

Exchanging Experience with Conservation Agriculture

Towards Climate Resilience

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Art drawing: JIANG Heping

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图书在版编目（CIP）数据

保护性耕作经验交流－应对气候变化：英文 / 李洪文，谢玫，何进著；蒋和平绘．
—北京：科学普及出版社，2014.8
ISBN 978-7-110-08724-4

I．①保… II．①李… ②谢… ③何… ④蒋… III．
①资源保护—土壤耕作—英文 IV．① S341

中国版本图书馆 CIP 数据核字（2014）第 172830 号

策划编辑 吕建华 许英
责任编辑 赵晖 杨丽
责任校对 何士如
封面设计 蒋和平
责任印制 李春利

出版 科学普及出版社
发行 科学普及出版社发行部
地址 北京市海淀区中关村南大街 16 号
邮编 100081
发行电话 010-62173865
传真 010-62179148
投稿电话 010-62176522
网址 <http://www.cspbooks.com.cn>

开本 889mm×1194mm 1/24
字数 20 千字
印张 2.25
版次 2014 年 8 月第 1 版
印次 2014 年 8 月第 1 次印刷
印刷 北京盛通印刷股份有限公司
书号 978-7-110-08724-4/S·548
定价 20.00 元

Acknowledgements

Technical and Language Editor: William CRITCHLEY

Special thanks to the following experts for their contributions during peer review : Saidi MKOMWA, Patrice DJAMEN, Peter KURIA (African Conservation Tillage Network); Martin SISHEKANU; Sandra CORSI.

Thanks also go to Mayya REVZINA (World Bank Publishing & Knowledge Unit); WU Yuehua and LI Sheng (World Bank Institute), who helped prepare the publication of this book.

Funding support for this publication: TerrAfrica program and Climate Change Group of the World Bank.

The conservation agriculture technology won four national scientific and technological awards in China, and is among the key areas of technological innovation in agriculture that the government is promoting domestically.

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Welcome south-south knowledge sharing delegation

My name is Li Long. Welcome to my farm.

Thank you for inviting us!

It is our pleasure to meet you, Mr. Li.



I hear that you are having a bad drought. But I see that your crops are doing very well. What is your trick?

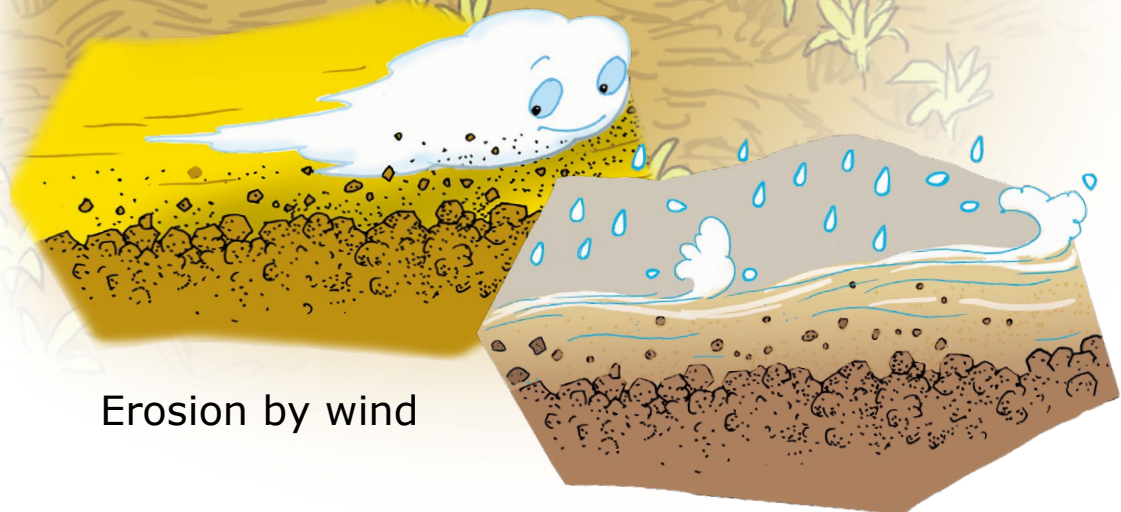
Well, my "trick" is conservation agriculture.





How have you benefited from this new way of farming?

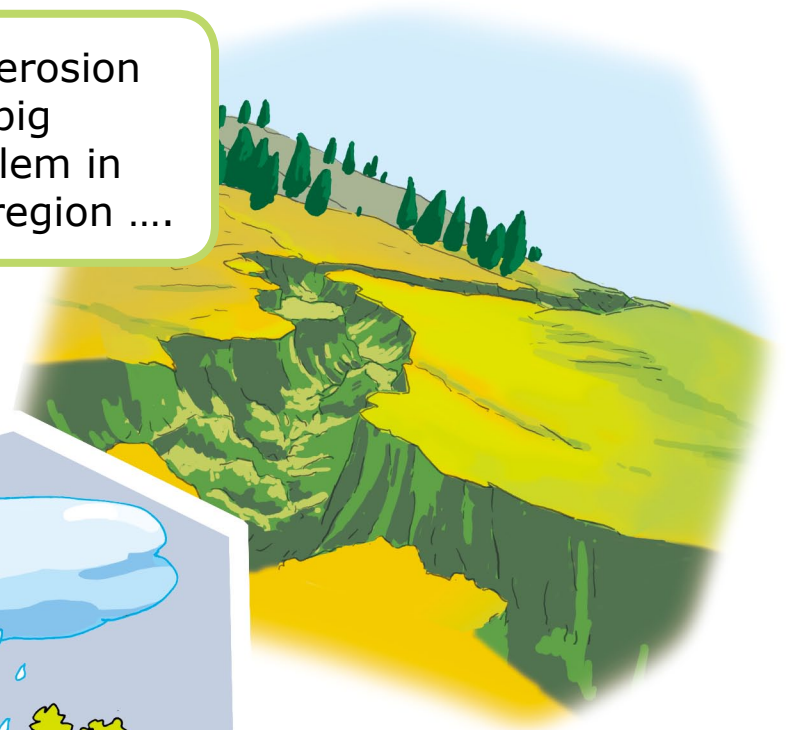
In a lot of ways! First, less soil erosion in my field. Remember point 1, "Don't plow"? Plowed fields without vegetation cover get easily eroded by wind and water.



