it knows India too has nuclear weapons.

But China does not rule out the possibility of India using nuclear weapons against its friend—Pakistan. India also cannot rule out the possibilities of Pakistan using them against India in view of its long history of talk of avenging the defeat of 1971. The desire for revenge is dangerously coupled with religious fanaticism. For these very reasons, there is no need to deploy them against Pakistan as it has no strategic depth and it will be highly provocative in view of its likely irrational decision-making.

Fifth, India needs to develop a system of command and control over the nuclear weapons. The ultimate decision to use the nuclear weapons will have to rest with the Prime Minister. But in the worst case scenario, there is a need to clearly lay down the alternative line of control in the event of conflict escalating into a war. Similarly, if New Delhi is made dysfunctional by enemy bombing, from where will the command and control operate? How do you carry nuclear weapons to enemy targets? Do you use aircraft or missiles or submarines or use the tactical nuclear weapons? In other words, it is also necessary to resolve the question of inter-service rivalry over the possession of nuclear weapons. Since all three services may have to be provided with nuclear weapons, creation of a Chief of Defence Staff assumes additional urgency.

Sixth, India also will have to develop or acquire, in the coming years, necessary protective safety systems for nuclear weapons. There is also a need to take steps to prevent triggering of any accidental war, simultaneously taking confidence-building measures between India and its two adversaries on the borders in the north.

Seventh, in the coming years, however, India will not be able to reduce the size of its armed forces because of acquisition of nuclear weapons—though eventually that is a possibility—as the threat to India's security will continue to arise from Pakistan, mainly through low-intensity conflict in fulfilment of the religiously motivated issue of the incomplete partition process in Kashmir. It has reduced to some extent on the Indo-Sino border due to bilateral agreements.

Eighth, Indian strategic policy needs to be backed by a well-conceived diplomatic posture for the future. It will be a prudent policy for India to cultivate cordial relations with countries which feel threatened by the expansionist policies of China. The way in which the US conducted its policy towards China in the months prior to and after Bill Clinton's summit meeting with Jiang Zemin in June 1998, shows that Japan increasingly, might feel threatened. Hence, despite Japan following in the US steps to

criticise India for its nuclear tests, Indo-Japan relations are now on a good road.

In Europe, France has shown always an inclination to pursue an independent policy not totally identified with the US: as such it needs to be cultivated. Hence, the opening of a strategic dialogue between India and France by Prime Minister Vajpayee and then by Dr Manmohan Singh and the French President, Jacques Chirac, is a step in the right direction. During this dialogue, France agreed to cooperate in nuclear power projects and to transfer dual-use technology to India.

Ninth, India will have to maintain a steady economic growth to sustain an estimated expenditure of at least Rs. 1,000 crore or more in the next ten years to put nuclear deterrence in place. This will need India to continue to maintain its GDP growth at a minimum of 7 to 8 per cent per annum in the next two decades.

Tenth, India also needs to highlight the possibilities of Pakistani nuclear weapons falling into the hands of Islamic terrorists in the Indian subcontinent as well as in the Middle East. US Senator Patrick Moynihan characterised the Pakistani bomb as an "Islamic bomb" and apprehended that finally it "will inevitably be pointed at the Middle East".

However, eventually India-Pakistan relations are likely to turn into a secular mould because of nuclear deterrence. It is likely that knowing that the other side has nuclear weapons, each state will desist from provoking a suicidal war. Pakistan considers nuclear weapons as the biggest "equaliser". Mushahid Hussain stated in October 1998 that nuclear weapons "reduced the chances of a fourth war between India and Pakistan". This may thus leave Pakistan's dream of grabbing Kashmir on the religious principle of Muslims constituting a majority in Jammu & Kashmir, unfulfilled. When this happens, one may very well say that the nuclear weapon has a force to secularise domestic politics and international relations.

Eleventh, India needs to devise ways and means to secure a stable government, as the political instability that the nation has witnessed ever since 1989 cannot be conducive to peace and stability in the nation's strategic policy. Only with political stability can the political parties develop a non-partisan approach to the nation's foreign policy and security.

Finally, India needs to cultivate different segments of the American ruling elite through public diplomacy. In the highly fragmented system of politics and administration in the US, a large number of politicians and opinion leaders had taken a pro-India stand when India exploded nuclear weapons and also on the Indo-US Nuclear deal (2005). We need to remember that their pro-India stand is not because of their acceptance of our compulsions in going nuclear—it is so more because of their internal dynamics of party politics. We need to strengthen our ties with such segments of American politics, including the India caucus in the US Congress.

Conclusions

It is the sovereign right of India to decide whether its security compulsions warrant going in for nuclear weapons as an ultimate shield, notwithstanding the opinion of the Western nations. The opposition of the US and other developed nations appears to be totally self-serving when one looks at the actions of these very powers which advise India to desist from possessing nuclear weapons. It is unnecessary to illustrate the behaviour of every nation to convincingly prove this point. Suffice it, if I give here one example. After the North Korean missile test in August 1998, and October 2006, the US and Japan decided to conduct joint research on a missile defence system to protect US troops in Japan and also Japan itself. It was argued that in the absence of this, Japan would be open to blackmail from North Korea and China! If, despite possessing nearly 10,000 nuclear weapons, the US needs a new system of missile defence to protect its troops abroad, why can't India have a small number of nuclear weapons to protect itself from any blackmailer in the neighbourhood?

India has vigorously moved in the UN to achieve some of the goals of its nuclear strategy. When in October 1998, the UNSC adopted a resolution deploring the Indian nuclear tests, and calling upon India to desist from further tests and development of missiles, the Indian representative in the UN, Kamlesh Sharma, pointed out that the UN nowhere has banned the production of ballistic missiles. Arguing in favour of a "no-first strike" agreement, he pointed out the irony of the situation wherein "statutes treat murder as an international crime but refuse to treat the first use of nuclear weapons as an international crime".

India also succeeded in drawing international attention to the need for taking immediate steps to reduce the risks of unintentional and accidental use of nuclear weapons by placing a resolution to that effect on the UNGA agenda despite the opposition of the US and China.

In the ultimate analysis, however, a congruence of national interests between the US and India is likely to develop over their mutual perception of a security threat from China. The Chinese themselves see the US as the only power that is going to act as an obstacle in their pursuit of superpower status. Hence, as Professor Samuel P. Huntington has argued in *The Clash of Civilizations and the Remaking of World Order*, "their common interests in containing China is likely to bring India and the United States closer together. The expansion of Indian power in Southern Asia cannot harm US interests and could serve them".

One specific field in which the two will find congruence in their interests is the US goal of nuclear counter-proliferation. Again, as Huntington says, "in due course, US policy will shift from countering proliferation to accommodating proliferation and, if the government can escape from its cold war mindset, to how promoting proliferation can serve US... interests".

