

# Condition Changes – How do I measure them?

## What are condition changes?

Condition changes are the long-term benefit of your work to the broader public.



- **The concern.** “How do I measure my impact (condition change) without spending all my time measuring my impact?!” – both a valid question and an understandable concern.

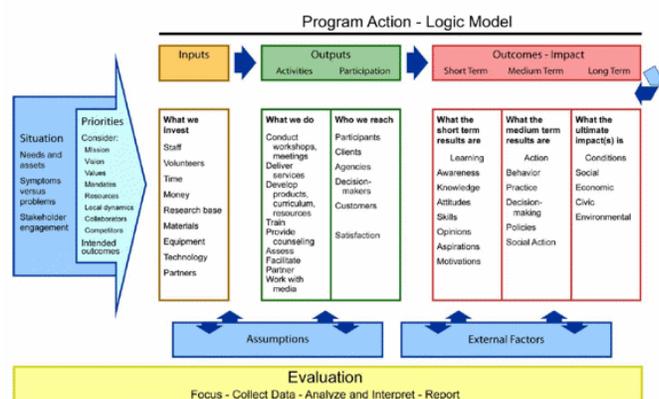
Many of us are overthinking the level of change at which we need to measure. No, we don't actually need to conduct massive longitudinal studies. No, we don't have to measure knowledge change at every meeting or extension event. Change doesn't happen as a result of a single event or product. Behavioral change that leads to condition change is the result of many interactions over time (research, meetings, writings, access to tools; etc.) and reflects the sum of your programmatic activities.

- **But, I only just started the work.** When you are just beginning work, change will come later. You can still explain the potential type and extent of the change your research can lead to. A preconceived idea of what change you and your clientele hope your work to have will help you focus your efforts and direct your program.
- **Also, I'm not responsible for all the change.** We know impact takes time and often involves many other players, so how can we ascribe credit for the change? The key is that you can explain how your efforts contribute to a long-term benefit to the wider public.

## Where do I start?

1. A good place to start is with a **Logic Model**. Consider starting with the end in mind. What story do you want to tell about the difference (outcomes) your programmatic efforts (research and extension) will make? What participant changes are needed (behavioral and knowledge outcomes)? What activities and products (outputs) are needed in order to realize the story?
2. Match your **long-term goals for your program** with the **relevant condition change(s)** (See Appendix).

### PROGRAM DEVELOPMENT Planning – Implementation – Evaluation



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3. Next, what sort of **condition change indicators** are already available for your condition changes? What data can you collect or track (collected by someone else) to support your contribution? You are encouraged to identify these indicators and start tracking early in your career and/or early on a project/program.

# Sustainable Food Systems Example: *Agricultural Production*

## How do I get condition change indicator data?

When you write up your impact include A or B and if possible C.

- A. Condition change data you may collect from your clientele and partners, e.g., \$/acre saved as a result of adopting a recommended practice (primary data collected from your clientele) or nursery or seed sales data (secondary data collected by partners that you can use for program evaluation purposes).
- B. Research (conducted by you or others) that documents ecological or economic benefits of particular crop management practices that you are recommending through your work. Use these research findings as a safe inference for how your work contributes to condition changes. For example, you systematically documented that 10 of your grower clientele adopted primocane-bearing blackberries which UCCE field trials found can produce fruit a year earlier and the [UC cost and return study](#) shows have the potential to increase profits.
- C. Larger scale data from other agencies or organizations that measure condition changes, e.g. [California Department of Food and Agriculture \(CDFA\)](#). For example, CDFA measures increases in CA farm cash receipts, which can be an indicator for increased agricultural efficiency and profitability.

## **IMPACT: Connect your work to condition change indicator data to tell a compelling story about how your program contributes to public value.**

Example adapted from [Katherine Jarvis-Shean](#), Orchard System Advisor, UCCE Yolo County

### **Your contribution**

- Research – Conducted rootstock trials to deal with soil conditions
- Extension – Disseminated information about improved rootstocks through grower meetings and a media interview

### **Behavior change**

- Grower participants adopted improved rootstock

### **Primary ANR condition change**

- Increased agriculture and forestry efficiency and profitability

### **Condition change indicators**

- Nursery sales data (ex. of A above)
- CDFA commodity production data (ex. of C above)