Erosion by wind

Erosion by water

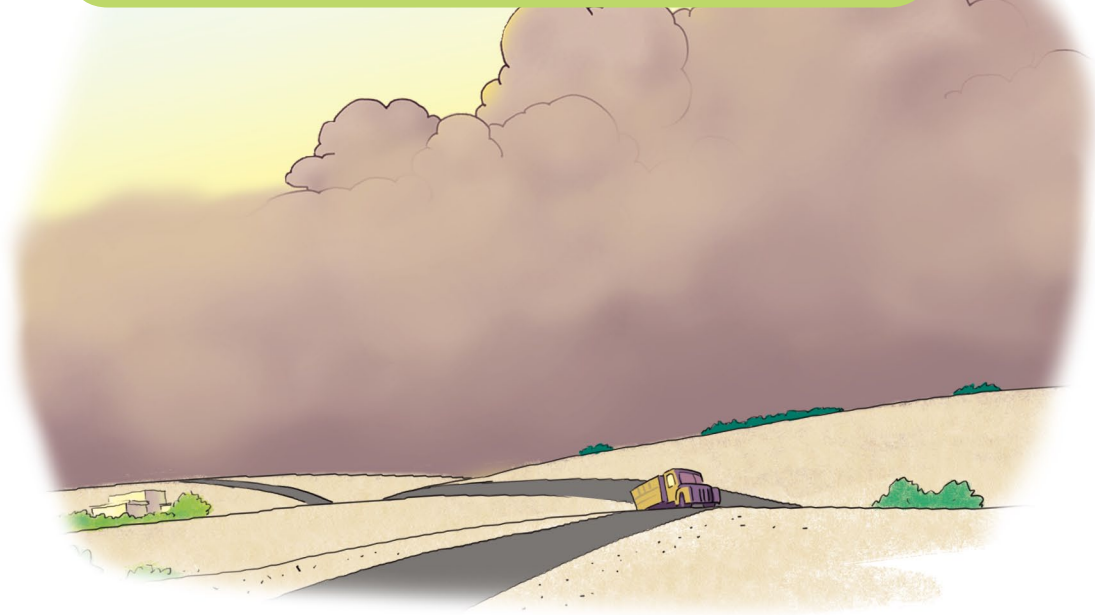
Soil erosion is a big problem in our region



Yes, you often see earth-colored water running off farm lands.

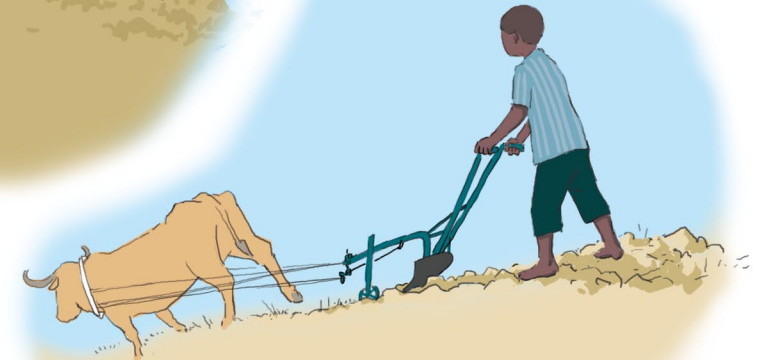


I heard about the "Great Dust Bowl" of the last century in the US. That was because of plowing large fields year after year. To address this problem, the US started no-till.



We also have bad dust storm problems, and they affect cities too. Soil erosion used to be my headache. That was partially why I decided to stop plowing.

No plow? How do you sow seeds? I use a disc plow to loosen the soil



Not even an animal-drawn plow?

Plowing creates a hard plough pan



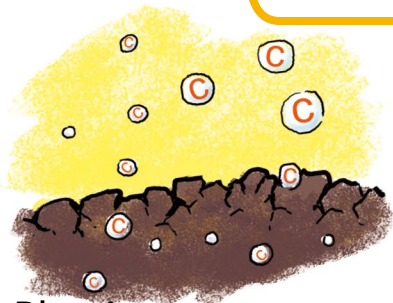
Plowing reduces water infiltration and moisture holding



Plowing disturbs soil organisms



Actually, we say: "The deeper you plow, the more you lose!"



Plowing exposes organic matter, releases greenhouse gases

Li Long, in our region, when heavy tropical rains hit bare soil, the runoff washes away topsoil. Can conservation agriculture help?

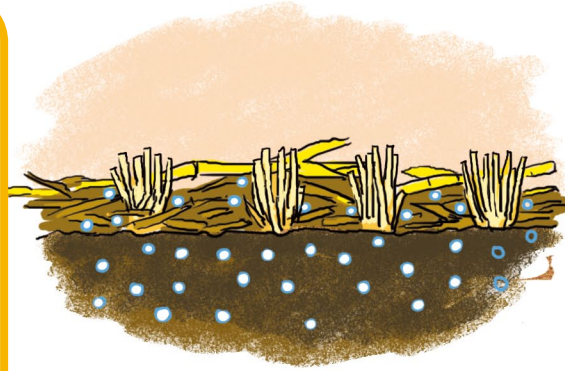


Yes! Remember the second point of conservation agriculture?