Hence, the pursuit of the above strategic policy will not only make India by 2020 a major power in the global politics and economy but also a permanent member of the UN Security Council, fulfilling Nehru's dream expressed in 1954 in the Lok Sabha that "if nothing goes wrong, like wars, the fourth major power next to US, Russia and China is India". India needs to develop self-confidence and, as A.P.J. Abdul Kalam very aptly observed, begin to think in terms of making India a developed nation in the 21st century. A strong and stable India will be a force for peace not only in South Asia, but in the world as well.

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ललितसाहित्यापलीकडील संस्कृत ...

भावना बालटे
द्वि.व.सा. (संस्कृत)

संस्कृत ही भारताची एक प्राचीन भाषा आहे. भाषा हे लौकिक व्यवहाराचे तसेच साहित्यनिर्मितीचे एक माध्यम आहे. साहित्याचे मुख्यतः दोन प्रकार पडतात - १. ललितसाहित्य, २. शास्त्रीय साहित्य.

ललितसाहित्यामध्ये काव्य, नाटक इत्यादींचा समावेश होता, तर शास्त्रीय साहित्यात सर्वप्रकारची शास्त्रे व तंत्रज्ञान यांचा समावेश होतो. साधारणतः सर्व भाषांचा या दोन्ही अंगांनी विकास झाला. त्याप्रमाणेच संस्कृत भाषेचाही ललित व शास्त्रीय या दोन्ही अंगांनी विकास झाला. मात्र, संस्कृत म्हणजे ललितसाहित्य किंवा संस्कृत म्हणजे अध्यात्म किंवा तत्त्वज्ञान असा बऱ्याचजणांचा समज असतो. त्यामुळेच प्रस्तुत लेखामधून संस्कृत भाषेत आढळणाऱ्या शास्त्रीय साहित्यावर प्रकाश टाकण्याचा अल्पसा प्रयत्न केला आहे.

सुरुवातीला, सध्या अतिशय लोकप्रिय असणाऱ्या आयुर्वेदापासून सुरुवात करू. आयुर्वेद हा चार वेदांतील अथर्वाचा उपवेद आहे. आयुर्वेद शब्दाची व्युत्पत्ती 'आयुषः वेदः' अशी होते. त्याचा अर्थ आयुष्याचा वेद असा आहे. आयुर्वेद हे असे एक शास्त्र आहे की, ज्यामुळे माणूस निरोगी बनू शकतो. हे एकमेव असे शास्त्र आहे, की रोग होण्याच्या आधीच तो होऊ नये अशी काळजी घेते. तसेच हे शास्त्र व्यक्तिगणिक बदलते. माणसाची प्रकृती ही कफ, वात, पित्त या तीन दोषांवर अवलंबून असते. औषधाच्या मात्रा आपल्या शरीरात असणाऱ्या दोषांच्या प्राबल्यावरून ठरतात. चरक, सुश्रुत, वाग्भट, धन्वन्तरी इत्यादी शास्त्रज्ञांचे संस्कृत ग्रंथ वैद्यकशास्त्रात फार महत्त्वाचे मानण्यात येतात.

सुश्रुत हा शल्यचिकित्सेसाठी प्रसिद्ध आहे. शस्त्रक्रिया कशा कराव्यात, त्यासाठी कोणती उपकरणे वापरावीत, ती उपकरणे कोणत्या धातूची असावीत, त्यांचे आकार कसे असावेत याचे विस्तृत विवेचन सुश्रुताने 'सुश्रुत संहिता' या त्याच्या ग्रंथात केले आहे. एवढेच नव्हे, तर कोणती उपकरणे कोणत्या प्राण्याच्या शस्त्रक्रियेसाठी वापरावीत यांचे सूक्ष्म विवेचन सुश्रुत करतो.

सर्वात महत्त्वाचा उल्लेख नाक, कान, ओठ यांवर कृत्रिम त्वचारोपण (plastic surgery) केल्याचे उल्लेख आढळतात. (सुश्रुत संहिता १६.२७.३०) तसेच एखाद्या उत्तम सर्जनने कसे वागावे याबाबत सुश्रुत म्हणतो.

शौर्यम् आशुक्रिया शस्त्रैतैक्ष्ण्यममस्वेदवेपथु ।

असंमोहश्च वैद्यस्य शस्त्रकर्मणिं शस्यते ॥

(सुश्रुत संहिता ५.१०)

वैद्याने धीट, कामच्या बाबतीत चपळ, उपकरणांची धार माहित असणारा, घामरहित, न कापता-थोडक्यात आत्मविश्वास या सर्व गुणानी युक्त असावा.

आयुर्वेदाची एक उपशाखा म्हणून भारतात रसायनशास्त्राचा विकास झाला. पाश्चात्य राष्ट्रांमध्ये इ.स. ६ व्या शतकानंतर रसायनशास्त्राचा उदय झाला. मात्र वैदिक काळापासून भारतात रसायनशास्त्राचा विकास झाला. डॉ. प्रफुल्लचंद्र राय यांनी आपल्या *History of Indian Chemistry* नामक ग्रंथात वैदिक काळापासून भारतामध्ये रसायनशास्त्राचा विकास कसा झाला हे सांगितले आहे. भारतीयांना पूर्वीपासूनच गंधकाम्ल (sulphuric acid) नत्राम्ल (nitric acid) यांसारखी रसायने तयार करण्याचे ज्ञान होते. मोरचूद (copper sulphate), रसकापूर (मर्क्युरिक सल्फाईड) यासारख्या रासायनिक पदार्थांचे कारखाने या देशात सर्वत्र होते. रसार्णव, रसरत्नाकर, रसेंद्रकल्पद्रुम यांसारखे रसायनशास्त्राचे संस्कृत ग्रंथ लिहिण्यात आले.

रसायनशास्त्राबरोबरच भारतात धातुविद्याही मोठ्या प्रमाणावर विकसित झालेली दिसून येते. धातूंचे अनेक संदर्भ वेदांपासून उपनिषदांपर्यंत आढळतात. त्यात सुवर्ण, लोह, रौप्य इ. अनेक धातूंचे उल्लेख आहेत. धातुशास्त्र हे भारतात प्रगत होते याला काही ऐतिहासिक पुरावे सापडतात. त्यातीलच एक उदाहरण म्हणजे कुतुबमिनारसमोर असलेला लोहस्तंभ. आज अनेक वर्षांनंतरही तो गंजरहित आहे. यावरून त्या धातूची शुद्धता दिसून येते. याचाच अर्थ, शुद्ध धातू बनवायची पद्धत पूर्वीपासून माहित होती.

‘तमोगर्भलोह’ हा धातुसंशोधकाने हैद्राबादमधील डॉ. प्रभू यांनी सिद्ध केला आहे. ‘तमोगर्भलोह’ हे जगातील एक आश्चर्यच होय. तमोगर्भलोह याचा शब्दशः अर्थ म्हणजे अंधार पोटात साठवणारे लोह होय. या धातूला परावर्तन नसल्याने हा धातू डोळ्याला दिसत नाही. याचे संदर्भ विमानसूत्रात आढळतात. या धातूचे प्रयोग डॉ. प्रभू यांनी प्रयोगशाळातत्त्वावर यशस्वीरीत्या केले आहेत. (*Pride of India*, Sanskritbharati Publication.)

