1994 -1996

ON-STATION WORK IN NIGER ON THE DEVELOPMENT OF THE MICRODOSING TECHNOLOGY

The concept of microdosing was born and on-station trials to develop the technology started in Niger

**Partners:** ICRISAT-Niger, University of Hohenheim, International Fertilizer Development Center (IFDC) and the Institut National de la Recherche Agronomique du Niger (INRAN)

- Encouraging results obtained on-station
- Led to participative on-farm trials and demonstrations for over 10 years
- Farmers appreciate the value of soil fertility restoration for crop yield improvement

**More Reading:**
Research briefs
http://www.icrisat.org/what-we-do/agro-ecosystems/aes-ro-microdosing.htm

The story of Fertilizer Microdosing in Africa

ICRISAT scientists developed the microdosing technique. This story covers the wide variety of initiatives and organizations ICRISAT worked with to further test and implement the technology across Africa.
1996-1999

THE FAO PROJET INTRANTS
WORK BEGAN IN 1996 IN ANIGER

Testing of microdosing technology was moved on-farm for the first time. This was through the FAO Projet Intrant.

Funded by: Belgium Cooperation Agency (DGCD)

Partners: FAO Project Intrants, INRAN, Aquaculture et Development (AQUADEV), Programme Cadre de Lutte Contre la Pauvreté (PCLCP), Programme Spécial de Sécurité Alimentaire (PSSA) at early stages of dissemination with backstopping from ICRISAT.

• NGOs started over 300 producer groups and/or credit co-ops to provide warrantage
• Overall impact – Over 15,000 households using microdosing-warrantage system across the Sahel crop yield improvement

More Reading:
FAO and ICRISAT: A Vital Partnership

1999 to date

WARRANTAGE SYSTEM STARTED IN NIGER IN 1999 THROUGH FAO PROJET INTRANTS

Warrantage system: started in Niger in 1999 through FAO Projet Intrants

Funded by: FAO within the Ministry of Agriculture in Niger

The Warrantage system is based on the establishment of farmer-based cooperatives or producers’ associations and village savings-credit associations which provide farmer’s access to microcredit.

• It allows farmers and producer organizations to mortgage their cereals at harvest time to secure a loan in order to carry out their income-generating activities during the off-season, without selling their grains at lower prices
• Cereal grains and grains of other crops are kept securely in a clean store
• Development and implementation of the Warrantage system continues to date
• Designed and initiated the establishment of a network of input shops and inventory credit schemes to increase farmers’ access to fertilizers at affordable prices
• Improved the financial liquidity of farmers
• Improved farmers’ income from the sales of their produce at the end of the dry season and by their engagement in a range of income-generating activities during off-seasons
• Fertilizer use in Karabedji, Niger, rose from 350 kg in 1998 to 3600 kg in 2000 due to the warrantage system
• Though 2000 was a drought year, microdosing enabled farmers to obtain reasonably good yields and make a profit, while the crops of neighboring farmers using traditional methods failed

More Reading:
Research briefs
2002 - 2004
SCALING OUT IN BURKINA FASO, NIGER AND MALI

Scaling out in Burkina Faso, Niger and Mali

Funded by: United States Agency for International Development (USAID)

Partners: ICRISAT, Burkina Faso; Institut de l’Environnement et de Recherche Agricoles du Burkina Faso (INERA), Association pour le Développement de la Région de Kaya (ADRK), Fédération Nationale des groupements Naam (FNNG), Hunger Project, Mali; Institut d’Economie Rurale (IER), Association pour le Développement des activités de Production et de Formation (ADAF/Galle), Sasakawa Global 2000 (SG 2000), Winrock International and ICRISAT

• Yields of sorghum and millet increased by 44 to 120%
• Income of farmers increased by 52 to 131% through microdosing and warrantage system
• 12,650 farm households benefited in the three countries

More Reading:
Research briefs
Global Theme on Agroecosystems

2003 - 2006
CONSERVATION AGRICULTURE AND MICRODOSING IN ZIMBABWE. FAO SCALING UP

Conservation agriculture and microdosing in Zimbabwe

Funded by: Department for International Development (DFID), UK

• 160,000 resource poor households received at least 25 kg of nitrogen fertilizer and a simple flyer in vernacular explaining how to apply the fertilizer to a cereal crop
• ICREAT linked with the Zimbabwe Fertiliser Company (ZFC), from which 12 trade stores received small fertilizer packs (or mini packs) to sell to farmers

More Reading:
Conservation agriculture and micro-dosing in Zimbabwe

Zimbabwe 2003
Training, extension and promotion facilitated under a consortium of donors, working with nine international NGOs and a number of local NGOs

Zimbabwe 2003-2004
Wide scale testing of the microdosing (17 kg Nitrogen ha-1) concept initiated across multiple locations in southern Zimbabwe through relief and recovery programs