"Cover the field"



Right, Amos.
Under conservation
agriculture, I leave
crop residues in the
field to cover bare soil
after harvesting. So,
runoff and evaporation
are both reduced.



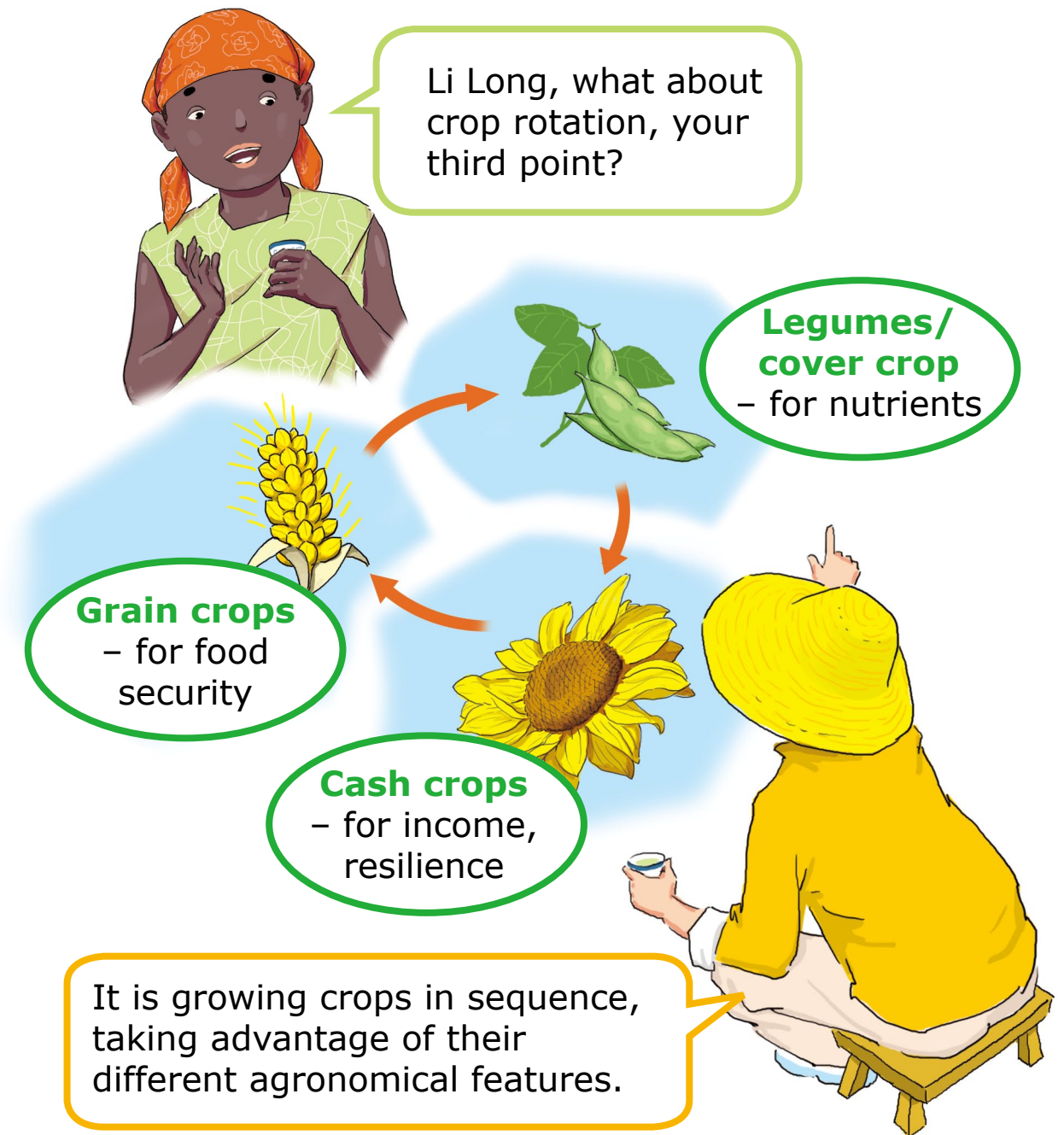
I see ... more moisture is
kept in the soil for crops
to grow. It helps during
dry spells or droughts.

... and when soil
is covered with
residues, the
surface wind speed
is slowed down.



... it reduces soil blown
from farmland too.







For me, after wheat harvest, I directly seed maize with no-till. Sometimes, I add a legume crop to improve soil nutrients and control pests.