वनस्पतीशास्त्र ही शास्त्राची एक महत्त्वाची शाखा आहे. संस्कृत साहित्यात या शास्त्राचा अतिशय मूलभूत, विस्तृत, सूक्ष्म विचार करण्यात आला आहे. शाड्गर्धर पद्धती, बृहत्संहिता इ. ग्रंथांतून वृक्षारोपणाचे महत्त्व सांगण्यात आले आहे. जे आजच्या काळातही अतिशय उपयुक्त आहे.

शाड्गर्धर पद्धतीत वनस्पतीतील पोषणमूल्ये कशी वाढवायची, त्यांची काळजी कशी घ्यायची हे विस्तृत स्वरूपात सांगितले आहे, तर वृक्षारोपणाच्या पद्धती यांचा विचारही त्यात केलेला दिसतो.

पोषणतत्त्व मुळातूनच वाढण्यासाठी मुळापाशी तूप व सांडपाणी शिंपडणे, दूध शिंपडणे असे घरगुती व उपयुक्त असे उपाय पुराणातही आढळतात.

‘शेती’ हा भारतीय अर्थव्यवस्थेतील मुख्य घटक होय. पूर्वी भारतात गोकृषी पद्धत प्रचारात होती. गोकृषी पद्धत म्हणजे गायीचे मूत्र, शेण इ. पासून करण्यात येणारी शेती. सध्या या ‘गो कृषी’चे पुनरुज्जीवन करण्याचे काम नागपूर येथील ‘गो संशोधन केंद्र’ करत आहे. शेतीवर करण्यात आलेल्या प्रयोगावरून असे सिद्ध करण्यात आले आहे, की रासायनिक खतांचा वापर केल्यास काही काळाने लगेचच पिकांवर जंतुनाशके मारावी लागतात. कारण रासायनिक खतांच्या वापराने पिकांवर कीड पडण्याची शक्यता असते. यावर नैसर्गिक उपाय असा, की कापसाच्या निंबोण्या व गोमूत्र यांचा वापर खत म्हणून केल्यास कोणत्याही प्रकारचे जंतुनाशक वापरावे लागत नाही. कारण मुळातूनच त्या रोपामध्ये / पिकामध्ये प्रतिकारक्षमता व पोषणमूल्ये वाढीस लागतात.

याबरोबरच, कौटिलीय अर्थशास्त्र हा राज्यशास्त्रविषयक ग्रंथ-जो राज्यशास्त्राबरोबरच सामाजिक शास्त्र ह्याचेही स्पष्टीकरण करतो. गणितशास्त्र याबाबत भास्कराचार्य यांचे संशोधन महत्त्वाचे ठरते. खगोलशास्त्राबाबत आर्यभट्ट, वराहमिहिर यांचे योगदान महत्त्वाचे ठरते.

संगीतशास्त्राचा उगम हा सामवेदामध्ये सापडतो. मातङ्गमुनींचा 'बृहत्देशी' हा संगीतविषयक ग्रंथ या शास्त्राचे विस्तृत विवेचन करतो. भरतमुनींचे नाट्यशास्त्र-जे साहित्यशास्त्राचे मूलाधार आहेत आजही National School of Drama या संस्थेत विषय म्हणून शिकवले जाते.

हे-व यांसारखे अनेक विषय संस्कृत साहित्यात पूर्वीपासून आढळतात. मात्र आता केवळ भाषा अवगत नसल्याने हे ज्ञानभांडार अपरिचित राहिले आहे. संस्कृत भाषा ही अनेक शास्त्रांबाबत माहिती देत असल्याने त्याचा अभ्यास करणे गरजेचे आहे. तेव्हा प्रत्येकाने इतर शास्त्रांच्या बरोबरीने संस्कृतचा अभ्यास केल्यास तो त्या त्या शास्त्रांच्या अभ्यासास उपकारक ठरेल.

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In the World of Orchids

Mugdha Sabale
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All plants belong to various families distinguished from each other by differences in the structure of flowers, stems, leaves, roots etc. Each family is split up into many sub families and sub families further split up into genera. These genera are established by similarities in their appearance and construction of flowers. Each genus is further divided into smaller groups with even similarities called species.

Orchids of all kinds belong to the family orchidaceae. This is the largest and most diverse family of flowering plants, with over 800 described genera and 25,000 species. Orchids, through their interactions with pollinators and their symbiosis with orchid mycorrhizal fungi, are considered by some, along with grasses, to be examples of most advanced floral evolution.

This is the most interesting family, because of the curious form taken by the different genera and widespread geographical distribution of species. Except for the Antarctic and deserts orchids have been found in every region of the world, even in the Arctic. There is no other family of plants where so much diversity of form and color is found.

Most of the tropical and subtropical species of orchids are epiphytic, often growing as much as 100 ft. above the ground in the tree tops of the cloud and rain forests, in the struggle for light and air. In semi-desert area, some species are epiphytic on cacti. Some can survive the drying effects of salt condition prevailing in mangrove-swamp. Many orchids have special adaptations to counteract the harshness of their environment; e.g. those which are subjected to long periods of drought have pseudo bulbs which act as a water storage organ to help them through the dry period.

Orchids can be grouped according to the way they retrieve nutrients:

- A majority of species are perennial epiphytes; they are found in tropical moist broadleaf forests or mountains and subtropics. These are anchored on other plants, mostly trees, sometimes shrubs. However, they are not parasites.
- A few are lithophytes, similar to epiphytes but growing naturally on rocks or on very rocky soil. They derive their nutrients from the atmosphere, rain water, litter, humus, and even their own dead tissue.
- Others are terrestrial plants. They grow in the soil or in the loose substrate atop the ground and obtain their nutrients from the soil or the substrate. This group includes nearly all temperate orchids.
- Some lack chlorophyll and are myco-heterotrophs (formerly incorrectly called saprophytes). These achlorophyllous orchids have an ectomycorrhizal relationship, i.e. they are completely dependent

on soil fungi feeding on decaying plant matter (usually fallen leaves) to provide them with nutrients. Typical examples include the Bird's-nest Orchid (*Neottia nidus-avis*) and Spotted Coral-root (*Corallorrhiza maculata*).

The orchids found in nature grow wild. When growing on trees or shrubs, they are termed epiphytes and when on rocks they are termed lithophytes. The species growing on ground are termed terrestrial or some are saprophytic which means they derive the nourishment from dead or decayed organic matter. Some are semi-aquatic under special conditions. They are not parasites; they prepare their own food by photosynthesis and do not easily die even if left uncared for several months.

Epiphytic: These flowers are more flamboyant flowers than terrestrials. In wild they grow on tree branches or rocks obtaining nourishment through clinging roots. Most consist of horizontal rhizome from which arises vertical, water storing often swollen stems known as pseudo bulbs. Flowers and foliage are produced from this.

Terrestrial: Some of which also produce pseudo bulbs grow in soil or leaf moulds, sustaining themselves in the normal way through roots and tubers. Some grow in temperate climate.

Vegetative structure: The vegetative structure of an orchid is modified according to the habit of growth which has a close relation to climate. In some orchids growth of stem sooner or later ceases usually at the end of one season and growth and lateral shoots are developed in the following season. This new growth generally begins with the development of leaf-like scales between which the true leaves arise later. This is called sympodial type of growth. This type of plant produces pseudo bulbs which are swollen stems used for storage of water and food. In this type mainly terrestrial orchids are included.

Other type of growth does not show seasonal growth. The main stem grows and elongates. Season after season produces leaves with flowers. There is no formation of pseudo bulbs and rhizomes. If necessary the food and water is stored in leaves. This type is known as monopodial.

In another type of growth of orchids the stem grows and elongates through seasons and also extends laterally. This may be an intermediate stage of monopodial and sympodial growth is known as pseudo-monopodial.

Roots: All the plants have roots which are necessary for their growth. The main function of roots is to absorb water and minerals which they provide to plants. They are mostly underground.

Also orchids show modification in case of roots. In terrestrial orchids in addition to simple absorbing roots provided with root hairs. Sometime large tubers are also formed. In epiphytic they have clinging roots for attachment to tree or rock on which they grow, absorbing roots which penetrate the humus collected on barks and aerial roots which hang freely in air and aid in absorption of moisture and some little amount of food also.

In some species roots are of green color help in photosynthesis. Some scientists found out that, aerial roots are covered by spongy tissues called velamen. Its main function is to protect the underlying tissues and absorption also.

Rhizomes: These underground swollen structures are actually primary stems from which secondary stems arise. This is found only in sympodial type. These structures also show variations in different species.

Pseudo bulbs: This is thickened secondary stem with one or more internodes. Internode is the region between two nodal regions. It is found in epiphytic orchids. It is also variable in shape.

Orchids have simple leaves with parallel veins. Their shape is highly variable between species; ovate, lanceolate, or orbiculate. Their size and shape can be an aid in identifying the orchid, since it reflects the taxonomic position. The leaves can be enormous or minute, or they can even be lacking (as in the Ghost Orchid (*Dendrophylax lindenii*), a mycoheterotrophic species, and Aphyllorchis and Taeniophyllum, which depend on their roots, which contain chlorophyll for photosynthesis).

The structure of the leaves corresponds to the specific habitat of the orchid. Species that typically bask in sunlight, or grow on sites which can be occasionally very dry, have thick, leathery leaves. The laminae are covered by a waxy cuticle. These retain their necessary water supply. Shade species, on the other hand, have tall, thin leaves. They cannot tolerate a drop in atmospheric humidity or exposure to direct sunlight. Between these two extremes, there is a whole range of intermediate forms.

The leaves of most orchids live on, attached to their pseudobulbs, for several years. Some species, especially those with plicate leaves, shed their aged leaves annually, through an articulation between the lamina and the petiole sheath, and develop new leaves together with new pseudobulbs (as in the genus Catasetum).

The leaves of some species can be most beautiful. The leaves of the *Macodes sanderiana*, a semiterrestrial or lithophyte, show a sparkling silver and gold veining on a light green background. The cordate leaves of *Psychopsiella limminghei* are light brownish green with maroon-puce markings, created by flower pigments. The attractive mottle of the leaves of Lady's Slippers from temperate zones (*Paphiopedilum*) is caused by uneven distribution of chlorophyll. Also *Phalaenopsis schilleriana* is a lovely pastel pink orchid with leaves spotted dark green and light green. The Jewel Orchid (*Ludisia discolor*) is grown more for its colorful leaves than its fairly inconspicuous white flowers.

The reproductive organs in the center (stamens and pistil) have adapted to become a cylindrical structure called the column or gynandrium. On top of the column lies the stigma, the vestiges of stamens and the pollinia, a mass of waxy pollen on filaments. These filaments can be a caudicle (as in *Habenaria*) or a stipe (as in *Vanda*). These filaments hold the pollinia to the viscidium (sticky pad). The pollen are held together by

the alkaloid viscine. This viscidium adheres to the body of a visiting insect. The type of pollinia is useful in determining the genus. On top of the pollinia is the anther cap, preventing self-pollination. At the upper edge of the stigma of single-anthered orchids, in front of the anther cap, is the rostellum, a slender beaklike extension.

Floral structure: In orchid some flower produce singly or some are in bunch it is called as inflorescence that depend on genera.

Flower: Flowers shows variation in size from pinhead to about 15-30cm.size of diameter. Flower has three sepals, three petals and a column is also called as gynostegium having reproductive parts.

Sepals are many times similar but some time dissimilar from each other. They are colored and called petaloid sepals. It also shows variation in arrangement, size, and color in different variety.

Petals are three in number. Two are alike and lateral. One which is called lip or flabellum is highly modified, enlarged and colourful. The lip is attached to the base of column. They may be simple or lobed, flattened, sac-like, tubular.

The column and gynostegium situated in centre is the unique structure distinguishing the orchids from other plants. This is formed by fusion of male and female organ. This is reproductive part of orchid flower. It is attractively shaped and often is decorated with wings or cap or a fringed bonnet (extended). The column varies in shape, size and poster in various genera and species and bears at the tip or on the sides near the tip. It has one to three movable or rigidly attached anthers.

The family orchidaceae is divided on the basis of no of fertile anthers. On ventral of anther female reproductive structure that is stigma is present. It is fusion of two stigmas, the partition wall between stamen and stigma is termed as rosella. Ovary is at the base of all floral organs. This is characteristic of family orchidaceae.

The fruit is capsule takes long time to ripe. It also shows many variations in shape.

It is in the variety and the refinement of their reproductive methods that orchids truly amaze. On many orchids, the lip (labellum) serves as a landing pad for flying insects. The labellum is sometimes adapted to have a color and shape which attracts particular male insects via mimicry of a receptive female insect. Some orchids are reliant solely on this deception for pollination. After pollination, the epigynous ovary starts developing and produces a many-seeded capsule.

- The Lady's Slipper (Paphiopedilum) has a deep pocket that traps visiting insects, with just one exit. Passage through this exit leads to pollinia being deposited on the insect.
- Many neotropical orchids are pollinated by male orchid bees, which visit the flowers to gather volatile chemicals they require to synthesize pheromonal attractants. Each type of orchid places the pollinia on a

different body part of a different species of bee, so as to enforce proper cross-pollination.