More Reading:
Micro-dosing as a pathway to Africa’s Green Revolution: evidence from broad-scale on-farm trials

Zimbabwe 2003-2006
FAO also funded another scaling up effort in Niger from 2003-2006. This was in partnership with several NGOs and the International Center for Tropical Agriculture / Tropical Soil Biology Fertility (CIAT/TSBF), within the decision support system project of ICREAT
2004 - 2005

ON-FARM TRIALS ESTABLISHED ACROSS ZIMBABWE – RESULTS COMPARED WITH/WITHOUT FERTILIZER

2004 - 2009
Scaling out of microdosing and warrantage in Burkina Faso and Ghana – funded by CPWF, CORAF/WECARD and AfDB

Undertaken within the CGIAR Challenge Program on Water and Food (CPWF), which is now part of the CGIAR Research Program on Water Land and Ecosystems

- Microdosing technology increased the efficiency of nitrogen-use by 50%

More Reading:
The West and Central Africa Semi-Arid Tropics (WCA-SAT)
http://www.icrisat.org/icrisat-rrp2-nutrientuse-wca.htm

Scaling out of microdosing and Warrantage through Conseil Ouest et Centre Africain pour la Recherche et le Développement Agricoles / West and Central African Council for Agricultural Research and Development (CORAF/WECARD) Funded by: African Development Bank (AfDB) in Abo scaled out further in Mali, Niger, Senegal and Burkina Faso.

2005 - 2006

30-50% GRAIN YIELD INCREASES IN NIGER AREAS WITH WIDESPREAD ADOPTION OF MICRODOSING

Niger

- 26% of farmers practiced microdosing in 4 regions.
- 36% purchased fertilizers from input shops
- Value Cost Ratio (VCR) was 3.4 due to the use of microdosing
- 11% yield gains due to input shops
- 27% yield gains due to microdosing
- 30-50% grain yield increases in areas with widespread adoption of microdosing
- Over 170,000 households increased cereal production levels by an estimated 40,000 tons
- Significant improvement in household food security
2006

PARTNERS ARE KEY - IMPACTS IN MALAWI, ZIMBABWE AND SOUTH AFRICA

PARTNERS ARE KEY - IMPACTS IN MALAWI, ZIMBABWE AND SOUTH AFRICA

Funded by: International Development Research Centre (IDRC), Canada
1. Partners foster fertilizer use-Multi-institution partnerships are a key element of ICRI SAT’s R&D strategy.
   • 200,000 families in Malawi and Zimbabwe significantly improve incomes and food security

More Reading:
Increasing crop production in sub-Saharan Africa

Funded by: International Development Research Centre (IDRC), Canada
• Small fertilizer packs became available and began to be used by farmers as these were more affordable by poor farmers
• Public-private-farmer partnerships for fertilizer availability and access became highly successful in South Africa
• Such partnerships were partly successful in Zimbabwe in terms of availability of small fertilizer packs

2009 - 2013

ON-FARM TRIALS ESTABLISHED ACROSS ZIMBABWE – RESULTS COMPARED WITH / WITHOUT FERTILIZER

Scaling out of microdose & warrantage through the Alliance for a Green Revolution in Africa (AGRA)-funded microdosing project in Niger, Burkina Faso and Mali
• Mainstreaming fertilizer microdosing in the three countries
• Increasing food production
• Enhancing the capacity of smallholder farmers

1-4 December 2009: Launch workshop of the AGRA Project on Backstopping and coordinating the fertilizer microdosing and inventory credit system
• 50 participants from Burkina Faso, Ghana, Kenya, Mali, and Niger attended

29 November-3 December 2010: AGRA Microdosing Project conducts technical report writing workshop at Niamey, Niger
• 12 participants from Burkina Faso, Mali and Niger attended

More Reading:
AGRA holds Technical Report Writing training at ICRI SAT-WCA
http://www.icrisat.org/newsroom/latest-news/happenings/happenings1444.html#5

6 - 7 October 2010: Field Day at Niamey on the theme “Agricultural research results for better food security in Niger” (soil fertility and microdosing)

More Reading:
ICRISAT’s New Strategy Expounded at Agro-Biodiversity Symposium
http://www.icrisat.org/newsroom/latest-news/happenings/happenings1436.htm#3

More Reading:
Increasing the Impacts from Soil Fertility Research in Southern Africa
http://oar.icrisat.org/428/1/CO_200806.pdf
2011 - 2013

A 50-200% YIELD INCREASE IN SORGHUM AND MAIZE WITH MICRODOSING

Zimbabwe impacts
- A 50-200% yield increase in sorghum and maize with microdosing
- Microdosing improved food security in Zimbabwe
- Research data collected from eight districts suggests a return on investment in microdosing of over 40%
- But microdosing must be linked to extension support

More Reading:
Small fertilizer amounts boost crop yields
http://www.southerneye.co.zw/2014/04/13/small-fertiliser-amounts-boost-crop-yields/

