IMPROVING WATER USE IN AGRICULTURE pdf

1: Improving water use efficiency for rainfed agriculture by Wei Qin on Prezi

The core problem that water-saving agricultural research has to solve is how to raise the water utilization rate and water use efficiency that is to achieve a high yield on irrigated farmland with the minimum input of water and in rain-fed agriculture to maximize rainfall use efficiency.

Members of the Farming First coalition believe that: Water is a precious resource so improving its use is essential. Adopting proven sustainable agricultural practices reduces water use per bushel. Research, innovation, and access to improved technologies, seeds, and improved irrigation techniques are essential to increasing the efficiency of water use. Agriculture needs to be part of watershed management. Therefore, farmers must be involved in making crops more resistant to stress and cropping techniques more water efficient. To support them, we must create sound and reliable incentives, share knowledge and we must make adequate tools and technologies accessible to deliver both food and water security. There are things that can be done to help farmers reduce water use. Today 50, fewer gallons of water are needed to grow an acre of corn in the U. It is one step but much more progress is needed. The Farming First coalition advocates a six-point action plan for enhancing sustainable development through agriculture. In line with these six principles, we encourage stakeholders to pursue policies that achieve long-term global sustainability goals through proven techniques, including specific actions in the area of water use and management: Retain soil moisture, build up soil organic matter and prevent erosion by applying techniques such as conservation tillage, nutrient management and the use of reclamation varieties [3]. Share knowledge Create international programmes to share best practices for the adoption by farmers of existing water-efficient technologies by making them more affordable, accessible and efficient in use. Use Integrated Crop Management ICM best practices notably by deploying the right nutrient and other inputs, at the right rate, right time and in the right place to improve nutrient uptake and prevent nitrogen and phosphate runoff or leakage to waterways [5]. Use best practices in livestock management to protect watersheds. Encourage improved cropping systems e. Build local access and capacity Invest in infrastructure-building of appropriate, efficient irrigations and fertigation systems. Repairing the worst leaks in irrigation channels or investing in low-volume and low-pressure micro irrigation such as drip and micro-sprayers will bring huge savings. Modest water storage can hugely improve yields in rain-fed agriculture. Pumping water into natural aquifers is much cheaper than building dams, as it prevents waste of water through evaporation. Flooding rice paddy fields only part of the time cuts water consumption. Satellite technology can be used to make water use more efficient. Enhancing capabilities to recycle or treat wastewater for use in irrigating some crops. Secure access to land and water resources, especially for women farmers. Provide risk management tools to support farmers in managing weather and market variations. Protect harvests Reduce water use by minimising pre- and post-harvest losses. Support efforts to enhance food quality and safety and to reduce waste along the food chain through to end-consumers. Improve safety testing for food-handling and processing equipment, as well as storage techniques, conservation-chain systems cold chain, dehydration, drying and transportation infrastructure. Enable access to markets Build infrastructure that allows product to be stored safely and moved to market efficiently to reduce waste. Develop climate information services and early warning systems, as well as best possible estimates of weather and climate impacts on crop or forage production, at a temporal and spatial scale useful for vulnerable rural communities. Promote partnerships between farmers and scientists to develop adequate and fit-for-use technologies as well as land and water management tools where they are most needed. Improve the capacity of a broad range of crops to grow in harsher climates, developing locally-adapted drought-tolerant, salinity-tolerant, and heat-tolerant varieties. Download the Farming First water paper here Posted on:

2: Water - Farming First

Agriculture is a major user of ground and surface water in the United States, accounting for approximately 80 percent of the Nation's consumptive water use and over 90 percent in many Western States.