- ⑥ A Eurasian genus *Ophrys* has some species that look and smell so much like female bumblebees that male bees flying nearby are irresistibly drawn in and attempt to mate with the flower, such as with the Bumblebee Orchid (*Ophrys bombyliflora*). The viscidium, and thus pollinia, stick to the head or the abdomen of the bumblebee. On visiting another orchid of the same species, the bumblebee pollinates the sticky stigma with the pollinia. The filaments of the pollinia have, during transport, taken such position that the waxy pollen are able to stick in the second orchid to the stigma, just below the rostellum. Such is the refinement of the reproduction. If the filaments had not taken the new position on the bee, the pollinia could not have pollinated the original orchid. Other species of *Ophrys* are mimics of different bees or wasps, and are also pollinated by males attempting to mate with the flowers, and other orchid genera practice similar deception.
- ⑥ An underground orchid in Australia, *Rhizanthella slateri*, never sees the light of day, but depends on ants and other terrestrial insects to pollinate it.
- ⑥ Many *Bulbophyllum* species stink like rotting carcasses, and the flies they attract assist their reproduction.
- ⑥ *Catasetum saccatum*, a species discussed briefly by Darwin actually launches its viscid pollen sacs with explosive force, when an insect touches a seta. He was ridiculed for reporting this by the naturalist Thomas Huxley.
- ⑥ Some *Phalaenopsis* species in Malaysia are known to use subtle weather cues to coordinate mass flowering.
- ⑥ Some *Phalaenopsis*, *Dendrobium* and *Vanda* species produce keiki, offshoots or plantlets formed from one of the nodes along the stem, through the accumulation of growth hormones at that point.

The filaments of the pollinia of some orchids dry up if they haven't been visited by an insect. This way, the waxy pollen falls on the stigma causing the orchid to self-fertilize.

The Life of an Orchid

In nature almost all orchid flowers whether terrestrial, epiphytic or lithophytic species are fertilized by insects. In 19th century there was great interest in this aspect of orchid logy, both in old and new world. Darwin was fascinated by this subject and published his delightful book *The Various Contrivances by Which Orchids are Fertilized by Insects* in 1862.

Although there are some species which are self-fertilizing, most species are fertilized by insects and during course of evolution some have developed the most ingenious and varied adaptations to ensure their pollination and thus their survival.

The genus *Cattelya* endowed with beautiful fringed labile- often with gold streaking at its throat leading to the column at the apex of which pollen is present which attracts large insects such as bees and wasps. By means of sweet perfume as well as gold called as honey guides. The labellum depressed by the bee in landing to allow it to pass down to nectary, springs back into the place and the bee finds itself trapped. In this struggle to escape, the bee pressed against the pollinia-in *Cattelya* genus these are usually 4 in no. and attached to the column by sticky, elastic thready stem, which become fasten to its back. On its next visit to a flower the pollinia brush off and adhere to the stigmatic surface of column, which is also tacky and in this way the flower is fertilized. The pollinia are disc shaped and each contains thousands of pollen grains.

In the *Paphiopedilum* genus the insect becomes trapped in the boat or shoe shaped pouch and can escape only by passing through one of two narrow exit gaps or tunnels in which the pollinia are placed in the exact position for easy removal.

Odontoglossum, *Miltonia*, *Oncidium* and other many genera are usually fertilized by butterflies or moths, which the flowers mimic in shape, size and color. The moth mistaking the flower for another moth, in orchid *Carrison* a vigorous court ship follows, which in its result is rewarding only to the orchid. *Oncidium pappilio* and *Oncidium kramerianum* in particular resemble huge brilliantly colored butterflies, an impression enhanced by the hovering motion imparted to the long stem flowers by the gentlest breeze. This method of attracting pollinating agent by insect mimicry is also adapted by some species of the Mediterranean genus *Ophrys*, which not only look like female wasp but also emit the same color as a female ready for mating,

Angraecum sesquipedale, the white Christmas star orchid from Madagascar has a 12-inch spur-like nectar below the labellum in which the nectaries gather right in the tip. Darwin reasoned that only an insect which could reach the nectar could pollinate the flowers and therefore postulated the existence of some hue moth, with a wonderful long proboscis. Capable of extension to a length of between 10 and 11 inches these flowers are fertilized in most dramatic manner of all flowers. The labellum is in the form of a helmet or an upturned cap at the top of the flower and the pollen is held at the end of a member similar to a coiled spring. There is no nectar but the thickened labellum taste equally good to a bee and as it gnaws through the cap it touches one of two long antennae which are very sensitive. This activates the spring like mechanism causing the pollen to be ejected forcibly. Sometimes to a distance of several inches on to the bee's head or thorax and in dew, this course is deposited on stigma of next flower visited by bee.

After pollination, the sepals and petals wilt and shrivel. This condition does not occur to such an obvious extent during the fertilization of *Paphiopedilums* or of *Cymbidiums* but in the case of *Cymbidiums*, although the sepals and petals remain apparently unchanged the lip becomes

suffused with dark pink color very rapidly. This probably accounts for the statement in a newspaper that, "The orchid blushes when it is married." This is also the characteristic of family that flower must be entire when it is put before the orchid committee.

It is possible to gain an idea of the life cycle of orchids in general by following in detail what happened with *Cattelya* after it has been fertilized. A day or two after the pollinia have been deposited on the stigma. The pollen forms a glutinous mass with viscid substance it secretes. The column has a central duct containing elongated cells, which leads to the ovary at its base, and through which the pollen tube makes their way to the ovary. At first the ovary is circular in cross section with three lines radiating from the centre to the circumference. After about fourteen days the walls of the ovary thicken and the lines widen causing the cross section outline of the ovary to alter from circular to triangular. These lines are placentas and after a further fortnight the ovary develops rudimentary ovules attached to the placenta and pollen tubes enter to ovary, making their way down to the sides of placentas and between the ovules. At the end of about two months, the pollen tubes fill the ovary and are situated along the placentas and among the ovules which have not yet been fertilized. In three more weeks however, the ovules start to develop in size and to alter their shape. By the end of five months, when each pollen tube has entered a small orifice in each ovule—the micropyle—to fertilize it, the process is almost complete.

In a temperate climate, the pod needs more time in order to ripen and this depends on weather, along sunny spell causing the ripening to be shorter and vice-versa. In nature where there are always at least twelve hours of intense sunlight, the process will no doubt be much quicker. In addition, some genera mature the pods more rapidly than *Cattelya*, and there are also considerable variations among species even within this genus.

At the end of the year, in some species it may be month earlier or in others take as long as 14 months the pods start to dehisce by splitting along the sides usually beginning at the apex. This is caused by the drying of the pod and in nature the seed, which is also dry and powdery, is then wind borne much falling on stony ground and only a very small percentage finding a resting place where it is able to germinate.