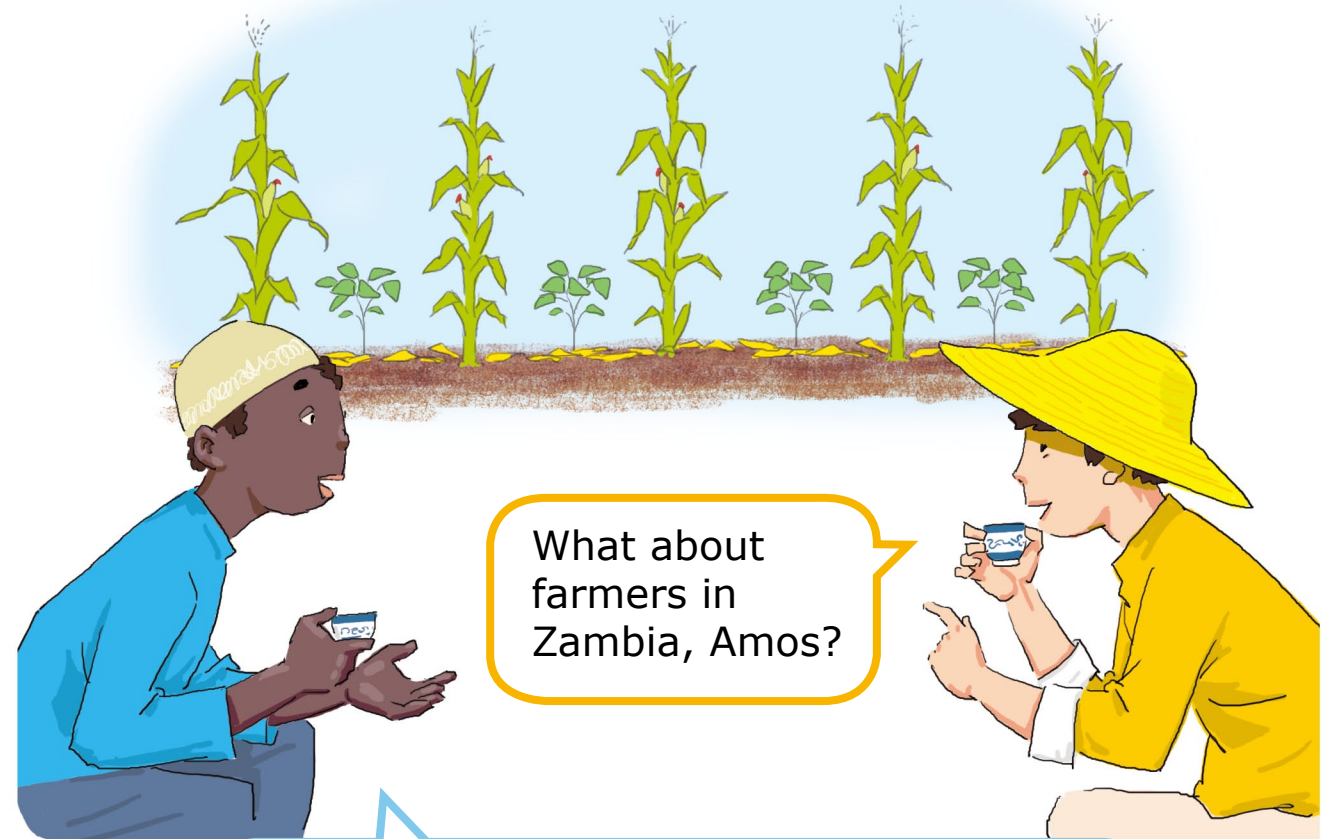
Combine Harvester



Chopping

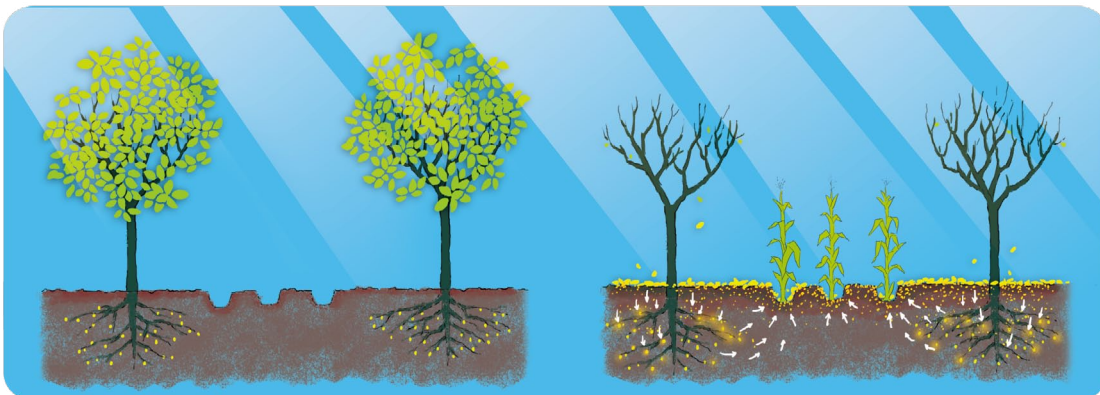


Direct seeding



What about farmers in Zambia, Amos?

Some farmers grow a cereal crop, followed by a cash crop like cotton...then, a legume crop, such as beans. In Africa, farmers often use crop association through intercropping rather than crop rotation.



Some innovative farmers practice agroforestry, using faidherbia trees in croplands. They call them fertilizer trees, whose nitrogen-rich leaves drop on the ground during the cropping season, enriching soil, and making crops stronger.



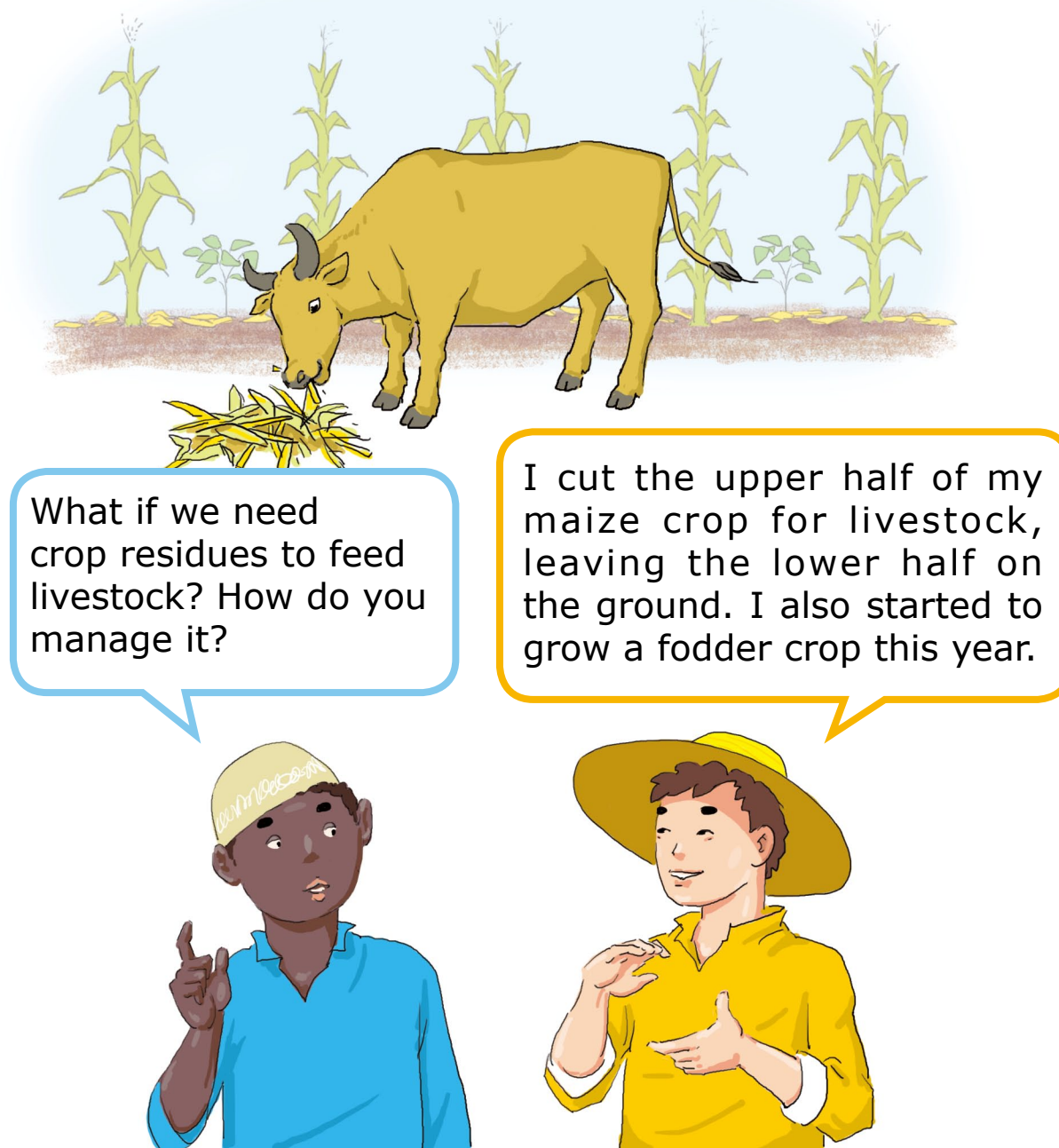
That is so interesting and innovative.



What crops work well under conservation agriculture?

You can use it for most crops. I grow maize, wheat, groundnuts, soybeans, and even rice.





How much residue should I leave in the field?

The more, the better. If you don't have enough, you should at least cover 30% of the field. Distribute the residues evenly.



Does conservation agriculture require special seeds?

No. I use undamaged seeds with a high germination rate. I pre-mix them with chemicals against pests and diseases.



Jab planter



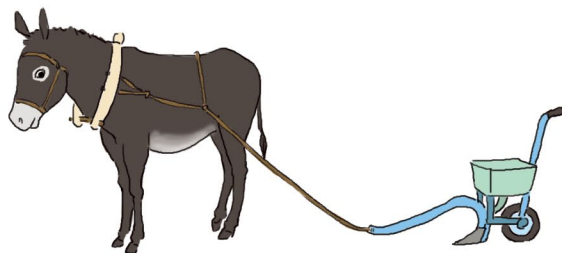
Bike planter



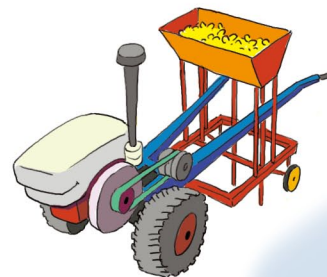
Li Seeder



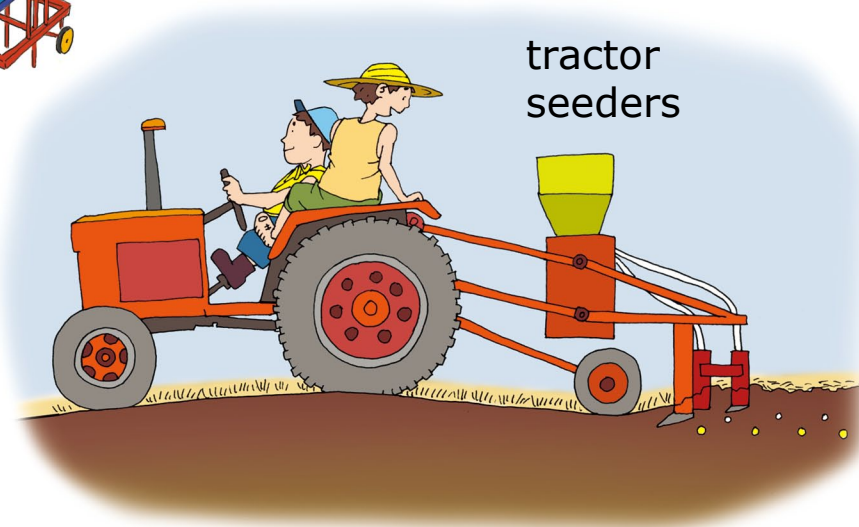
How do you seed
if you don't plow?
Wouldn't the
ground be too
hard to sow?



Walking
tractor
seeders

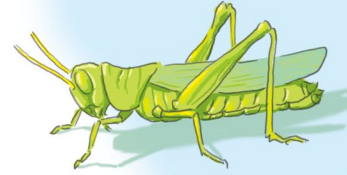
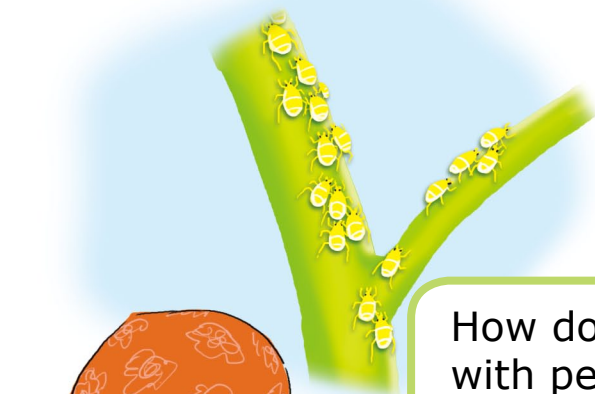


tractor
seeders



You can use no-till
seeders like these.
Over time, mulching
makes the soil soft to
work with.





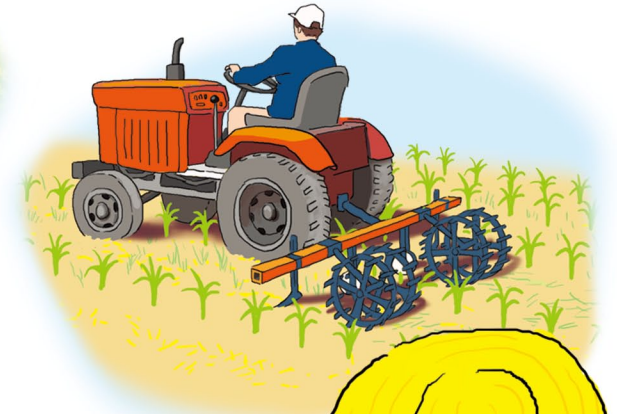
How do you deal with pests and diseases, with all the straw on the ground?



I spray pesticide. But best to use integrated pest management measures.



How do you control weeds if you don't plow?



You can weed by hand, herbicide or machine. You should control weeds before they set seed, so weeds become less of a problem over time.



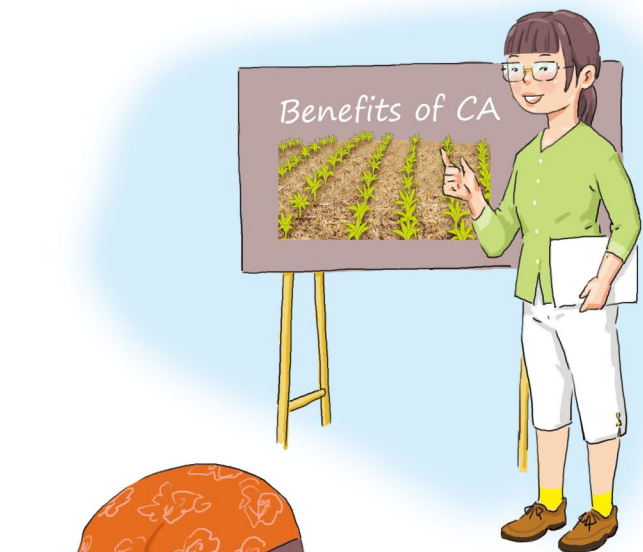
I hear conservation agriculture could increase manual labor input. But you said it reduced labor input. How?



I used to do four operations. Now I do only two. Big savings!







Hmmm... It is best to talk to our extension officer, Ms. Jiang Ying.



Li Long, how does government support conservation agriculture?



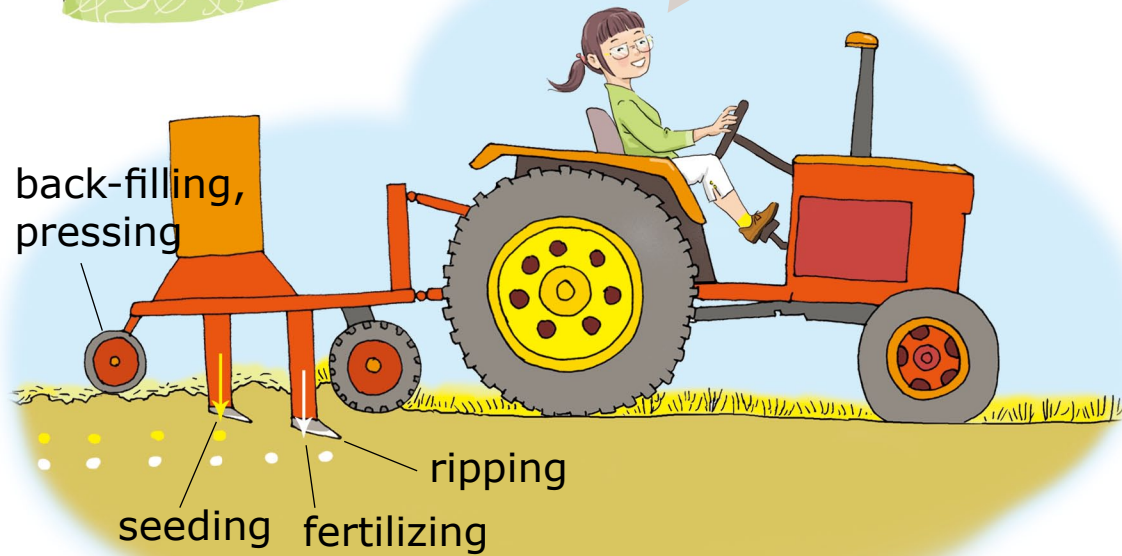
Pleased to meet you. Now, China has 6 million ha under conservation agriculture. Our government has supported it in 4 ways

1. Demonstration in areas with potential to scale up
2. Incentives to the private sector for manufacturing affordable machinery
3. Subsidy on CA machinery
4. Research and training



Can you explain more about machinery?

First look at this seeder, specially designed for no-till. It does everything in one operation. It has also anti-blocking, stubble breaking, and depth control functions.



This tractor mounted chisel ripper opens shallow planting furrows.



This is a combine harvester with residue chopper. It spreads straw evenly on the fields as it harvests.



It seems that the scaling up of conservation agriculture in China benefited a lot from innovative mechanization, right?

Right. Innovation in agricultural mechanization has helped a lot.

Indeed, it is a key for me to switch to this new farming practice.

CA machine-
new arrival

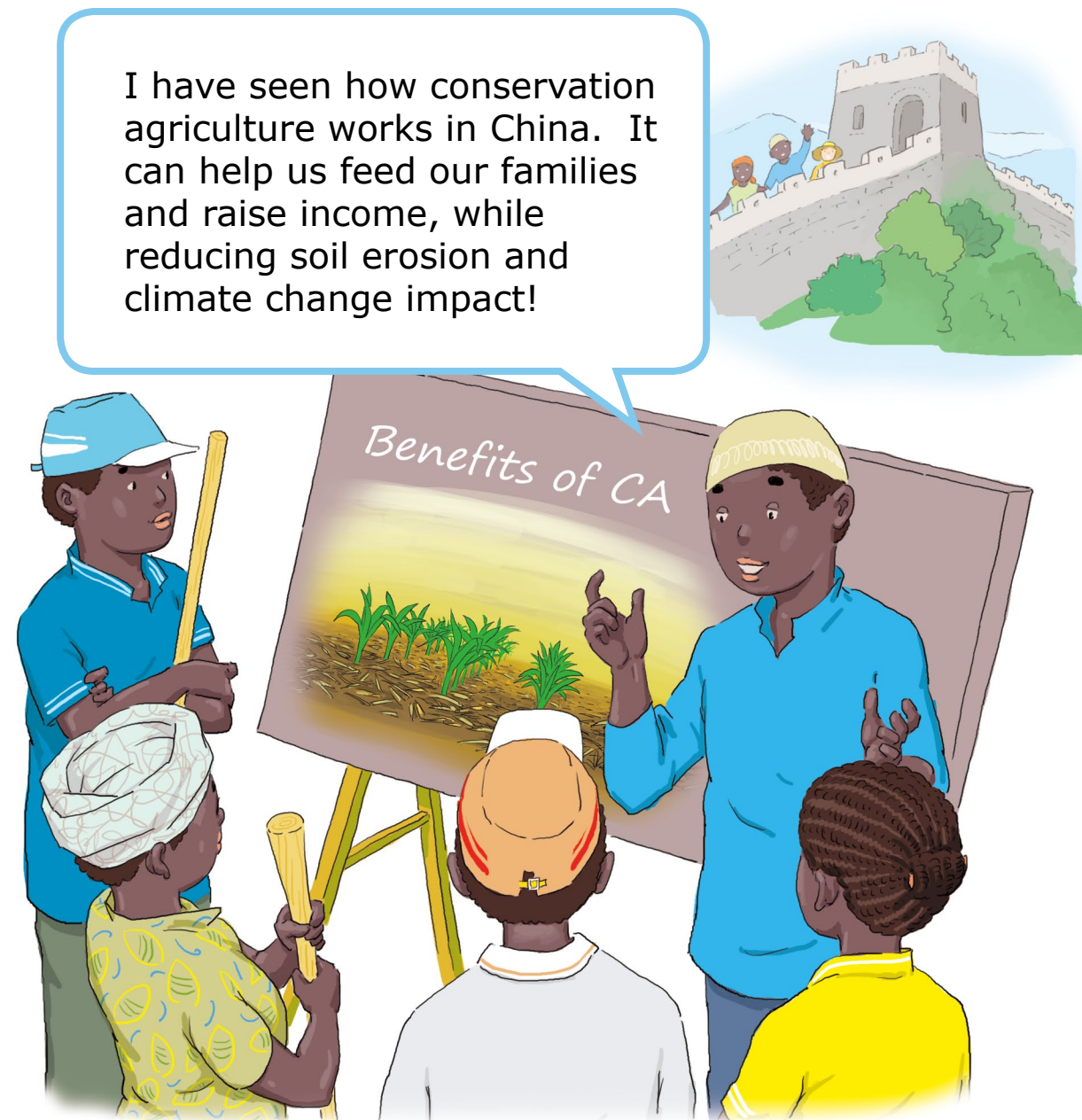
Soil moisture
is a constraint

Farmers burn
residues

Where does conservation
agriculture work well?

Labor is
short

Here, we found that it works more effectively in regions where 1. Soil moisture is a constraint. 2. Farmers have surplus residues or burn them to clean ground. 3. Labor is short.