### **Associated ANR public value**

- Promoting economic prosperity in California



## Impact story: Improved almond rootstocks increase production and profitability

### The Issue

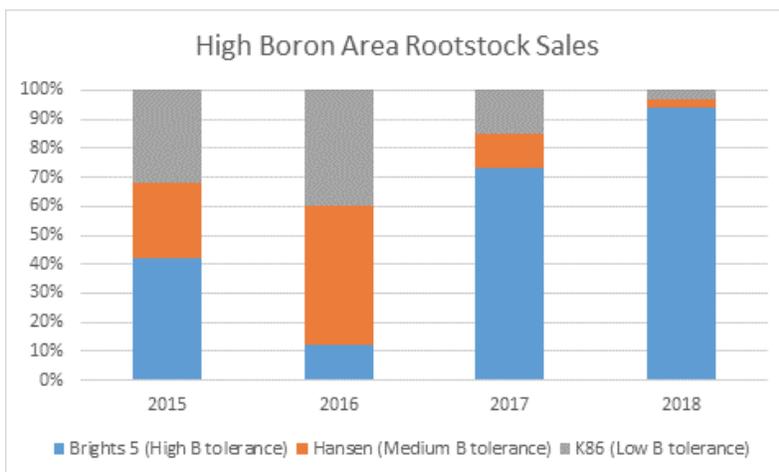
California is the sole producer and exporter (99 percent or more) of the nation's almonds. Almonds rank second or third for top California commodity, depending on the year. In 2017 almonds totaled \$5.8 billion in production value. The state's growers must innovate and adapt to technical, social, and environmental challenges to maintain California's almond production and economic vigor. In particular, in Yolo County where almonds are the lead commodity, high levels of boron adversely affect production.

### How UC Delivers

UCCE Yolo County responded to growers asking how to properly manage this over-supplied, naturally occurring element in soil and water. A rootstock trial was started in 2011 looking for tree rootstocks that can decrease boron toxicity. The research findings identified rootstocks that had high boron tolerance and thus more yield. This information was extended through local meetings, the statewide meeting hosted by the Almond Board of California, and through an interview with an industry news outlet.

### The Impact

Research and extension on almond rootstocks in high boron conditions has led to decreased planting of the least boron tolerant almond rootstock that was previously one of the most planted rootstocks in Yolo County. Sales data provided by two nurseries indicate sales doubled for the rootstock that the trial found to be superior, i.e. has high boron tolerance. The nursery sales data show grower adoption of the improved rootstock and demonstrates economic benefit to the nursery industry. This increased use of improved rootstock contributes to increased agricultural efficiency and profitability; and thus, the public value of promoting economic prosperity in California. In 2017, California had record production of almonds.



# Endemic and Invasive Pests and Diseases Example: *Agricultural Production*

## How do I get condition change indicator data?

When you write up your impact include A or B and if possible C.

A. Condition change data you may collect from your clientele and partners, e.g. # of acres that will be affected or \$/acre saved as a result of recommended practice (primary data collected from your clientele).

B. Research (conducted by you or others) that documents ecological or economic benefits of recommended pest management practices. Use these research findings as a safe inference for how your work contributes to condition changes. You can sometimes use the research to extrapolate. For example, using a cost study: one applied spray costs \$82/acre. Applying one fewer spray on 8,000 acres could result in \$650,000 saved.

C. Larger scale data from other agencies or organizations that measure condition changes, e.g. [California Department of Pesticide Regulation \(CDPR\)](#). For example, CDPR measures decreased use of pesticides, which can be an indicator for increased ecological sustainability of agriculture, landscapes, and forestry.

## **IMPACT: Connect your work to condition change indicator data to tell a compelling story about how your program contributes to public value.**

Example adapted from [Surendra K. Dara](#), Entomology and Biologicals Advisor, UCCE Santa Barbara, San Luis Obispo, and Ventura Counties

### **Your contribution**

- Research – Conducted study in a commercial strawberry field that demonstrates microbial and bioactive amendments improve crop health and fruit yield
- Extension – Informed growers, crop advisors, and pest control advisors about biologicals through Ag Innovations Conference that drew nearly 180 people



### **Intent to change behavior**

- 95.7% (132 of 138) of respondents plan to use information they learned

### **Primary ANR condition change**

- Increased ecological sustainability of agriculture, landscapes, and forestry

### **Condition change indicators**

- # of acres that will be made more sustainable through use of biologicals (ex. of A above)

### **Associated ANR public value**

- Protecting California's natural resources

## **Impact story: Increased understanding of biologicals increases ecological sustainability of agriculture**

### The Issue

The term biologicals in agriculture refers to biocontrol agents such as parasitic wasps and predatory arthropods, microbial and botanical pesticides, biostimulants and other bio-based inputs used for pest management or improving crop health and productivity. The potential of many biologicals is not fully explored mainly because of the stigma that they do not perform well compared to some synthetic inputs. There is a need among growers, crop advisors, and pest control advisors to learn about the basic and applied aspects of biologicals, successful field examples, and associated regulatory aspects, improving the use of biologicals in crop production and protection for more sustainable food production.

### How UC Delivers

UC Cooperative Extension Advisor Surendra Dara organized an Ag Innovations Conference focused exclusively on biologicals. Held in March 2019 in Santa Maria, the biologicals conference and trade show drew nearly 180 people from California, other states, and outside the United States. The conference offered a platform for the farming community, agricultural input industry, and researchers to come together, network, learn about growers' concerns, and discuss the potential of biologicals in promoting sustainable agriculture. Topics presented at the conference included regulatory updates; how to improve soil organic matter and soil microbiome; microbial and botanical biostimulants, their mode of action, and use strategies; biological and microbial studies; and alternative uses for entomopathogenic fungi. The trade show allowed vendors to showcase their products and technologies and meet with the farming community to understand their needs.

### The Impact

Out of the 138 survey responses, 95.7% (132 of 138) plan to use information they learned on nearly 70,000 acres which they farm, manage, and influence. The use of microbial and bioactive amendments has been shown to improve crop health and fruit yield, according to [a recent study](#) conducted by Dara in a commercial strawberry field. In addition, biologicals are more sustainable because they allow for the efficient use of chemical fertilizers and pesticides, reducing groundwater contamination and avoiding resistance problems for pests and diseases, respectively. In this way, UC ANR enhances the ecological sustainability of agriculture, contributing to the public value of protecting California's natural resources.

# Sustainable Natural Ecosystems Example: *Land Management*

## How do I get condition change indicator data?

When you write up your impact include A or B and if possible C.

A. Condition change data you may collect from your clientele or partners, e.g. increase in grazed acreage or acres under management plans (primary data collected from your clientele), or \$ saved, # of native species protected, or % decrease in weeds as a result of managing land (secondary data collected by partners for program evaluation purposes).

B. Research (conducted by you or others) that documents ecological or economic benefits of land management practices that you recommended. Use these research findings to make a safe inference for how your work contributes to condition changes. You may be able to use the research to extrapolate. For example, through your program evaluation you know that five land managers started using grazing as a conservation management strategy, and a [UC ANR 8000 series publication](#) shows that grazing controls non-native vegetation and creates opportunities for native plants and animals, including threatened species, to survive.

C. Larger scale data from other agencies or organizations that measure condition changes, e.g. the [U.S. Bureau of Land Management](#) reports the economic value of grazing on public lands, which is an indicator for improved land management.

## **IMPACT: Connect your work to condition change indicator data to tell a compelling story about how your program contributes to public value.**

Example adapted from [Sheila Barry](#), Livestock and Natural Resources Advisor, UCCE San Francisco Bay Area

### **Your contribution**

- Research – Developed grazing management practices to improve conservation outcomes
- Extension – Informed county decision-makers about the role of livestock grazing and rancher stewardship in managing vegetation and rangeland resources for conservation, and assisted in the development of conservation plans

### **Policy/decision-making change**

- Agencies adopted and implemented conservation plans based on best practices

### **Primary ANR condition change**

- Improved management and use of land

### **Condition change indicators**

- # of acres benefiting from grazing (ex. of A, primary data)
- Cost savings associated with adopting management strategies (ex. of A, secondary data)

### **Associated ANR public value**

- Protecting California's natural resources



## **Impact story: Reintroduction of grazing improves land management**

### The Issue

Over 30 different public agencies in the San Francisco Bay Area manage their lands to meet conservation objectives. These agencies have sought rangeland science expertise to inform their planning efforts to continue to use livestock grazing as a way to improve conservation outcomes while working to sustain rangeland livestock production.

### How UC Delivers

UCCE Advisor, Sheila Barry, conducted research and extension efforts that assisted agencies in understanding the role of livestock grazing and rancher stewardship in managing vegetation and rangeland resources for conservation. Best practices for rangeland management and grazing management informed regional conservation planning efforts.

### The Impact

The Santa Clara Valley Habitat Agency adopted a Habitat Conservation Plan and Alameda County adopted a Conservation Strategy for east Alameda. As a result, grazing has been reintroduced on five properties and 11,000 acres including lands managed by the Mid-Peninsula Open Space District. Additionally, by adopting strategies to reduce impacts from unpaved roads and improve monitoring efficiency, the Santa Clara Valley Habitat Agency reduced its operational budget by \$11 million. Further, the inclusion of rangeland science and a recognition of the value of grazing impacts has led to change in land acquisition policies recognizing conservation easements as an option. Science-informed practices and policies lead to improved land management and conservation of rangelands. In this way UC ANR contributes to the public value of protecting California's natural resources.

# Water Quality Quantity and Security Example: *Water Use*

## How do I get condition change indicator data?

When you write up your impact include A or B and if possible C.

A. Condition change data you may collect from your clientele or partners, e.g. acre/feet of water saved or \$ saved by your program participants (primary data collected from your clientele), or water reductions in a municipal water district (secondary data collected by partners that you can use for program evaluation purposes).

B. Research (conducted by you or others) that documents the benefits of adopting science-based recommended practices. Use these research findings to make a safe inference for how your work contributes to condition changes; you may be able to extrapolate. For example, a project used California Irrigation Management Information System (CIMIS) weather data to inform growers about more efficient water practices. They estimated that participating growers could save \$6.5 million by reducing water and energy use, based on an extrapolation from Parker et al. (California Agriculture journal, 2000) which estimated that growers save approximately \$64.7 million per year by using CIMIS weather station data.

C. Larger scale data from other agencies or organizations that measure condition changes, e.g. a summary by the [Congressional Research Service](#) using data collected by the California Department of Water Resources, USGS, USDA etc. For example, the CRS summary provides measured water-use by region, selected crops, and irrigation types, which can be indicators for improved water-use efficiency.

## **IMPACT: Connect your work to condition change indicator data to tell a compelling story about how your program contributes to public value.**

Example adapted from [Steven Swain](#), Environmental Horticulture Advisor, UCCE Marin County

### **Your contribution**

- Extension – Provided academic oversight over 10-year period to UC Master Gardeners who conducted 1,638 Garden Walks
- Research – Evaluated the extension activities by developing a controlled study to estimate water savings achieved as a result of direct volunteer outreach conducted at people's homes

### **Behavior change**

- Garden Walks participants adopted water conservation practices

### **Primary ANR condition change**

- Improved water-use efficiency

### **Condition Change indicators**

- # of gallons of water saved/year (ex. of A, primary data above)
- % reduction in water use from water district (ex. of A, secondary data above)

### **Associated ANR public value**

- Protecting California's natural resources



## **Impact story: Marin-Friendly Garden Walks program saves water**

### The Issue

California's climate has the largest precipitation and streamflow variability in the contiguous United States and the state is subject to periodic severe droughts. One recurring challenge municipal water agencies face is meeting demand for water in suburban and urban environments in which homeowners use more water on outside landscapes than for inside uses. Agencies and homeowners need to understand the benefits and impacts of water-wise landscaping practices.

### How UC Delivers

In 2008, the UC Master Gardeners in Marin County formed a partnership with the Marin Municipal Water District (MMWD) to create the Marin-Friendly Garden Walks program. The UC Master Gardeners provided direct volunteer outreach at people's homes, sharing information to improve irrigation and other water use practices. From January 2008 to December 2018, the UC Master Gardeners conducted over 1,600 Garden Walks. UC ANR academics developed a controlled study to measure water savings from Garden Walks participants compared with non-participants. They tracked the resulting water savings from homeowners that implemented the suggested practices as a result of these educational walks.

### The Impact

Garden Walks program participants saved over 9,000 gallons of water a year on average when compared to control groups. The total water savings for all participants over the lifetime of the program is 27 million gallons to date. The program has cost less to run over the same ten year time frame than it would cost to simply buy 27 million gallons at the average rate paid by the MMWD residential customers. This impact has resulted in a 5-7% reduction in MMWD clients' water usage. These measured outcomes demonstrate the benefits of informing homeowners about water wise practices. This district and other water districts in California can use this information to increase the adoption of solutions to improve water-use efficiency in suburban and urban areas to reduce demand and maintain a sustainable water supply. In this way UC ANR contributes to the public value of protecting California's natural resources.

# Healthy Families & Communities Example: *Nutrition Education*

## How do I get condition change indicator data?

When you write up your impact include A or B and if possible C.

A. Condition change data you may collect from your clientele and partners, e.g. Body Mass Index or nutrient level changes as a result of participating in an educational intervention. This can be primary data collected from your clientele or secondary data collected by partners that you can use for program evaluation purposes.

B. Research (conducted by you or others) that documents the benefits of adopting the science-based recommended practices. Use these research findings as a safe inference for how your work contributes to condition changes. For example, you systematically documented that 100 of your nutrition education participants self-reported increased consumption of fruits, vegetables, whole grains, and lean proteins and several research studies associate increased consumption of nutritious foods with better health outcomes.

C. Larger scale data from other agencies or organizations that measure condition changes, e.g., [SNAP-Ed County Profiles](#), [Centers for Disease Control and Prevention \(CDC\)](#). For example, SNAP-Ed County Profiles provide county-level percentages of individuals who have an obesity classification and CDC provides state-level percentages of individuals who have an obesity classification across multiple years. Reduced obesity rates are an indicator of improved health.

## **IMPACT: Connect your work to condition change indicator data to tell a compelling story about how your program contributes to public value.**

Example adapted from [Chutima Ganthavorn](#), Nutrition, Family, and Consumer Sciences Advisor, UCCE Riverside and San Bernardino Counties

### **Your contribution**

- Extension – Conducted nutrition education classes to adults using the Eating Smart Being Active curriculum, Plan, Shop, Save, Cook series, and other workshops

### **Behavior change**

- 93% (602 of 650) of participants showed improvement in one or more diet quality indicators

### **Primary ANR condition change**

- Improved health for all

### **Condition change indicators**

- Reduced risk of cardiovascular disease (ex. of B)
- % of obese adults in California (ex. of C)

### **Associated ANR public value**

- Promoting healthy people and communities



## Impact story: Change in food choices improves health

### The Issue

Much work is still needed to improve the health and well-being of Inland Empire residents (Riverside and San Bernardino Counties). According to the California Department of Public Health's county profiles for the Supplemental Nutrition Assistance Program – Education (SNAP-Ed), low income adults in the Inland Empire have higher obesity prevalence than the state average: 63% overweight/obese adults in California, 67% Riverside, 70% San Bernardino.

### How UC Delivers

UCCE works to improve the health and nutritional status of low-income consumers in Riverside and San Bernardino Counties by promoting behavior change with education, and especially working with parents to establish healthy habits for the family. During 2018, Expanded Foods and Nutrition Education Program (EFNEP) Educators in Riverside and San Bernardino Counties delivered lessons from the Eating Smart Being Active curriculum to 670 low-income parents with children. CalFresh Healthy Living, University of California (CFHL, UC) Educators delivered nutrition education to 835 adult participants in Riverside County, through the Plan, Shop, Save, Cook (PSSC) Series or through educational workshops.

### The Impact

EFNEP participant outcomes include 93% (602 of 650) of participants showing improvement in one or more diet quality indicators, including eating fruits, vegetables, red and orange vegetables, dark green vegetables, drinking less regular soda or sugar-sweetened beverages, and cooking dinner at home.

CFHL, UC participant outcomes included statistically significant ( $p < .001$ ) improvements from pre to post in the percent of participants, in PSSC series, who reported that they “almost always” or “most of the time”: use MyPlate to make food choices (from 19% to 58%); use the “Nutrition Facts” label to make food choices (from 38% to 64%); and think about healthy food choices when deciding what to feed the family (from 63% to 79%).

These measured behavior changes demonstrate improvements in food choices among nutrition education participants. Increased consumption of nutritious foods is associated with better health outcomes such as reduced risk of cardiovascular disease according to several studies reviewed in an article published by the [Journal of American Dietetic Association](#). Thus, UC ANR contributes to the public value of promoting healthy people and communities in California. Work must continue, however, as 60% of California's adults continued to have an obesity or overweight classification between 2016 and 2017, according to the Centers for Disease Control and Prevention.

## **Appendix: UC ANR Public Value Statements and associated Condition Changes**

These were generated by UC ANR personnel through a series of workshops and consultations.

### **UC ANR: Promoting economic prosperity in California**

- Improved individual and household financial stability
- Enhanced community economic development
- Improved animal management, productivity and efficiency
- Increased agriculture and forestry efficiency and profitability
- Increased emerging food economies and markets

### **UC ANR: Safeguarding abundant and healthy food for all Californians**

- Improved food security
- Improved food safety

### **UC ANR: Protecting California's natural resources**

- Improved management and use of land
- Improved air quality
- Protected and conserved soil quality
- Increased ecological sustainability of agriculture, landscapes, and forestry
- Improved water quality
- Improved water-use efficiency
- Improved water-supply security

### **UC ANR: Promoting healthy people and communities**

- Improved health for all
- Improved community health and wellness
- Improved access to positive built and natural environments

### **UC ANR: Developing a qualified workforce for California**

- Increased workforce retention and competency
- Increased effective public leaders
- Improved college readiness and access
- Increased civic engagement

### **UC ANR: Building climate-resilient communities and ecosystems**

- Increased preparedness and resilience to extreme weather and climate change

### **UC ANR: Developing an inclusive and equitable society**

- Improved living and working conditions for California's food system and farm workers
- Increased diversity, inclusiveness, and cultural competency in California's workplaces