To address these concerns, water use efficiency must be enhanced through various holistic and integrated approaches. Water for irrigation has now become now a major limiting factor in rice production. The irrigated area has been expanding, while at the same time there has been a growing demand for water for industrial and residential uses. This decrease in the supply of available water has sharpened concerns over the allocation and optimum use of available water. There is a need to enhance the efficiency of water use, through various approaches such as water-saving technologies and improved cropping systems. Aside from technological advances, innovative participatory approaches are needed in irrigation management to provide support at the community level. There is also a need to consider policy issues related to the valuation of water resources. This Workshop aimed at drawing on the experience of a range of Asian countries in water resource use efficiency as applied to irrigated rice-based diversified cropping systems. Water Use Efficiency in Asia: Status, Problems, and Directions The development of irrigation in Southeast Asia can be divided into four phases: Irrigation efficiency is measured by the amount of water used by the crop, divided by the amount of water diverted. From the early s to the end of the s, the irrigated area doubled in size. The issues shaping the development of agriculture today are: The need to produce more food and other agricultural products with less water is becoming a global concern. As the era of globalization unfolds, major changes in technologies and policies will occur. Some areas will experience a shortage of water, while others may face the problem of draining away excess water. The challenge ahead lies in developing institutions that can integrate management of ground and surface water irrigation; integrate management of irrigation at a farm, system, and basin level; allocate water equitably among competing uses and users, including environmental services; and address the problems of irrigation development, including the impact of using wastewater on the environment and human health. Promoting Irrigation Efficiency Different Asian countries are carrying out a range of programs to improve their use of irrigation water. Below is a selection of successful projects now in operation. Korea In Korea, fertigation is practiced as a method of enhancing the efficiency of water use and fertilizer application. Irrigation efficiency through fertigation is measured using hardware and software management tools. The recently developed Korean auto-irrigation system covers a number of plots, and can irrigate several plots at the same time. It uses an electronic tensiometer to measure the level of soil moisture, and an electric flow meter as a watering gauge. This system provides accurate and uniform applications of water and fertilizer at a low labor cost. Japan Japan taps its biggest river in Kyushu island, the Chikugo river, for irrigating diversified cropping systems through water re-use and recycling. Farmers practice the Ao-intake method as a means of maximizing the amount of stored water. During high tide, water pours in through the intake gate. Use of available water is maximized by a massive system of pipelines and pumps, as well as open canals. The main pipeline and pump systems are managed by the Japan Water Agency. Newly organized Land Improvement Districts and the Local Government Units manage the operation of creeks, lateral canals and drainage systems. Coupled with these developments is the transformation from rice-based farming to multiple cropping. The area planted in soybean and wheat is expanding, in contrast with the area planted in rice. The focus is on the establishment and capability development of Irrigators Associations IAs. Improvements in the performance of irrigation systems can be attributed, not only to improved infrastructure and facilities, but also to the involvement of farmer-beneficiaries, from project planning to operation and maintenance of irrigation facilities. A common practice now in the Philippines is the pressurized irrigation system PIS , which uses drip and sprinkler systems. More than 21, hectares are now irrigated in this way, mainly in Mindanao, much of which is planted in high-value crops such as banana and mango. PIS reduces non-beneficial evaporation, applies water uniformly to crops, reduces stress in plants, and helps increase the economic productivity of water. PIS is appropriate in high-value production and other intensive cultivation. Irrigation systems for rice paddies depend party on the scale of production. Paddy farms in Taiwan, Korea, and Japan are fairly small. However, irrigation and drainage practices are sophisticated, and considerable labor is needed to control the gate operations. This becomes economically inefficient when labor costs are high. Rather than independent management of irrigation water by farmers, the focus now is on rotational block irrigation, with ditches to recycle the overflow. This system helps reduce labor costs, and promotes the use of mechanization. An important concept is deep-water irrigation cultivation technique. This means providing the rice crop with surplus irrigation water when precipitation is plentiful. With this practice, fewer irrigations are needed and irrigation efficiency is improved. The water depth is increased gradually to 25 cm in keeping with the growth of the crop. The paddy field becomes a natural reservoir which helps to recharge groundwater and continuously return water to the system. This involved selecting a pilot site, and assessing the needs and opportunities. A public seminar was then held to discuss water-saving technologies, and appropriate technology was selected. Demonstration farms were set up, where two years of validation was carried out. This included regular collection and analysis of data, not only about the soils and crops, but also the economic returns and other socio-economic aspects. Regular discussion took place with farmers, and the technology was adapted according to feedback from farmers. Regular field days were held for farmers, to teach them about the technology. Finally, the technology was applied on a larger scale, and extension materials were developed. The study area was in Central Luzon, among farmers who were using shallow tube wells as well as deep well systems. Among the water-saving technologies that were introduced to the area were controlled irrigation, in which standing water does not remain in fields continuously. Instead, fields alternate between submerged and non-submerged conditions. Research on controlled irrigation showed that it has good potential for reducing water needs. Yields can remain high without continuous flooding. There was no significant reduction in rice yield. Farmers in this area organized themselves through the assistance of the local office of the National Irrigation Administration. A continuous education program made members conversant with the operations and management of the irrigation service. Farmers were able to adopt new technologies and increase their productivity. All members were given access to postharvest facilities. A core project was the rehabilitation of old irrigation facilities. A participatory approach was followed. Farmers were given training, and were involved in the project from planning and conceptualizing programs and projects, up to implementation. To increase production income and maximize land use, farmers are practicing crop diversification rice-watermelon. One policy of the irrigation association was that no water was supplied to farmers who did not have an official irrigation service fee receipt. Problems and Recommendations The problems identified during the presentations and discussions can be categorized into technical, economic, institutional, social and political, and environmental. Some technologies that have been developed are not acceptable under local conditions. This is because of several factors, including a lack of funds for large infrastructure projects, a lack of technical skills to automate irrigation systems, and lack of adequate rainfall as one source of irrigation water. In developed countries, where funding is less of a problem, the issues related to the costs and benefits of large infrastructure projects are still under discussion. When governments make a large capital investment, there may be less concern to assess its cost effectiveness. Common among developing countries with small farms is the problem of collecting irrigation service fees. Most, if not all, experience a low rate of payment of fees. This low rate of collection leads to another problem, of poor infrastructure and irrigation facilities due to lack of funds. This in turn reduces the productivity of farms. The impact of intensive agriculture on the environment was another concern for almost all countries represented at the workshop. The growing public awareness of the deteriorating water quality and widespread water pollution makes it imperative to develop a more holistic approach to water resources management. Conclusion It seems that the key success factors in irrigation management are related and intertwined. The absence or weakness of one factor leads to the inability of the whole system to perform at its best. Among these factors are: Where there is an integrated, holistic approach to irrigation management, the impacts are positive. Water use efficiency involves a wide range of factors such as farm size, soil conditions, cropping patterns, agronomic crops, as well as the interplay of socio-political and economic aspects of allocation, management, and utilization of water.