In nature seed is carried indiscriminately by the wind and only that succeeds which is lucky enough to find the right condition for germination unlikely the seeds of most other plants, orchid seed posses no food store on which to draw while germinating. Instead, every species develops a symbiotic relationship- mutually beneficial partnership- with certain fungi and because the seed cannot survive alone during its early stage so it will perish, unless it makes immediate contact with right type of fungus.

After 6 months, the seed becomes a tiny spec of green vegetation which, if viewed under a microscope, appears bowl shaped with a little peak at top. After a further period of month the peak has developed into

what is undoubtedly a leaf, and at the end of year there are two pairs of leaves and several short white rootlets. In another 4 months the speck has become recognizable *Cattelya* plantlets and from on then makes rapid progress. The roots grow fastest because the life of plant will depend on how efficiently they anchor the plant to the tree. They do not bring much nourishment to the plant, as their main function is to keep the plant attached to its host. The green showing in the rot is about half an inch or so at the tip (the growing part), the rest of the root being covered with a fleshy white tissues, absorbent to a certain degree but otherwise incapable in taking nourishment for plant.

The *Cattelya* plant in the jungle grows more rapidly than its glass house counterpart if only because in its natural habitat. It is subjected to much longer period of life of a much higher average of daily intensity. All green plants depend for life on the action of light on their parts, that is their leaves and in the case of *Cattelya*, the green tips of its roots. If, in an addition to the longer hours of light, there is an added bonus of extra warmth- especially during the day- this action is hastened, CO₂ is taken in more rapidly during the hours of day- light and converted into sugar during the hours of darkness, the plants cells multiply more rapidly and the plant therefore grows more vigorously and quickly.

The *Cattelya* lifecycle described above is similar to that of many other orchids and nearly all epiphytes, although the way the capsule dehisces is different in many genera. Some split in 3 places from top to bottom, some have two valves, some 3, while others remain attached to each other at apex or at base, one at least split into three different sections, each having the seed attached to the median line or midrib running from apex to base.

The amount of seed in most capsules varies, but is usually immense in quantity. Darwin calculated if every one of the approximately 6200 seeds produced by the average 30 capsule of the small European spotted orchid germinates successfully it could cover the entire land surface of the surface of the earth in 3 generations. Some tropical species reveal a greater abundance, 3700000 seeds were found by scientific count in a single pod of the Venezuelan *Cynoches chlorochilon*.

Why does Nature Provide Such a Bountiful Number of Orchids?

The proportion of orchid flowers actually pollinated in wild is very tiny and the amount of seeds finding a congenial resting place and the right fungus to enable it to germinate it is minute. Again only the most vigorous survive. When sown in laboratory conditions, however, most of the seed germinates and is duly pricked off and cultivated. The vigorous, less vigorous and the down right unwilling are all grown, but some are quick to reach maturity and some slow. This is reflected in the time taken to reach flowering size and to produce flowers. In *Paphiopedilum* genus, for example, a hybrid will flower in four and half years from the date of sowing, but out of same batch some will not flower for perhaps a further

five years. It is, however, these slow growing varieties which are often the best.

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Paradoxes in Mathematics. – Strange but True

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*How quaint the ways of paradox –
At common sense she gaily mocks.*

- W. S. Gilbert

A man says, "I am lying." Is his statement true? If so, then he is lying and his statement is false. Is his statement false? If so, then he is lying and the statement is true!

There is hardly a person living who has not made use, at some time or other, of the well-worn adage, 'All rules have exceptions.' There are probably few people, however, who are aware of the fact that it is self-contradictory.

Let us check out the following argument:

1. All rules have exceptions.
2. Statement (1) is a rule.
3. Therefore statement (1) has exceptions.
4. Therefore all rules do not have exceptions.

This is how the statement contradicts itself.

In general, a paradox is anything which offhand appears to be false, but is actually true; or which appears to be true, but is actually false; or which is simply self-contradictory.

Perhaps the greatest paradox of all is that there are paradoxes in mathematics. We are not surprised to discover inconsistencies in experimental sciences, which periodically undergo revolutionary changes. But, because mathematics is the most conservative of the sciences, because its theorems are deduced from postulates by methods of logic, in spite of its having undergone revolutionary changes, we do not suspect it of being a discipline capable of engendering paradoxes.

In mathematics, a paradox is a mathematical truth so startling that it is difficult to believe even after every step of its proof has been verified.

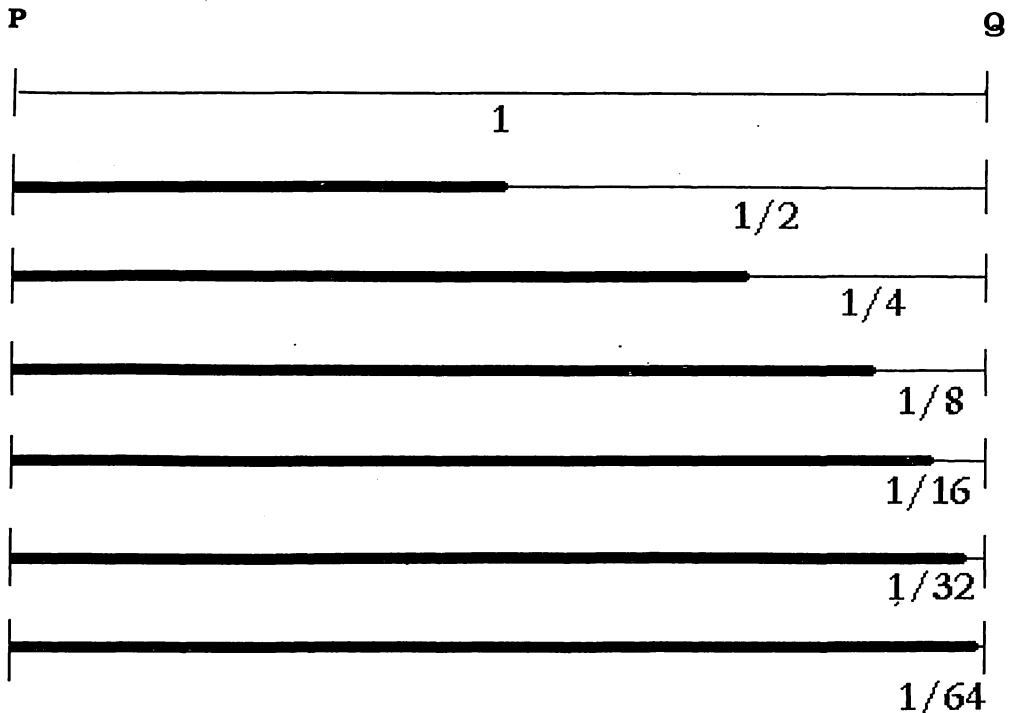
Here we have tried to give a glimpse of paradoxes that can arise in mathematics.

Paradoxes of the Infinite

For well over two thousand years, mathematicians have been struggling with the infinite. They cannot afford to disregard it, for it is

indispensable in much of their work. Yet in their attempts to understand it and to use it, they have run up against many contradictions. Some of these they have been able to overcome, while others are still causing them trouble. Indeed the paradoxes proposed by Zeno of Elea in the fifth century B.C. have never been settled to the complete satisfaction of all mathematicians.

The first of the paradoxes of Zeno is about motion. It says, 'Motion is impossible.' The conclusion is startling, we must admit; and the argument is rather convincing. Let's look at it.



To go from any point **P** to another point **Q**, we must first go half of the distance from **P** to **Q**, then half of the remaining distance, then half the distance then remaining, then half the distance then remaining, and so on. The 'and so on' implies that the process can be repeated, and is to be repeated, an infinite number of times. Now, regardless of how small the successive distances become, each time some distance is left to cover.

If a series is convergent, but not absolutely convergent, it is said to be 'simply convergent'. The question of rearranging the terms of a simply convergent series was settled in 1854 by the German mathematician Riemann, when he succeeded in proving the following remarkable theorem: *The terms of a simply convergent series can be so rearranged that the limit of the series is any specified finite number, or positive infinity, or negative infinity!*

Consider an example given by Bolzano.

Let

$$S = 1 - 2 + 4 - 8 + 16 - 32 + 64 - 128 + \dots$$

Then,

$$\begin{aligned} S &= 1 - 2(1 - 2 + 4 - 8 + 16 - 32 + 64 - \dots) \\ &= 1 - 2S. \end{aligned}$$

That is,

$$3S = 1, \text{ or } S = 1/3.$$

On other hand, the original series can be written as

$$\begin{aligned} S &= 1 + (-2 + 4) + (-8 + 16) + (-32 + 64) + \dots \\ &= 1 + 2 + 8 + 32 + 64 + \dots \end{aligned}$$

Then S diverges to infinity. But again, we can write

$$\begin{aligned} S &= (1 - 2) + (4 - 8) + (16 - 32) + (64 - 128) + \dots \\ &= -1 - 4 - 16 - 64 - \dots \end{aligned}$$

Then S diverges to negative infinity!

These contradictions are to be explained by the fact that this series is not only an oscillating series, but is one which oscillates *infinitely*. We try to apply to this infinite series the processes of finite arithmetic. In finite arithmetic we go on the assumption that we can remove brackets at will, grouping terms in any way we please.

In general, now we prove that every infinite series, convergent or not, can be summed to any desired number N.

Consider the series

$$a_1 + a_2 + a_3 + a_4 + a_5 + a_6 + \dots$$

We can express the a_s as follows:

$$a_1 = N + (a_1 - N)$$

$$a_2 = - (a_1 - N) + (a_1 + a_2 - N)$$

$$a_3 = - (a_1 + a_2 - N) + (a_1 + a_2 + a_3 - N)$$

$$a_4 = - (a_1 + a_2 + a_3 - N) + (a_1 + a_2 + a_3 + a_4 - N)$$

$$a_5 = - (a_1 + a_2 + a_3 + a_4 - N) + (a_1 + a_2 + a_3 + a_4 + a_5 - N)$$

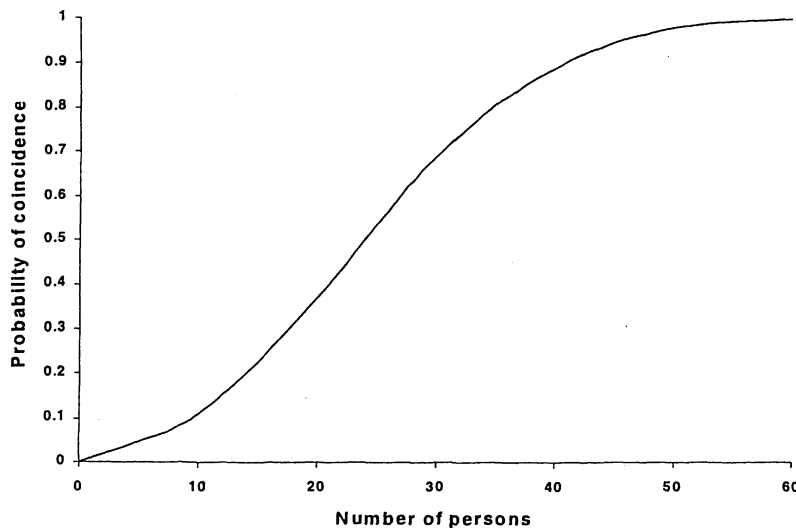
and so on indefinitely. Adding these equations, we have

$$\begin{aligned} a_1 + a_2 + a_3 + a_4 + a_5 + \dots \\ &= N + (a_1 - N) - (a_1 - N) + (a_1 + a_2 - N) - (a_1 + a_2 - N) + \\ &(a_1 + a_2 + a_3 - N) - (a_1 + a_2 + a_3 - N) + (a_1 + a_2 + a_3 + a_4 - N) - \\ &(a_1 + a_2 + a_3 + a_4 - N) + \dots \end{aligned}$$

But, now, on the right-hand side of this equation, all terms after the first one drop out when the brackets are removed. Consequently the sum of the series on the left-hand side is N!

Probability Paradoxes

Probability theory is a field of mathematics unusually rich in paradoxes – truths that cut so strongly against the grain of common sense that they are difficult to believe even after one is confronted with their proofs. The paradox of birth dates is a sterling example. If 24 people were selected at random, what would you estimate the probability to be that two or more of them will have the same birth date (that is, the same month and day of the year)? Intuitively you feel it should be very low. In fact, it is 27/50 or slightly better than 50 per cent!



George Gamow, in *One Two Three – Infinity*, gives the following simple method of arriving at this unexpected result. The probability that the birth dates of any two people are *not* alike is clearly 364/365 (since there is only one chance in 365 that one person's birth date will coincide with another's). The probability that a third person's birth date will differ from the other two is 363/365; a fourth person's, 362/365; and so on until we reach the 24th person (342/365). We thus obtain a series of 23 fractions which must be multiplied together to reach the probability that all 24 birthdays are different. The final product is a fraction that reduces to 23/50. In other words, if you were to bet on at least one coincidence of birth dates among 24 people, you would in the long run lose 23 and win 27 out of every 50 such bets. (This computation ignores 29 February and also the fact that birth dates tend to be concentrated more in certain months than others; the former lowers the probability, the latter raises it.)

Logical Paradoxes

A stranger in town once asked the barber if he had much competition. "None at all," replied the barber. "Of all the men in the village, I naturally don't shave any of those who shave themselves, but I do shave all those who don't shave themselves".

This remark appears innocent enough until we stop to think of the plight of the barber. Does he shave himself or doesn't he? Let's suppose he *does*. Then he is to be classed with those who shave themselves. But the barber doesn't shave those who shave themselves. Therefore he does *not* shave himself. All right, then, let's suppose he does *not* shave himself. Then he is to be classed with those who don't shave themselves. But the barber shaves all those who don't shave themselves. There he *does* shave himself.