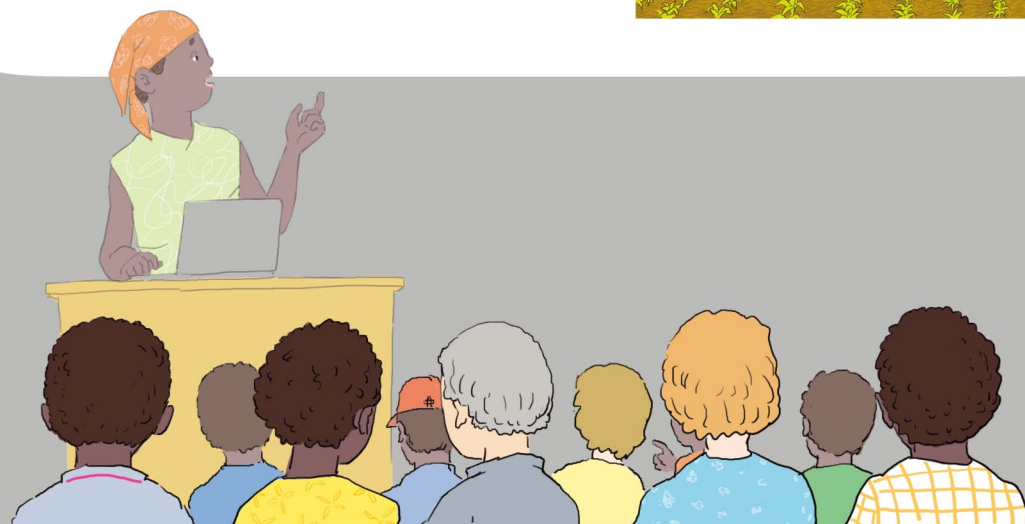


Dear colleagues,

Conservation agriculture can help address issues of productivity, land degradation and climate resilience.

Our government should support extension, farmer learning and agricultural mechanization.

Conservation agriculture pays – I have seen it in China.



Photos relating to conservation agriculture



Photo: LI Hongwen

China – No-till wheat seeder in maize residue field



Photo: LI Hongwen

China – No-till maize seeder in wheat residue field



Photo: LI Hongwen

China – Two row no-till maize seeder



Photo: LI Hongwen

China – No-till direct seeder driven by two-wheel tractor



Photo: LI Hongwen

China – No-till maize seeder with herbicide sprayers

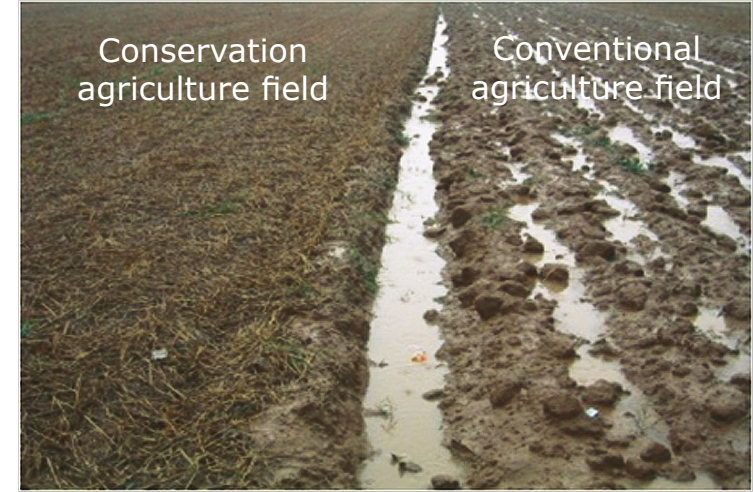


Photo: LI Hongwen

China – After rain, no logging in CA field



Photo: LI Yan

China – Jab planter



Photo: LI Yan

China – Li Seeder



Photo: LI Hongwen

China – Comparison of crop growth



Photo: LI Hongwen

China – No-till maize field after the first crop (left).
Second maize crop in the same field (right)



Photo: Peter Kuria

Kenya – Maize intercropping
with dolichos lablab



Photo: Peter Kuria

Kenya – Pigeon pea
after the maize harvest



Photo: LI Hongwen

China – No-till sowed wheat
in the maize residue field



Photo: XIE Mei

Zambia – Faidherbia trees
in maize field (GART)



Photo: Patrice Djamien

Burkina Faso – Millet
intercropping with cowpea

Dr. LI Hongwen is Professor of Agriculture and Changjiang Scholar at China Agricultural University. He is the Head of the Conservation Tillage Research Center at the Ministry of Agriculture, and Chairman of the Agricultural Mechanization Committee of the China Society of Agricultural Engineering. He has over 20 years of research experience in conservation agriculture. He has published over 180 papers, received 70 patents, and won three times second prize of the National Award for Technical Advancement for his work on conservation tillage. Email: lhwen@cau.edu.cn

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This wonderful booklet offers hands-on, practical advice for farmers and extension workers interested in using conservation agriculture techniques to boost crop yields, soil quality and water retention. These practices represent some of the many ways we can become more 'climate smart', which is essential if we are to sustainably produce more food on less land to feed our growing planet.

–Juergen Voegelé, Senior Director, Agriculture
Global Practices, World Bank

Conservation Agriculture: a modern farming practice with ancient Chinese philosophy.

– Ke Bingsheng, President,
China Agricultural University

Smart use of land resources can turn agriculture around from being part of the problem to being part of the climate change solution.

– Saidi Mkomwa, Executive Secretary,
African Conservation Tillage Network

Sharing of experience between practitioners through South-South exchanges is an effective way to learn from mistakes of the past and scale up successes to meet climate change challenges.

– Neeraj Prasad, Manager,
Climate Change Knowledge, World Bank



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