3: Water, Food, and Agriculture - Pacific Institute

IMPROVING WATER USE EFFICIENCY FOR A SUSTAINABLE PRODUCTIVITY OF AGRICULTURAL SYSTEMS IN LEBANON F. Karam, L. Geagea** and M. Saadeh*** *Department of Irrigation and Agro-Meteorology, Lebanese Agricultural Research Institute.*

The buildup of these gases may alter global temperatures, the worldwide distribution of precipitation, and the quantity and quality of our water resourcesâ€”all of which impact the productivity of our crop land, range land, and forest land. Yet, agriculture is not only impacted by environmental change, it is also a cause of that change. A recent EPA report shows, for example, that agriculture contributed an estimated 26 percent to the increase in atmospheric gases in the s; agriculture accounted for 13 of the 18 percent increase in atmospheric methane. Though we know agriculture is contributing to the increase in atmospheric gases, our understanding of the links between agriculture and climate variability is still limited. Understanding how agriculture affects and is affected by environmental change requires improved understanding of basic hydrologic processes and improved water supply forecasting techniques. We also need to develop improved fundamental process models that link appropriate hydrologic processes to relative factors in environmental change. We need improved predictions of future water supplies. We need to improve the accuracy of water supply forecast models through new developments in hydrologic process models and new technologies, such as remote sensing, geographic information sys- Page Share Cite Suggested Citation: Improvements in Agricultural Water Management. The National Academies Press. We have some of the pieces of this puzzle, but we need to start using forecasting models in agriculture. Atmospheric science has made great progress in the last 25 years in understanding atmospheric conditions and developing an improved capability to make predictions for very short time periods. But we need to improve our predictions of precipitation, temperature, and evaporation for a month or more in advance. Existing meteorological information could be used more often to provide statistical probabilities that certain events will occurâ€”for example, to provide the probable beginning and duration of rainy seasons or the statistical likelihood that a drought will continue for a specific period. Such knowledge is useful in planning the introduction of drought-resistant cultivars, selecting the crop to be produced, introducing new crop rotation systems, and selecting improved agricultural practices. We also need to improve predictions of interannual or decadal variations in temperature, precipitation, and evaporation. Though such predictions have been made, accurate predictions of the onset, duration, cessation, or likelihood of recurrence of drought for site-specific locations are not available. As carbon dioxide levels go up, yield will more than likely increase. But the likely increase will be counterbalanced if precipitation declines, in which case we could find that production decreases or remains the same. The wise course for dealing with this uncertain future is to increase water use efficiency. More efficient water management technology is evolving at an accelerated pace, but implementing new technologies may require decades and will usually require additional investments in physical and supportive infrastructure. National water policies may in some cases hinder the implementation of new technologies. Dryland Agriculture The key to successful dryland farming is using systems and practices that can take better advantage of favorable years. Retaining precipitation on the land starts with preventing runoff. For example, furrow diking, conservation bench terraces, and precision land leveling have proven effective. We need to increase the use of these methods. For reducing evaporation, the most promising practice is application of a mulch or residue cover. Crop residues are the only practical source of mulching, which makes crop rotations and predictions of precipitation and snow on a monthly or annual bases extremely important. Matching cropping systems with rainfall patternsâ€”essential in dryland farming for ensuring a good probability of producing a harvestable cropâ€”requires predictions of climate variability on an interannual or decadal basis. There is a potential to change our cropping patterns, but it is very difficult to make adjustments if we do not know the direction or magnitude of precipitation change. Irrigated Agriculture Irrigated agriculture consumes 80 percent of our fresh water supply. All irrigation systems could be operated more efficiently to help solve the problem of limited water supplies. Many individuals have the misconception that irrigation efficiency depends only on irrigation system design. However, an important aspect of improving water use efficiency is improving irrigation system management, operation, and maintenance. Automated irrigation scheduling can have a major impact on improving on-farm irrigation efficiency. Excessive seepage of irrigation water from canals constructed in permeable soilâ€"a major cause of high water tables and saline soils in many irrigation areasâ€"can be reduced by lining the canals. Finally, automation of delivery systems can sometimes provide a higher level of water control: Page Share Cite Suggested Citation: The drainage or reclaimed water can be blended or used separately for irrigation or other purposes after it has been fully used for crop production. Whatever the strategy chosen for adapting irrigated agriculture to limited water supplies, the strategy must be matched to the crop, management, and labor conditions. Mixed Range Land and Crop Land The interaction between rand land and crop land is regulated primarily by climate, available irrigation water, and management. Weather modification, water harvesting, snow harvesting, livestock management, water spreading, and other techniques are available for improving water-use efficiency of range and crop plants. However, environmental impacts of altering meteorological parameters such as precipitation have not been determined scientifically, and intensive, well-designed experimentation is still needed to evaluate properly the potential usefulness of weather modification techniques. Many range lands are now invaded by brush and need vegetative modification to control runoff and improve infiltration. Successful brush control, reseeding, reforestation, and other range land improvement actions must be integrated into the total water supply management system. Some economists suggest that a change in the pricing scheme for water is needed so that water will be allocated more efficiently. Others argue that jumping immediately to increased water pricing would ignore the need for an institutional structure that will allow improved decisionmaking with respect to water use. Water policy and law, when properly employed and enforced, become not the single solution to improving water use for increased production but an essential ingredient of efficient and effective management. Many authorities are recommending that greater attention should be focused on improving existing irrigation systems. Sound education and technical assistance programs can reduce the gap between research and actual improved irrigation practices. Some authorities suggest that increased public financial assistance is required before any significant shift toward water conservation and environmental protection can occur. On the other hand, technical assistance, interest-free or low-interest loans, or direct cost sharing can only be provided where benefits to the public sector are documented. Generally, new and improved irrigation systems that integrate automated irrigation water management systems and water measurement need to be developed. Such systems can simplify or reduce the number of management decisions to be made by the water managers and irrigators. The result is improved efficiency of water application, reduced energy use, and environmental protection. Even without environmental changes, agriculture will be faced with the seemingly impossible challenge of providing for twice as many peopleâ€"each person with increasing demandsâ€"as exist now. With a relatively fixed land base and water supply and with diminishing reserves of petroleum and mineral resources, our options for increasing agricultural production are severely limited. No single technology can solve all of the water quantity and quality problems confronting agriculture. However, water conservation technologies, when properly selected and implemented, can improve water use and management of crop land, range land, and forest land. Improvements in water management are required at all levels of water use. These management improvements will require bold changes in institutions and organizations, water policy and law, farming systems, education and training programs, and research and development. We must all recognize the critical role of water resources in human life. Improvements in agricultural water management are required both to cope with environmental change and to ensure environmental protection.

4: Growing more food with less water - Improving water usage in agriculture - The Crop Site

A concerted focus on improving water use efficiency in agriculture will increase the productivity of both rain fed and irrigated agriculture. The prize is that more areas of the world, and especially those arid and semi-arid areas where population growth is greatest, will be able to sustain their future populations.

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5: Water use in agriculture - OECD

Improvements in agricultural water use can be achieved at several points along the production chain, such as (1) the irrigation system (2) the proportion of water attributed to plants use, and (3) the conversion of crop water consumption into yield (Hsiao et al.).

6: Improving Water Use Efficiency in Asian Agriculture

Analysis of equations relating crop growth and water use shows that there are three ways in which the 'water use efficiency' of dry matter production can be increased.

7: USDA ERS - Irrigation & Water Use

2. Water use in agriculture. Some figures at different scales illustrate the amount of water used in agriculture. Globally, some Ã—10 3 km 3 of water were used in agriculture in ().

8: To Combat Scarcity, Increase Water-Use Efficiency in Agriculture | Worldwatch Institute

1 Optimizing Resource Use Efficiency for Sustainable Intensification of Agriculture Kunming, China, 27 February - 2 March Improving Water Use.

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