Here is an intolerable situation. For if the poor barber shaves himself, then he doesn't, and if he doesn't, he does. Even growing a beard won't help him!

Another paradox, which has its foundation—real or legendary—in antiquity, concerns the sophist Protagoras, who lived and taught in the fifth century B.C. It is said that Protagoras made an arrangement with one of his pupils whereby the pupil was to pay for his instruction after he had won his first case. The young man completed his course, hung up the traditional shingle, and waited for clients. None appeared. Protagoras grew impatient and decided to sue his former pupil for the amount owed him.

"For," argued Protagoras, "either I win this suit, or you win it. If I win, you pay me according to the judgment of the court. If you win, you pay me according to our arrangement. In either case I am bound to be paid."

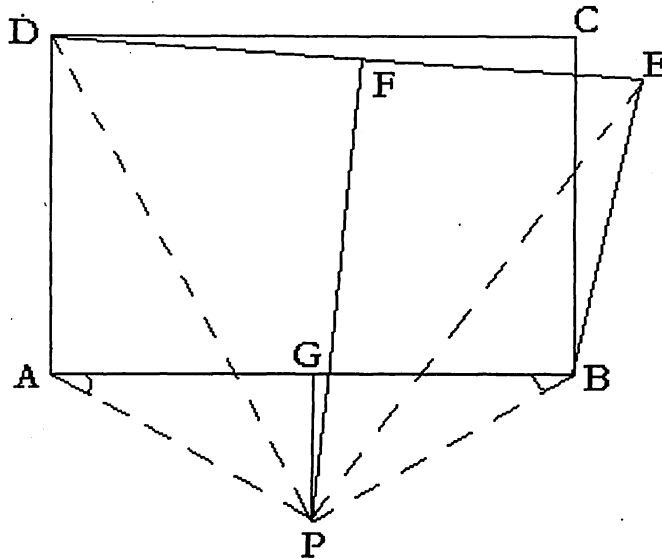
"Not so," replied the young man. "If I win, then by the judgment of the court I need not pay you. If you win, then by our agreement I need not pay you. In either case I am bound not to have to pay you."

Whose argument was right? Who knows?

Geometrical Fallacies

As distinguished from the paradoxes just considered, there are those which are more properly referred to as mathematical fallacies. Mathematical fallacies are equally astonishing assertions, but unlike mathematical paradoxes their proofs contain subtle errors. Most mathematical fallacies are too trivial to deserve attention; nevertheless the subject is entitled to some consideration because, apart from its amusing aspect, it shows how a chain of mathematical reasoning may be entirely vitiated by one fallacious step.

A right angle is equal to an obtuse angle:



Let **ABCD** be any rectangle. Following figure, draw through **B** a line **BE** outside the rectangle and equal in length to **BC** (hence to **AD**). Construct the perpendicular bisectors of **DE** and **AB**. Since these lines are perpendicular to non-parallel lines, they must meet, as at **P**. Draw **AP**, **BP**, **DP**, and **EP**. In triangles **APD** and **BPE**, **AD=BE** by construction. Also **AP=BP** and **DP=EP**. (Any point in the perpendicular bisector of a line is equidistant from the ends of the line.) Since the three sides of triangle **APD** are equal respectively to the three sides of triangle **BPE**, these triangles are congruent. Hence

$$\angle \text{DAP} = \angle \text{EBP} \quad (1)$$

But

$$\angle 1 = \angle 2 \quad (2)$$

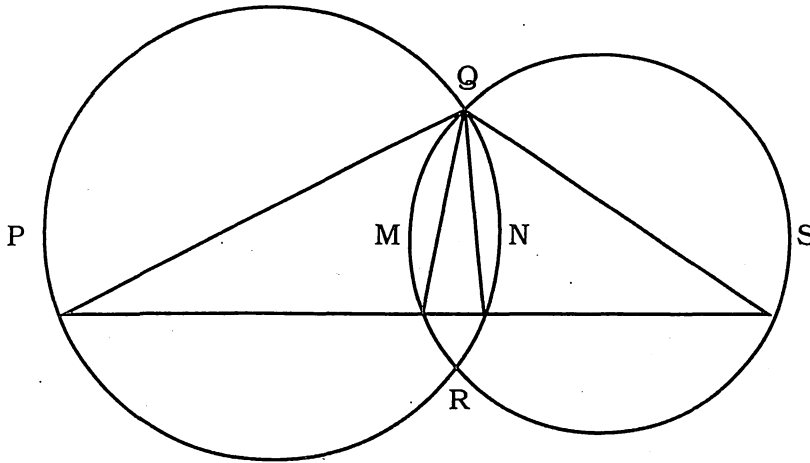
(Angles opposite the equal sides of an isosceles triangle are equal.)

Subtracting (2) from (1), we conclude that $\angle \text{DAG}$ (given a right angle) is equal to $\angle \text{EBG}$ (an obtuse angle by construction).

Two perpendiculars from a point to a line:

Let any two circles intersect in **Q** and **R**. Draw diameters **QR** and **QS** and let **PS** cut the circles at **M** and **N** respectively, as in the figure. Then

$\angle \text{PNQ}$ and $\angle \text{SMQ}$ are right angles. (An angle inscribed in a semicircle is a right angle.) Hence QM and QN are both perpendicular to PS .



Can you find the flaw in the above assertions? Hint: Try drawing the figures exactly.

☞☞☞

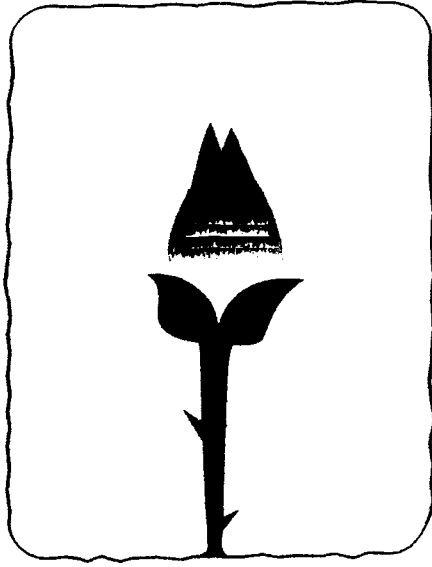
References:

1. *Riddles in Mathematics* by Eugene P. Northrop.
2. *Mathematical Puzzles and Diversions* by Martin Gardner.
3. *Mathematics and the Imagination* by Kasner and Newman.

*I am a part of all that I have met;
Yet all experience is an arch wherethrough
Gleams that untravelled world, whose margin fades
For ever and for ever when I move.*

- Alfred Tennyson

चुकता चुकता शिकता येते ।
प्रतिभेतून मग कला जळते ॥



शब्दहि सुचतिल, जुळतिल ओळी गुणगुणता, गुणगुणता...
तसेल लिहिलं जरी आजवर, होइल लिहून कविता...