Impact assessment study of 2011-2012 season in Zimbabwe:
- ICRI SAT investment of US$1 = US$ 5 return to farmers in Zimbabwe
- 2011-2012: Maize yields double – from 424 kg to 963 kg for those using microdosing
- Increased food security for women farmers in the Sahel

More Reading:
ICRISAT HAPPENINGS
http://www.icrisat.org/newsroom/latest-news/happenings/happenings1580.htm

Overall assessment findings from West and Central Africa (WCA) and Southern Africa
- Investment in microdosing has unlocked the power of chemical fertilizers in low-rainfall areas
- Sustaining and expanding the benefits of microdosing will also require efforts to extend microdosing training to under-served areas
- Extension personnel require further training to serve in these areas

Science-based and sustainable solutions to the drought and famine in the Horn of Africa
Excerpts from the ICRISAT Media Factsheet, August 2011:

More Reading:
ICRISAT HAPPENINGS
http://www.icrisat.org/newsroom/latest-news/happenings/happenings1479.htm
Hunger in Niger could have been prevented, scientists say
Scaling out and improvement effort of the microdosing technology through International Development Research Centre (IDRC) and Agricultural Cooperative Development International (ACDI) project on microdosing and water harvesting in Niger, Burkina Faso, Mali, and Benin

More Reading:
Hunger in Niger Could Have Been prevented, Scientists Say
http://www.icrisat.org/newsroom/latest-news/one-pager/afrika-hunger/afrika-hu
ger-crisis.htm

2012: RA targets 360,000 households to be aided with the microdosing technology – well on its way to achievement
December 2012: Governor's Keynote Address on ICRISAT's 40th Anniversary celebrations in Zimbabwe – ICRISAT's work and achievements in Zimbabwe, including microdosing, commended

More Reading:
Plant genetic conservation in the fight against hunger and poverty Olympic medalist commends ICRISAT's crop germplasm conservation initiatives
http://www.icrisat.org/newsroom/latest-news/happenings/happenings1552.htm
PARTICIPATORY TESTING OF TECHNOLOGIES FOR REDUCED RISK (E.G. MICRODOSING, SEED PRIMING)

Participatory testing of technologies for reduced risk (e.g. microdosing, seed priming), increased profitability and stability (e.g., soil and water conservation, forecast based decisions) and enhanced soil quality (e.g., conservation agriculture, agroforestry)

Funded by CGIAR’s Climate Change, Agriculture and Food Security (CCAFS) Program

Partners: ICRISAT | Kenya Agricultural Research Institute (KARI) | Ethiopian Institute of Agricultural Research (EIAR)

- Microdosing technology disseminated in Kenya and Ethiopia
- Improved soil and water conservation practices propagated to guard against dry spells
- Locally relevant conservation agriculture practices taught to farmers

For more information on other CCAFS interventions that have a microdosing component:

- Simulation analysis of factors affecting sorghum yield at selected sites in Eastern and Southern Africa, with emphasis on increasing temperatures

More Reading: https://ccafs.cgiar.org/publications/simulation-analysis-factors-affecting-sorghum-yield-selected-sites-eastern-and-southern#

- Does conservation agriculture work for smallholder farmers in Africa? New report highlights key points for action.

More Reading: https://ccafs.cgiar.org/research-highlight/does-conservation-agriculture-work-smallholder-farmers-africa-new-report#

- Small affordable fertilizer packages could increase yields in a risky business

More Reading: https://ccafs.cgiar.org/blog/small-affordable-fertilizer-packages-could-increase-yields-risky-business#
ONGOING

ICRISAT continues to work on microdosing technology to help improve it - through the Harnessing Opportunities for Productivity Enhancement (HOPE) project and others.

For more on mini packs and their relevance to small holder farmers & More Reading:
  - For more information on Microdosing and the HOPE project:
  ICRISAT-HOPE holds farmers' field days in Kenya
  http://www.icrisat.org/newsroom/latest-news/happenings/happenings1530.htm#top

Lessons learned:
- Microdosing has the potential for broad-scale impact on food security for a large section of the poor
  More Reading:

ECOAGRICULTURIST
https://ecogastronomist.wordpress.com/2014/05/08/microdosing-cutting-waste-and-putting-nutrients-exactly-where-they-are-needed/#comments
- Multi-million dollar savings through reduced food aid to African countries
- Extensive crop modeling data indicates gains can be sustained in southern Zimbabwe for many years
- Importantly, microdosing has encouraged farmers to experiment with alternative improvements in crop management
- This simple technology is renewing farmers' interest in exploring new options for technological change.

More Reading:

Selected publications

More Reading:
http://oar.icrisat.org/6800/

More Reading:
http://link.springer.com/chapter/10.1007%2F978-1-4020-5760-1_18#page-1

More Reading:

More Reading: